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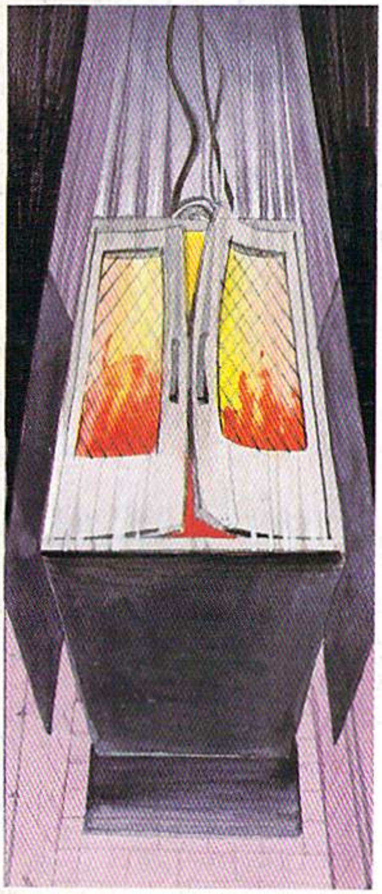

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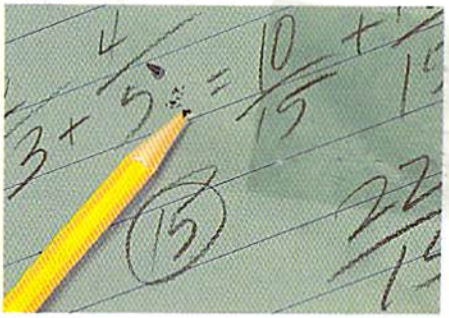

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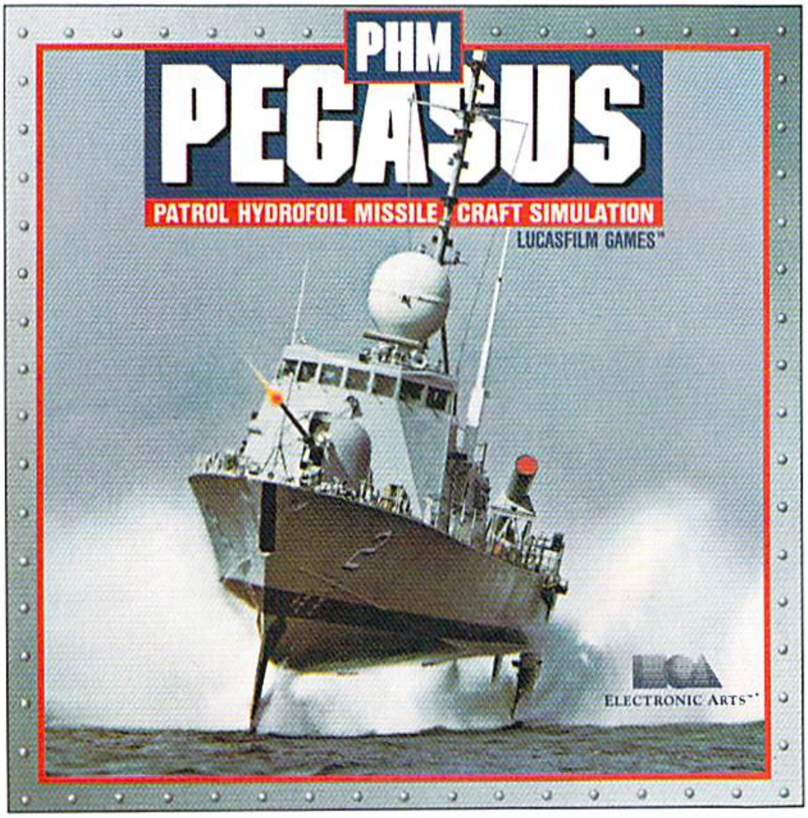

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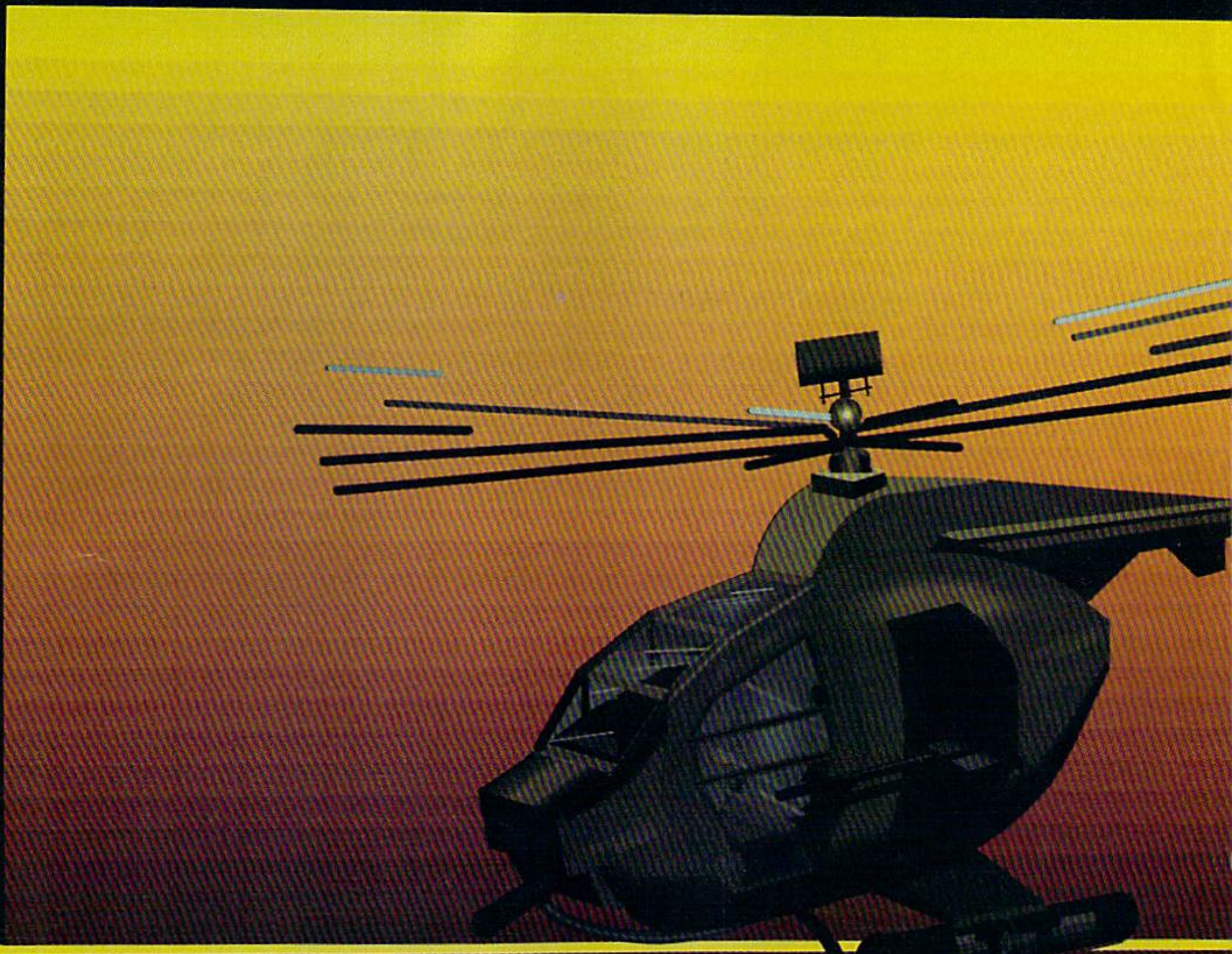

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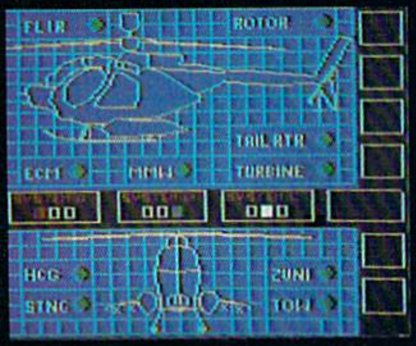

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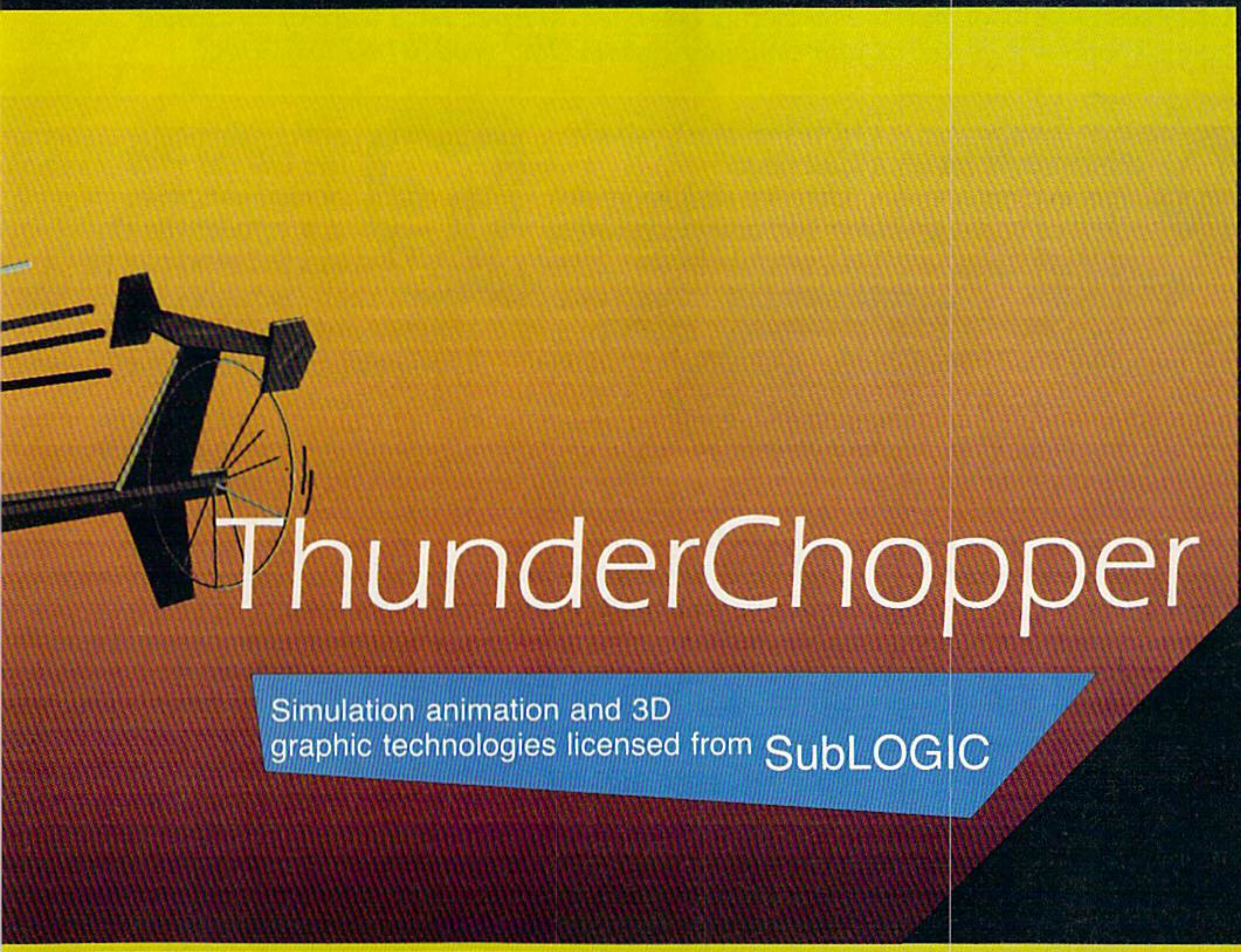

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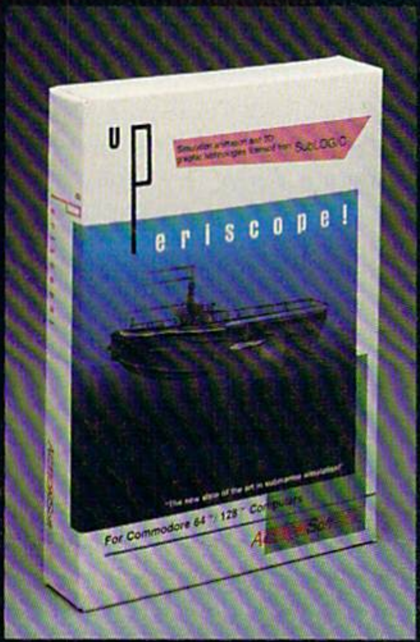

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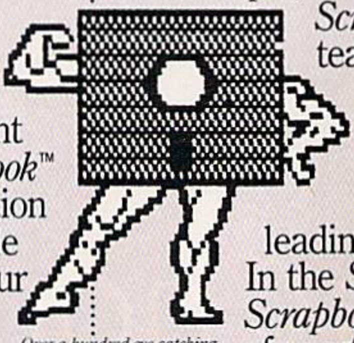

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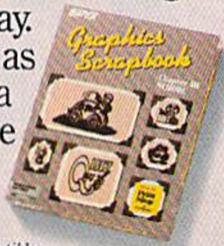

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*=General, **V**=VIC-20, **64**=Commodore 64, **+4**=Plus/4, **16**=Commodore 16, **128**=Commodore 128

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editor's notes

It was ten years ago this month that Commodore unveiled the first all-in-one personal computer, the PET. This great-grandfather of the Commodore 64 was a lovely, futuristic piece of work: a sleek gray cabinet, a glossy keyboard, and a nine-inch black-and-white monitor jutting above like the entrance to a space station. Looking at the advertisements, I knew that beyond that little screen, inside the cabinet, there was something I'd always wanted to understand.

How could metal and plastic and wires remember? How could a machine make decisions? And—given that the Pentagon had spent millions for the same capabilities a few years earlier—how many ways could these affordable computers now help the average person in managing his or her life, becoming more efficient, or just passing the time with a fascinating new technology?

Popular electronics magazines were full of ads, that summer of 1977, for build-it-yourself computers, single-board 1K RAM wonders. But the magazines also described the self-contained PET. At $795 it seemed a great bargain: everything you needed, including a built-in BASIC language, an instruction book, a cassette player for saving programs and data, even a second cassette port built in. To get one, you had to send in your check and be put on a waiting list.

If you'd never programmed before, not even on a mainframe, the waiting was very difficult. You wanted at least to read up on the subject, to learn what to expect. There were only a half-dozen books about computers and they were very technical: all about the problems of interfacing mainframes or FORTRAN algorithms. There were no computer magazines. There was nothing to read which explained what personal computers could do; what RAM meant (was 4K enough?); how an optional second cassette drive would be of use; how a monitor was different from a TV.

For example, it was clear that you, the programmer, decided what a program would display. Did this mean that you could control every dot of light on the screen? If so, you could create your own TV show by brute force programming. (Reality later revealed that this was only theoretically accurate. In fact, high-resolution animation is so memory-intensive that 4K is orders of magnitude insufficient.) But the months went by and the illusions proliferated.

I was in limbo those months, waiting the way some people wait for their first automobile. I filled a notebook with plans for programs I would write, and elementary flowcharts, lists of instructions including branches and loops (I got something out of the FORTRAN book).

One day I even cut out a cardboard model, based on the pictures of the PET, and put it together with Scotch tape. It sat on my desk, in place of the real thing, like sympathetic magic.

At the time, I lived in a rural Pennsylvania mountain community. Many times I went downtown and asked the UPS man if my package from Commodore had arrived. One day, months later, it did.

I carefully put it on the back seat of my car and drove it home, sure that I would break it or that it was *already* broken, carelessly tossed from truck to truck in transit. The box was big—about four feet square. I unpacked it and plugged it in. Then, turning on the power, I was greeted with the first computer message I'd ever seen: Commodore BASIC and a message that there were seven-thousand-some bytes free. READY. I was too excited to worry about the fact that 8K was supposed to be 8192 bytes.

In a few hours I had managed to go through the little instruction booklet and was delighting myself with loops that printed messages across the screen, endlessly. In the weeks that followed I wrestled with the strange WAIT command, learned to tell what = means to a computer, and made some headway into the mysterious sequential tape file instructions.

From time to time I would accidentally type something that caused me to fall below BASIC into the sinister-sounding *monitor,* which, although I didn't understand it at all, hinted of a whole new world, an unexplored realm close to the 6502 chip, the heart of the intelligence of the machine.

I stuck with it, writing hundreds of BASIC programs and learning machine language. A few games and magazines and books began appearing on the market. A year later, having worn the paint off many of the calculator-style keys and having grown restless with the twin barriers of cassette storage and insufficient RAM, I bought the new Commodore 8032. It was somewhat larger, and featured a disk drive, 80 columns onscreen, and a typewriter-style keyboard. What was especially enticing was the immense 32K RAM; you had enough room for a word processor and a three-page document in memory at the same time. And of course, no BASIC program could possibly require that much space.

Then, with the VIC-20 in 1981, Commodore introduced color and sound; the company added 64K RAM with the Commodore 64 in 1983. Now the Amiga, with capabilities undreamed of in 1977, is continuing the tradition of ever more powerful machines at affordable prices. Who knows, maybe by the twentieth anniversary of the PET, even high-resolution animation will be taken for granted—everyone easily controlling all the dots of light on the screen.

Richard Mansfield

Richard Mansfield
Editorial Director

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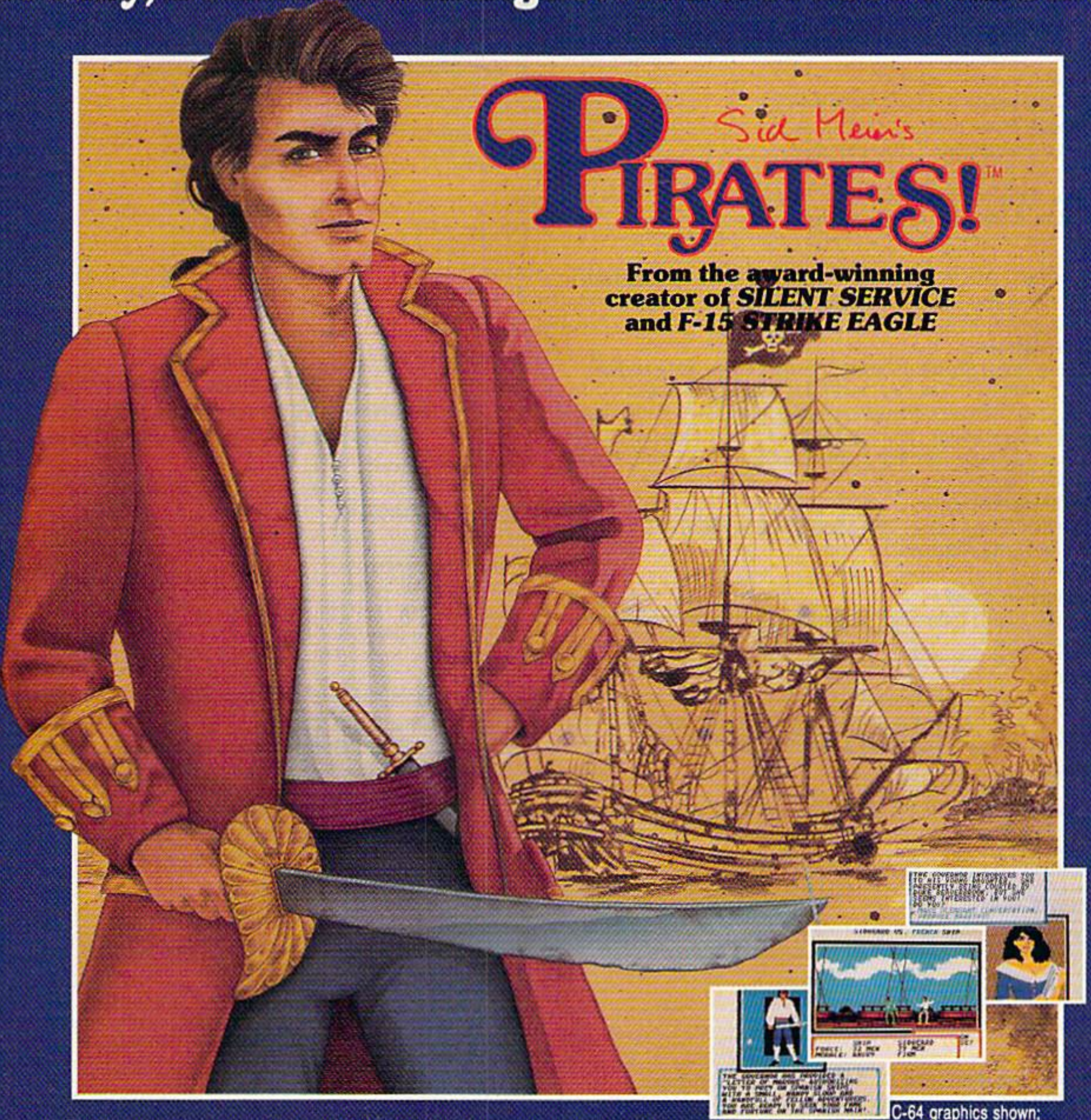

C-64 graphics shown;
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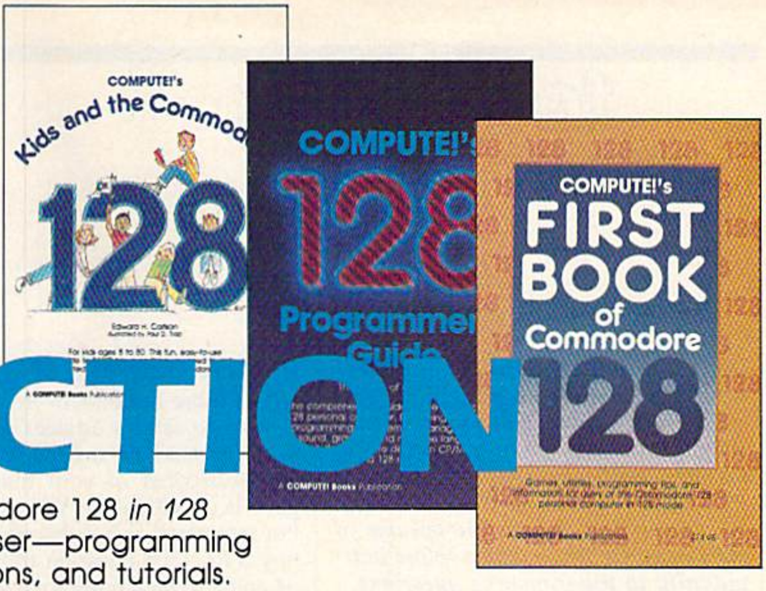

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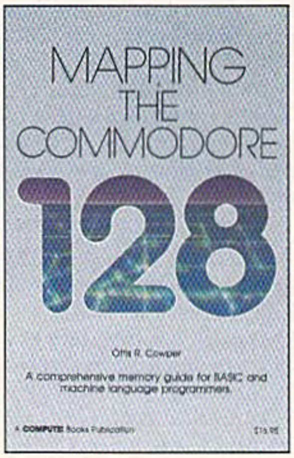

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The 64 Doesn't Speak BASIC 7.0

When I run the "Automatic Proofreader" on the 128, line 50 reports a ?SYNTAX ERROR. Pressing the HELP key highlights the line starting at GRAPHIC CLR: PRINT "128". I did not see any errors, so I modified the line to put the PRINT before the GRAPHIC CLR. This corrected the problem. Can you explain why PRINT must come before GRAPHIC CLR?

Alan Greig

If you typed in the program in 128 mode, there should be nothing wrong with that line. It should work as listed.

We suspect, however, that you previously typed in and used the program on a 64 or on the 128 in 64 mode. The problem is the GRAPHIC command, which is found in BASIC 7.0, but not BASIC 2.0.

Here's what happened: You pressed RETURN over the line on a 64, and BASIC did its usual job of scanning the line for commands it knows. Since GRAPHIC is not part of BASIC 2.0, the word GRAPHIC was stored as seven ASCII characters in memory. If you had typed the line in 128 mode, BASIC 7.0 would have recognized GRAPHIC and converted it to a one-byte token (the number 222), which identifies that particular command. When the program ran in 128 mode, BASIC 7.0 saw the seven letters G-R-A-P-H-I-C instead of the number 222 and returned a ?SYNTAX ERROR message.

Retyping the line in 128 mode caused GRAPHIC to be properly tokenized. If you had listed the line and pressed RETURN over it, that would have solved the problem, too. The key thing to remember is that 128 programs that use the new commands of BASIC 7.0 should be typed in 128 mode, not 64 mode.

Whither The 64?

I started programming on the VIC-20 and continued for about two years. Now I'm stuck with a computer for which there is no software and hardly anyone to ask for advice. What I want to do is purchase a 64. I was a reader and subscriber of your magazine but gave it up when the VIC disappeared. I'm interested in resubscribing when I buy a 64. One question though: Is the 64 going to be around for a while or am I just going to buy a computer that's going to sit on the shelf and collect dust?

John Merjave

While it's impossible to see into the future, it's safe to say that the 64 will not go the way of the VIC for a number of years. From the start, the 64 had a lot more going for it. First, the VIC had only 5K of RAM memory (of which 3.5K—about 3600 characters—was available to BASIC programs), and a display only 22 columns wide. The 64 has a much larger memory, a 40-column display, eight sprites, a sophisticated sound chip (SID), and much more. The potential of the 64 is still being exploited. When the price of the 64 dropped to $300 and then to $200, it fell into a price range that almost anyone interested in computing could afford. Consumers were buying the 64 as fast as it could be stocked. VIC sales diminished sharply. As 64 sales increased, so did the computer's software base. This made the 64's appeal even greater. Strong sales continue.

There's no reason to suspect that the 64 will fade any time soon. In fact, as we pointed out in our CES report in the April issue, industry leaders concur. Bing Gordon, vice president of marketing for Electronic Arts, thinks the 64 will continue to sell well into the 1990s. Nigel Shepherd, general manager of Commodore North America, says "I think if somebody had said to me—maybe in '85—what future do you see for the 64, I would have been very aggressive and said 'At least through to '87.' But I think today you're talking certainly past 1990."

Another factor in the 64's lifespan is the large number of active 64 users (as an example, consider the number of user groups listed elsewhere in this issue). A computer supported by millions of users continues to spawn interest and support, as well as to generate better software. The life of the 64 has also been expanded with products like GEOS *(Graphics Environment Operating System), and the recently announced 256K memory expander.*

We're reasonably certain that your experience with the VIC-20 will not be repeated should you decide to purchase a Commodore 64.

Filing Away An Array

I recently typed in a program for my 64 that learns the names of animals. However, when I turn off my computer it forgets all that it learned. Could you please write a program that will save and load the array A$ to disk. A$ is dimensioned to 200.

Brian Bagnall

This subroutine does what you need. You can renumber it and use it in your program.

```
DG 10 DIM A$(200)
KA 20 INPUT"NAME OF DATA FILE"
   ;F$
ED 30 FOR I=1 TO 200
BH 40 A$(I)=STR$(I)
DH 50 NEXT
KH 60 GOSUB 1000
RX 70 FOR I=1 TO 200:A$(I)="0"
   :NEXT
PK 80 GOSUB 2000
CH 90 FOR I=1 TO 200
ER 100 PRINT A$(I)
GH 110 NEXT
MQ 120 END
JR 1000 REM OPEN 1,8,15,"S0:"+
     F$:CLOSE 1:REM SCRATCH
     OLD FILE
HR 1010 OPEN 1,8,8,F$+"S,W":RE
     M OPEN DATA FILE FOR W
     RITING
MR 1020 FOR I=1 TO 200
DX 1030 PRINT#1,A$(I):REM WRIT
     E DATA TO FILE
HC 1040 NEXT
GS 1050 CLOSE 1:REM CLOSE DATA
     FILE
FC 1060 RETURN
FM 2000 OPEN 1,8,8,F$+"S,R":RE
     M OPEN DATA FILE FOR R
     EADING
CX 2010 FOR I=1 TO 200
PD 2020 INPUT#1,A$(I):REM READ
     DATA TO FILE
HB 2030 NEXT
GB 2040 CLOSE 1:REM CLOSE DATA
     FILE
FB 2050 RETURN
```

Using A 1571 With A 64

Is it possible to hook up both a 1541 and a 1571 disk drive to my Commodore 64 to make a backup faster? If it's possible, could you please give me a complete set of directions on how to hook them up?

Amiga screen

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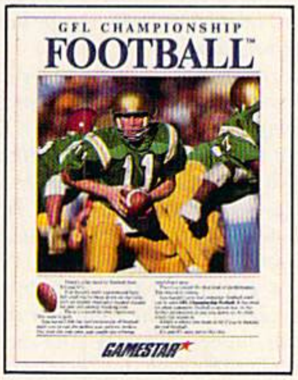

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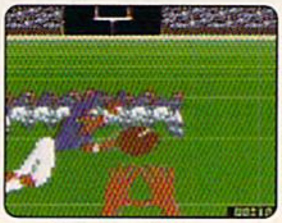

Commodore 64-128 screen

Commodore 64-128 screen

Commodore 64-128 screen

GAMESTAR

Do I need special cables?

San Pham

You don't need any special cables to connect two disk drives to your computer. Just use the serial cables that come with the disk drives. Attach one of the drives to your 64, and the other to the first disk drive. You need to assign one of the disk drives a device number other than the default value of 8 (9 is the most common device number for a second drive). See your disk drive manual for directions on how to do this.

If your intent is to make backup copies from one drive to the other, you'll also need a backup program that supports two drives. The 64 has no built-in provision for drive-to-drive copying.

Unfortunately, for loading and saving programs, the 1571 is no faster than the 1541 when it is connected to a 64. The drive's high-speed burst mode *protocol relies on a hardware-specific feature of the Commodore 128. If you were using a 128, you could take advantage of the 1571 to speed up disk access.*

Double Meaning

I own a 64 and I was wondering if you have to use a special kind of monitor for machine language. Can you use a video monitor model 1702?

Chris Carroll

The word monitor *has two meanings in computer jargon. A video monitor such as the 1702 is a television-like device that displays text and graphics when it's hooked up to a computer. A video monitor is hardware.*

A machine language monitor, on the other hand, is a program. It usually has commands for assembling and disassembling programs; for viewing the contents of memory; for searching through memory; for converting hex, binary, and decimal numbers; and so on. Popular monitor programs for the 64 include "Micromon" and "Supermon," both of which have been published in previous issues of COMPUTE!. The 128 has a built-in ML monitor, which you run by typing the command MONITOR.

If you have an ML monitor (the software), you still need a video monitor (the hardware) to see what you're doing. And a 1702 works quite nicely, as do other brands.

Parlez-Vous BASIC?

I have often thought about what a program from a non-English speaking nation might look like. How does a program from France or Italy look? Does a 64 sold in Italy have different tokens? Is the processor different? What does the ML instruction set look like? Is zero page the same? What about languages which use a different alphabet (Germany) or those which don't have 26 letters (Italy), or those which do not have an alphabet (Japan)?

Anthony Tamburro

Here are a few lines from program in a column called Tips & Tricks für Profis, *published in a German magazine called* 64er:

```
60 PRINT "DIESER TEXT WIRD JETZT
   GLEICH WEGEN"
70 PRINT "EINER GARBAGE COLLEC-
   TION UEBERSCH RIEBEN"
80 DIM A$(200,1):FOR I=1 TO 200:
   A$(I,1)=CHR$(I):NEXT
```

In this and other German programs, the text inside PRINT statements and REM statements is in German. But the BASIC keywords, such as PRINT, DIM, FOR, NEXT, and so on are the same as they are in English (and French and other languages). Commodore BASIC is the same from one country to the next. The BASIC tokens, the processor, ML instructions (both opcodes and mnemonics), and almost all memory locations are also the same.

There are some differences, though. The 128's character ROM is different in Germany, where the ALT key switches in a separate character set that includes the various German letters. And many European countries use electrical current of 220 volts and 50 Hertz where the U.S. uses 110V/60Hz. The power supply has to be different, although the processor runs at roughly the same speed. The jiffy clock clicks 60 times per second in the U.S., but only 50 times per second in Europe. The standard television set in Europe has more raster lines, also.

Occasionally, the differences in timing have caused some GAZETTE programs to run improperly on overseas 64s. For example, a clock program that continuously displayed the time in the corner of the screen was reported to lose ten minutes every hour on European 64s. An Australian reader sent us modifications for "TurboTape," a program which wouldn't work down under unless the timing of the program was changed slightly. And some servicemen stationed in Germany have reported that some commercial software will run on American 64s but not German 64s (and vice versa), primarily because of the method used to protect the disk from being copied.

Variables In Six Flavors

I recently typed in a program that asks you to enter names and phone numbers. After that, the computer displays the names and numbers. But when the program is run, it doesn't print them. My program looks like this:

```
110 INPUT "HOW MANY NAMES";A
120 DIM A$(A)
125 FOR B=1 TO A: PRINT "NAME
    AND NUMBER";B
130 INPUT A$: NEXT B
135 FOR Z=1 TO 1000: NEXT: PRINT
    CHR$(147)
140 FOR C=1 TO A
150 PRINT "NAME AND NUMBER";C:
    PRINT A$(C)
160 NEXT C
```

Could you please tell me what I am doing wrong?

Troy Oxford

Commodore computers allow programmers to use three types of variables: string, numeric, and integer. A string variable holds a string of characters and the name of the variable always ends with a dollar sign. Integer variables hold whole numbers in the range −32768 to +32727, and their names end with a percent character. Numeric variables—also called floating-point *variables—hold numbers. A numeric variable does not have a suffix.*

In addition, each of the three variable types can appear in two forms: scalar and array. An array variable name is followed immediately by a number (or a numeric variable) in parentheses. A scalar variable has no parentheses. You could theoretically have six separate variables named V in a program: V, V%, V$, V(X), V%(X), and V$(X). If you changed the value in one of them (like V$), the others would not be affected.

Your example program contains several variables called A. First, line 110 inputs the number of items on the list and stores the value in the scalar numeric variable A. Line 120 then DIMensions a string array A$(A) to this size. In line 130, the INPUT command asks for the name and number, putting the result into the scalar string A$. With each pass through the FOR-NEXT loop, a new string is stored in A$ and the old one is lost.

When the list is printed, the program uses the array A$(C), which was not affected by the INPUT in line 130. A$ is not the same as the array A$(C).

To fix the program, change line 130. You have two choices:

```
130 INPUT A$(B): NEXT B
```

or

```
130 INPUT A$: A$(B)=A$: NEXT B
```

Either line will store the name and phone number into the array A$(B). For all intents and purposes, A$(A) is the same array as A$(B) and A$(C), because the name A$ before the parentheses is the same. The value in parentheses can be numbers or a numeric variable. In line 130, you use a B because B is the index in the FOR-NEXT loop. In line 150, the C refers to the C from that FOR-NEXT loop.

Reading And Writing Files

The following line seems to have nothing wrong with it, but every time I run it I get an error in 500. What's wrong here?

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```
500 OPEN 8,8,8,"OL,P,W": INPUT#8,A,
    B,C,D,E: CLOSE 8
```

Timothy Woodruff

If you want to write to the file named OL the OPEN statement is correct, but you should PRINT# instead of INPUT#.

On the other hand, if you're trying to read the file OL, the INPUT# statement is okay, but the OPEN statement is wrong. The W after the filename means write. To read the file, substitute an R for the W.

ML Directory Printer

I have written or modified a number of BASIC programs for amateur radio use. These programs frequently require a subroutine that will print the disk directory without disturbing the resident program. Have you published such a routine?

Dennis Eksten

The source code for a machine language program which displays the directory without overwriting your BASIC programs is offered in Machine Language Routines for the Commodore 64 and 128, *from COMPUTE! Books. The routine below, called DIRBYT in the book, reads the directory bytewise from the disk and prints it to the screen.*

Here, we've modified DIRBYT slightly—adding a pause and break function—and listed it in the form of the BASIC loader below.

```
MK 10 FORI=828TO943:READA:POKE
      I,A:Z=Z+A:NEXT
AQ 20 FORI=1020TO1021:READA:PO
      KEI,A:Z=Z+A:NEXT
QS 30 IFZ<>16399THENPRINT"ERRO
      R IN DATA STATEMENTS":ST
      OP
QH 40 DATA 169,1,162,8,160,0,3
      2,186,255,169
HE 50 DATA 2,162,252,160,3,32,
      189,255,32,192
XJ 60 DATA 255,162,1,32,198,25
      5,32,170,3,32
BR 70 DATA 156,3,240,53,165,19
      8,240,19,169,0
BH 80 DATA 133,198,173,119,2,2
      01,3,240,38,165
DM 90 DATA 198,240,252,169,0,1
      33,198,169,13,32
MR 100 DATA 210,255,32,207,255
       ,170,32,207,255,32
FM 110 DATA 205,189,169,32,32,
       210,255,32,207,255
SM 120 DATA 240,203,32,210,255
       ,208,246,169,1,32
GA 130 DATA 195,255,32,204,255
       ,96,32,207,255,133
XA 140 DATA 251,32,207,255,5,2
       51,96,32,170,3
MK 150 DATA 32,207,255,76,207,
       255
CS 160 DATA 36,48
```

To incorporate this routine in your BASIC programs, add the lines above to each program. Execute them once to install the ML routine. Then, anytime you need to display the directory within the program, just SYS 828. If locations 828–943 are unavailable, you may relocate the program elsewhere in memory by changing the POKE addresses in line 10.

If you find the directory scrolls too rapidly as it prints to the screen, press any key to pause the routine. A second keypress causes it to continue. To halt it altogether, press the RUN/STOP key.

Adventure Games

I own a 64 and am currently writing a text adventure game. I need to know how to make the program select items randomly for a room or corridor (for example, an old lamp, a green vial, and so on) and display them on the screen. Also how would you describe a room that you are currently in? I have heard that flags are used. How and why are they used? Should I use DATA statements for all these things?

Hin Jang

There are always many ways to write a program, but since text adventures include many descriptions and characteristics for each location, most text adventures written in BASIC contain a great many DATA statements (an alternative is to store the information in disk files). Here's how a description of a dungeon might be stored in a program:

```
3000 DATA YOU ARE IN A HUGE
     COLD AND DREARY ROOM.
3010 DATA A MAN CHAINED TO THE
     WALL.
3020 DATA A RAT.
3030 DATA A BAG OF DOG FOOD.
3040 DATA 0,0,23,0,0,0
```

Since DATA statements can only be read once (actually, they can be read over and over by using the RESTORE command, but it is very slow to read through all the DATA that would be in a text adventure), you'd probably want to read the data into arrays. For example, we could read a series of descriptions like the one above like this:

```
1000 FOR I=1 TO RM:REM RM IS
     NUMBER OF ROOMS
1010 READ D$(I),I1$(I),I2$(I),I3$(I)
1020 READ U(I),D(I),N(I),S(I),E(I),W(I)
1030 NEXT I
```

D$() holds the description of each room, I1$(), I2$(), and I3$() hold the items in each room, and U(), D(), N(), S(), E(), and W() hold the room numbers that an exit from the room would lead to. In the room above, the only way out of the room is to the north. That path leads to room 23 (whatever that may be). To print the description of room 5, just PRINT D$(5).

With the technique outlined above, the same items are always found in a given room. Using BASIC's RND function, it's possible to "shuffle" things around at the beginning of the game. You could read the things into arrays and then move the elements within the arrays. Here's an example that moves a few things around before the game begins:

```
500 FOR I=1 TO 10
510 T1=(RND(0)*RM+1)
520 T2=(RND(0)*RM+1)
530 T$=I1$(T1)
540 I1$(T1)=I1$(T2)
550 I1$(T2)=T$
560 NEXT I
```

You asked about flags. Flags are boolean variables (they can hold two values, one of which stands for "true," the other "false"). There are many uses for flags in a text adventure program. For example, let's assume you wanted a monster to attack the player each time he entered a room he had already been in before. For this, you would need an array which held a flag for each room. Each time the player entered the room, you could check the array to see if he had already been there. If not (if the flag is zero), set the flag to true (one). If he has been there, have the monster attack. Flags can also be used to keep track of what objects the player is carrying and whether certain key goals have been accomplished.

Commodore 128 users do not need to put all of the descriptions into arrays, since the 128's RESTORE statement can accept an expression as a line number. For example, assuming each room description begins at a line number divisible by 100 and the first description is at 3000, we can print the description of the room N with this BASIC code segment:

```
2000 RESTORE 3000+(N-1)*100
2010 READ D$:PRINT D$
```

IBM Mode For The 128?

I own a 64. I've been reading a lot, mostly in your magazine, about the 128. I'm thinking about upgrading. My question is about operating systems. Specifically, do you know of any plans to upgrade the 128 to MS-DOS?

The reason I would like to know is that I have owned many different computers and I have software left over from all of them in both CP/M and MS-DOS. If I knew there were plans for MS-DOS, I would feel better about upgrading.

Ross Brown

The 128 has two processors: an 8502 (for 64 and 128 modes) and a Z80 (for CP/M mode). The IBM PC uses an 8088 processor, which is fundamentally different from the two processors in the 128. It would not be easy to get a 128 to run IBM programs. Nevertheless, there are three ways a 128 could emulate MS-DOS.

The first method is to emulate only the DOS commands such as format, copy, rename, sort, and so on. You wouldn't be able to run IBM-compatible programs, but you could use the various disk commands. This sort of emulation would be relatively

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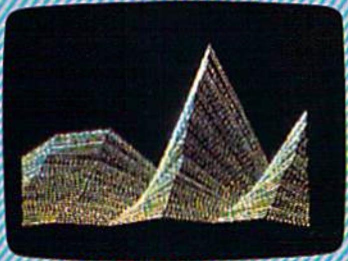

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The second method is to write an interpreter that emulates the 8088 machine language instruction set. Since the Z80 instructions are more similar to the 8088 instructions than the 8502 instructions are, it would probably have to be a CP/M program. There's an old saying that "any computer can emulate any other computer in software, as long as speed isn't important." It could be done, but the MS-DOS emulator would run much slower than an IBM or a compatible.

The third method is to rig up a hardware emulator (a coprocessor board), which contains an 8088 and the necessary support circuits. In essence, you'd have an IBM-in-a-box, with the 128 acting as a terminal—a keyboard plus a monitor. Money becomes a factor in this scenario. The price of IBM clones has dropped significantly, and you might find it cheaper just to buy an IBM compatible computer.

Don't expect to see an MS-DOS emulator for the 128 in the near future. A software emulator would be too slow and a hardware emulator would be too expensive. If you want to run 64 and CP/M programs, the 128 can handle them. For IBM programs, we'd suggest a clone, or something like the Amiga 2000, which has an IBM-compatibility option.

One final note: The 1571 disk drive can read disks formatted on the IBM, and there are commercial programs that will translate files from MS-DOS format to Commodore format. If you have data files or word processing documents on an IBM disk, you can transfer them to a disk for use in 64 or 128 mode. You can't run IBM programs, but you can use the data files on a 128.

Converting BASIC Programs

I use my Commodore 128 and 1571 disk drive with some commercial software and some which I developed myself in my small business. I have a book that lists BASIC programs for business. Several of these programs I would like to use.

However, several functions used in these programs are not available in Commodore BASIC, and I haven't been able to find substitutes. The functions include CVI, CVS, EOF, FIELD, LOF, LSET, MKI$, MKS$, PUT#, and SPACE$.

Tony Ruggiero

It sounds as if the programs in your book were written for IBM BASIC. The commands you mention are all related to random access files.

The 128's own BASIC 7.0 allows random data access through relative files, which appear in a directory as the REL type. If you're willing to make the conversion yourself, read about these commands in your 128 System Guide: DOPEN, DCLOSE, GET#, INPUT#, PRINT#, and RECORD. If you can find a programmer with some experience in reading and writing relative files (or if you have the time to experiment), you should be able to emulate the various IBM BASIC commands.

A second option is to use the CP/M side of your 128. MBASIC (the CP/M version of IBM's Microsoft BASIC) contains the commands you listed. Unfortunately, MBASIC doesn't come with the 128 and the price is significantly higher than the price for typical 64 and 128 software.

A final option is to buy a commercial package that keeps business records for you.

Input And Overflow

I have a couple of questions concerning 6502 machine language. First, how do I INPUT in ML? Second, what is the overflow flag and how are the instructions CLV, BVC, and BVS used?

Jerry Bashan

For input, use the Kernal routines GETIN (at $FFE4) or CHRIN ($FFCF). These entry points are the same on all Commodore eight-bit machines (VIC, 64, Plus/4, 16, 128). After you JSR $FFE4, the accumulator will hold the ASCII value of the most recently pressed key. If no key was pressed, the accumulator will hold a zero. It's a common practice to use the BEQ instruction to branch back to the JSR to the GETIN routine until a key is pressed.

CHRIN works much like the BASIC INPUT command. The first call to CHRIN accepts a line of input from the keyboard. The user sees a blinking cursor and can use the delete key to make corrections. RETURN must be pressed to end input. Upon return, the accumulator will hold the first character of the input string. Within a machine language loop, each subsequent call to CHRIN returns the ASCII code for the next character in the input string, until you receive a RETURN—CHR$(13)—which marks the end of the input. After each CHRIN, store the ASCII value and compare it to 13, branching back if it's not equal (BNE).

The overflow flag V is used in signed binary arithmetic. It functions like the carry flag C does in unsigned operations. A byte of memory can hold 256 values, from binary 00000000 to 11111111. These correspond to the decimal values 0–255 if you consider them to be unsigned. When you add two numbers and the result is greater than 255, the carry flag is set, to indicate an overflow past the maximum value. If you subtract and the result is less than 0, the carry flag is clear.

In signed arithmetic, you can use positive or negative numbers. The 256 possible values range from −128 to −1 (binary 10000000 to 11111111) and 0 to +127 (00000000 to 01111111). The highest bit is 1 for negative numbers and 0 for positive numbers and zero. To negate a number, flip the bits (EOR #$FF) and add one.

When you add two positive numbers and the result is greater than 127, the overflow flag is set. Likewise, if you add two negative numbers and the answer is less than −128, the overflow flag will also be set. In both situations, the V flag marks a number that falls outside of the normal range of −128 to +127. The BVS and BVC opcodes allow you to make branches depending on whether the V bit was set or cleared, respectively, by the most recent operation. The CLV instruction allows you to force the V flag to a known state (0).

Because of the limited range of possible values, eight-bit signed binary arithmetic is very rarely used. This explains why you'll almost never see these instructions.

Building A Light Pen

A friend recently told me that by placing a photodiode in the joystick port, you can tell light and dark outside the computer. Can this harm the computer in any way? If this does work, could you show me how to read the photodiode?

Stephen Hunter

It's possible to connect a photodiode to the joystick port and create a light pen. You then point the light pen at the screen and (with the proper software) do a variety of things such as drawing on the hi-res screen or using the pen to select items from a menu.

Complete plans for making your own light pen are contained in chapter 6 of Electronic Computer Projects *($10.95, COMPUTE! Books). It's not a simple matter of hooking up a photodiode. To make a truly workable light pen you also need a resistor, a switch, a NAND gate, and some wire.*

WHEN 2+3.5

The Evolution Of Commodore BASIC

Todd Heimarck, Assistant Editor

BASIC, perhaps the most widely used programming language ever developed, was invented at Dartmouth College nearly 25 years ago. Despite its age, BASIC—an acronym for Beginner's All-Purpose Symbolic Instruction Code—has stood the test of time, partly because it was originally designed for beginners and partly because it's relatively easy to learn.

BASIC has also kept pace with new developments in computer hardware, evolving into the many different versions that are available today. The language emerged at about the same time as another major development in computing: mainframe computer time-sharing. The combination of BASIC and time-sharing drastically changed the way programs were written.

Before BASIC: Batch Processing

In the 1950s and early 1960s, computers were rare and computer time was valuable. Programs were rarely written directly on the computer. Instead, you would sit down at a different machine that punched holes in cards or tape. Various combinations of holes represented different letters, numbers, or instructions.

After you typed in the program, you'd carry the batch of cards to the people in charge of the computer. Within a few days, your program would be submitted to the computer and you'd get back the results. The backlog of programs waiting to be run insured that the computer would be kept busy and that its time wouldn't be wasted.

But programmers' time was wasted; it might take weeks or months to debug a program, because every time you added a new routine or fixed a problem, you'd have to wait a few days to find out what happened when the program ran.

BASIC wouldn't have worked on a batch-processing system; you couldn't afford to have a novice experimenting with a program, tying up the computer for an hour or two. The computer time was too valuable. But time-sharing solved the problem.

In a time-sharing system, there's still just one computer, but there are multiple terminals. A *terminal* usually consists of a keyboard and a display device like a video screen or a printer. (BASIC's PRINT command is a holdover from the days when most terminals used printers instead of video monitors.) In a time-sharing system, the computer splits up its time between the terminals. It spends a little time running part of one program, then it spends some time on a second program, then it goes to a third pro-

+4 EQUALS 7

Commodore 64 and 128 owners have at their fingertips the immensely popular programming language, BASIC. As programmers are quick to discover, the two Commodore BASICs have the same roots, but different branches.

gram, and so on. The more terminals you have, the more people who can use the computer at a given time.

Suddenly, programs could be written in a matter of hours. A beginner could type a few lines, run the program, find mistakes, make changes, and finish a program in one day. BASIC was the first popular interactive programming language.

Micros: Decentralizing Computers

In the ten years from 1965 to 1975, mainframe and mini-computers continued to get smaller, faster, and less expensive. They were still too costly for the average individual, so computers were found mostly in universities, businesses, and government installations. Some professors or engineers might have had terminals in their offices, but the computer was still in a central location.

Some computer experts predicted that by the year 2000, most Americans would have a home terminal that was connected to a central city computer. However, that concept would have required wiring a city with computer cables similar to phone lines, which would have been a large and expensive project.

In the mid-1970s, computer kits became available. The first of these had only a few hundred bytes of memory and a microprocessor. You'd send your money, wait at least six months, and receive the parts in the mail. You then had to assemble the computer. The output consisted of eight LEDs (Light-Emitting Diodes); the input was eight toggle switches plus a key for storing the bits in memory. No software was included. You had to write your own programs in machine language.

By today's standards, the early microcomputers weren't very powerful, and they were hard to use. But the cost was so low that people who were interested in programming could afford to own a computer.

The first high-level language for the early microcomputers was a small version of BASIC written by Bill Gates and Paul Allen, who founded a company called Microsoft. When it first appeared, the only legal way you could obtain BASIC was to buy a 4K memory expander for one of the earliest personal computers, the Altair. But many illegal copies were made and distributed among owners of the Altair. BASIC became the first widely pirated piece of software.

The First Commodore BASIC

Within a couple of years—in the late 1970s—Apple, Radio Shack, Commodore, and others developed microcomputers complete with a keyboard and a screen. These micros contained versions of Microsoft BASIC, which was also available for CP/M computers and was later rewritten to become IBM BASIC. The first Altair BASIC was the forerunner of the BASIC on many current microcomputers. Thus, even though the American National Standards Institute (ANSI) defined a "standard" ANSI BASIC, on microcomputers the standard has actually become the different varieties of Microsoft BASIC.

The Commodore PET computer was announced in 1977, but demand was so great that the supply of PETs was limited during its first year or two. The PET/CBM line of machines went through a lot of changes, including a typewriter-like keyboard that replaced the original calculator-style keyboard, new ROMs, an 80-column screen, more memory, and so on. However, there are only two PET versions of Commodore BASIC: BASIC 2.0 and BASIC 4.0.

One very useful feature of Commodore BASIC is the full-screen editor. In some early versions of BASIC, especially on computers that use printers instead of video screens, you had to learn a series of editing commands. For example, to change the word *llama* to *zebra* in line 520, you might have to type E 520 (to go into edit mode) and then R /llama/zebra/ to replace the first string with the second. Since the beginning, Commodore

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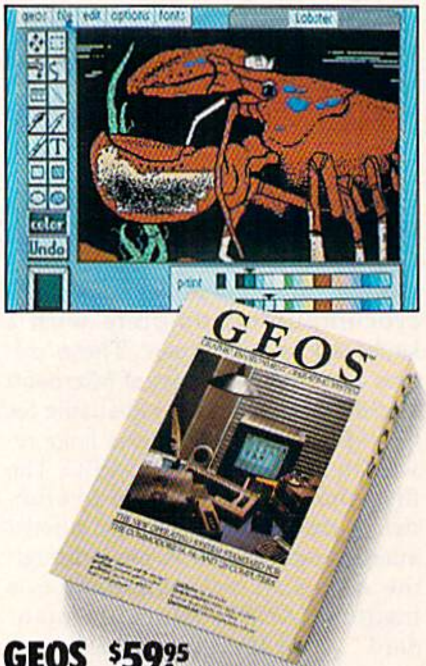

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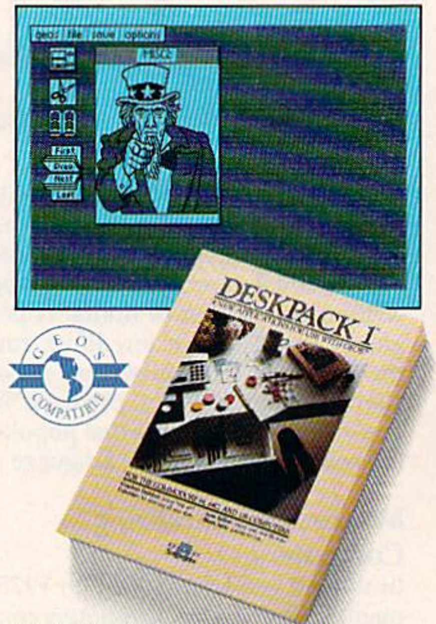

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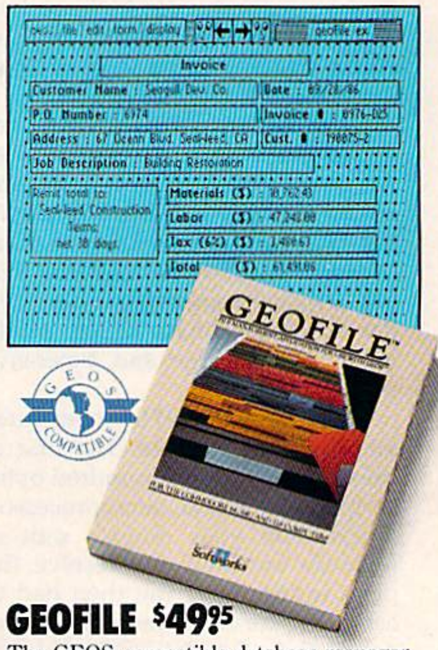

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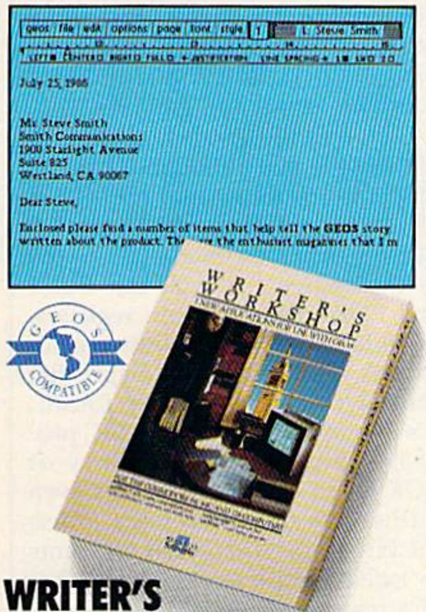

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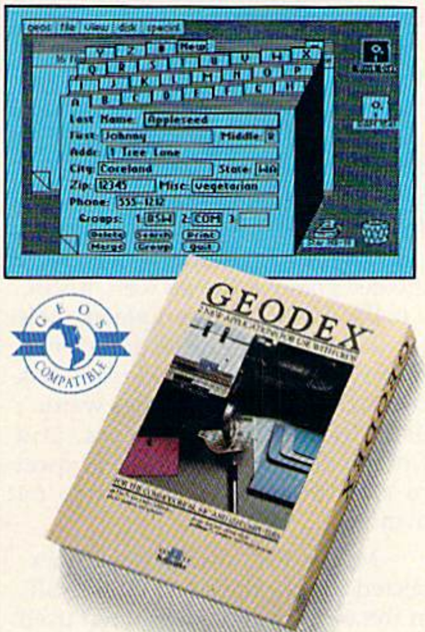

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Berkeley Softworks

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users have been able to list a line on the screen and use the cursor keys (and INSerT and DELete) to change lines on the screen.

Commodore originally designed the PET to store programs and data on cassette tape drives. Buyers of the original PET didn't have disk drives. Commodore BASIC 2.0 reflects this heritage. Commands like LOAD, SAVE, and OPEN assume you're using a cassette drive unless you indicate otherwise.

As the PET matured, more and more users bought disk drives. Version 4.0 of Commodore BASIC added 15 keywords to handle disk commands: APPEND, BACKUP, CATALOG, COLLECT, CONCAT, COPY, DCLOSE, DIRECTORY, DLOAD, DOPEN, DSAVE, HEADER, RECORD, RENAME, and SCRATCH. Once again, as the equipment changed and got more sophisticated, BASIC evolved.

A Computer Under $300

As the 1980s began, personal computers cost at least $1000. You'd have to invest a few thousand to put together a full-fledged system with a printer and disk drive. But Jack Tramiel, who founded Commodore, had an idea that a computer could be sold for under $300. This was to become the VIC-20. With a Datassette tape recorder and a memory expander added, the price was still under $500.

The original VIC-20, like the original PET, was designed to be used with a cassette drive. No one expected the still-expensive disk drives to become popular. Since most VIC owners didn't have a disk drive, the extra disk commands of BASIC 4.0 weren't really necessary. BASIC 2.0 was good enough for the VIC.

Millions of VICs were sold, and when the Commodore 64 was introduced (priced at $600), BASIC 2.0 was adapted to fit this new machine.

A New Computer, The Same BASIC

The 64 differed from the VIC in several important areas. It had two joystick ports instead of one. The price of memory had continually dropped, which meant the 64 could have 64K of RAM (38K for BASIC) instead of the VIC's 5K (3.5K for BASIC). The two biggest improvements were new chips: the VIC-II for video and the SID for sound. The VIC-II supports 40 columns (versus the VIC-20's 22 columns), 16 colors (versus 8 on the VIC), a true hi-res mode, multicolor and extended background color modes, a completely redefinable character set, and eight independent sprites. The SID chip has three voices with programmable waveforms, envelopes, filters, ring modulation, synchronization, and other features that were previously not available in home computers.

By the time the 64 was introduced, BASIC 2.0 had appeared in the PET/CBM computers, the VIC, and the 64. Why wasn't a new BASIC developed for the 64? In retrospect, there may be several answers to this question.

The three choices available to the designers of the 64 were BASIC 2.0, BASIC 4.0, or a completely new BASIC. The main attraction of version 4.0 was the set of 15 extra disk commands. But disk drives weren't used by most VIC owners, and Commodore probably didn't expect to sell many disk drives to 64 owners.

Many VIC owners were expected to buy the 64. If the BASIC in the 64 was identical to that used by the VIC, people wouldn't have to learn new ways of writing programs. Plus, many pure-BASIC programs (with no PEEKs or POKEs) would run as is on the 64. Changing the language would possibly introduce some incompatibilities.

Plus, BASIC 2.0 was a known quantity. Whatever bugs it originally contained had been documented and fixed. Modifying or rewriting it would take time and could lead to new bugs. Whenever you write a new piece of software (including a language like BASIC), there are bound to be a few well-hidden bugs.

An additional factor was the size of BASIC. If you started adding new commands, you would need more memory.

So the 64 was shipped with BASIC 2.0 in ROM. Although some very minor changes have been made in the 64's operating system, its BASIC has remained the same.

PEEKs And POKEs

Programmers who learn BASIC on a non-Commodore computer are sometimes surprised at the number of PEEKs and POKEs that are needed to write BASIC programs for the 64. To create interesting graphics or sound effects, you must POKE values directly to the chips that control the video and audio. Some BASICs on other computers have English-like commands for handling sound and graphics.

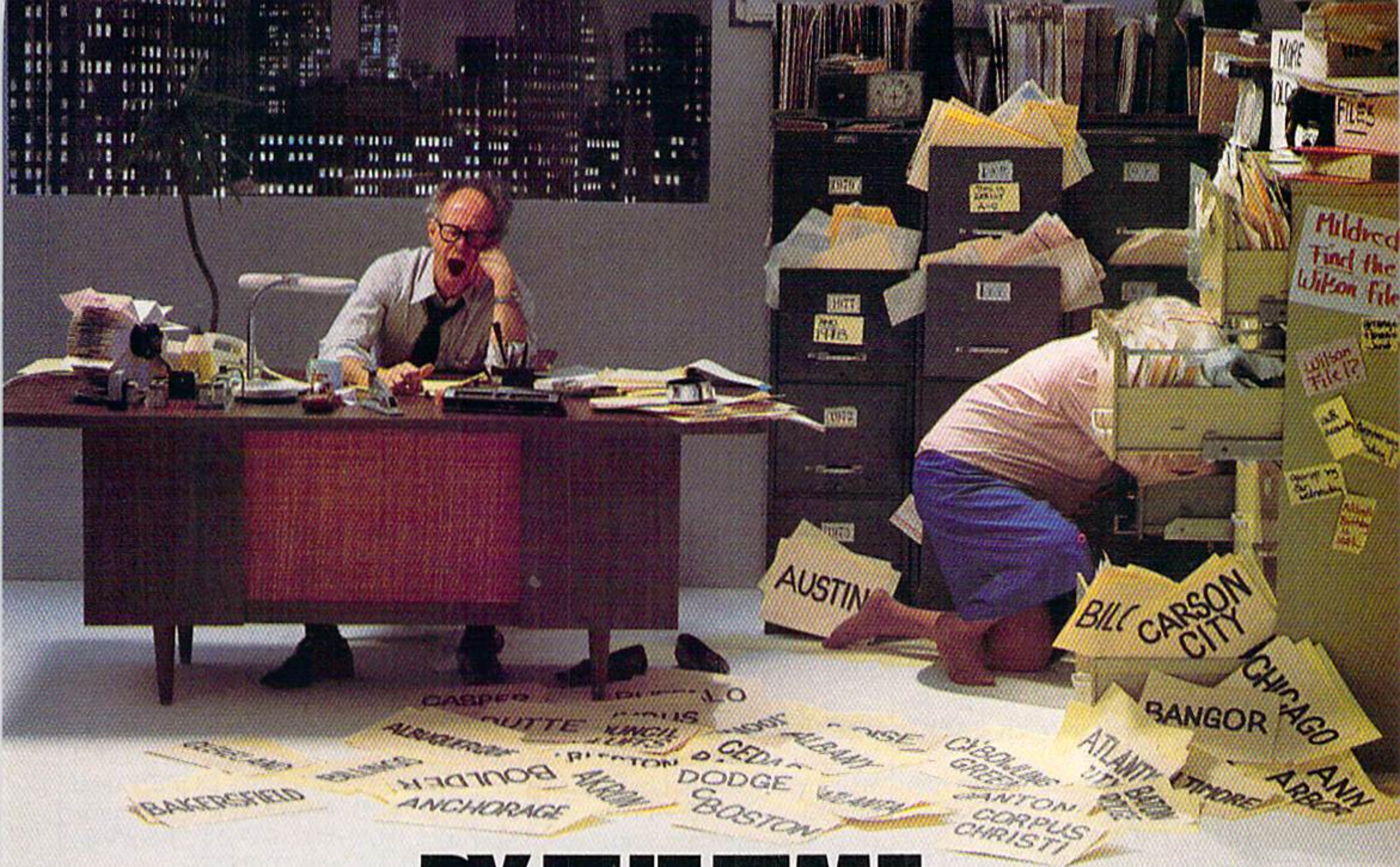
One of the great shortcomings of the 64 is that although it has the SID chip for sound and the VIC-II chip for graphics, BASIC 2.0 doesn't support either chip, except to the degree that you can PEEK and POKE the hardware registers. In addition, there are numerous locations in the first 1000 bytes that control various aspects of BASIC. It's not unusual to see a BASIC program that consists mainly of POKEs. To complicate things even further, it's often necessary to use the bitwise AND and OR operators to isolate and mask particular bits of a register or a memory location.

The 64's dependence on PEEKs and POKEs makes BASIC 2.0 more difficult for a beginner to learn. (Remember that BASIC was originally a language designed to help beginners.) Also, it's a chore, even for advanced programmers, to read through a sea of POKEs and try to figure out how a program works.

BASIC enhancement products like *Simons' BASIC* and the *Super-Expander* filled in some of the gaps of BASIC 2.0. These programs (and other BASIC enhancers) add new commands for manipulating hi-res graphics, sound, sprites, and other functions. If you're unhappy with the PEEKs and POKEs of BASIC 2.0, there are several such packages that give BASIC additional commands.

BASIC 3.5: Bridge To The 128

After the success of the VIC and 64, the popularity of Commodore's Plus/4 computer seemed to be assured. But reviewers—and consumers—were critical. Among the complaints: The keyboard layout was different from the standard VIC/64 keyboard, the cassette



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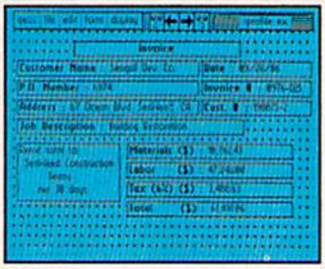

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ports and joystick ports weren't compatible with the VIC and 64, it lacked a SID chip for sound, there were no sprites, and the built-in software was not as powerful as one might have expected.

Whatever faults you might find with the Plus/4 and its little brother, the Commodore 16, you can't criticize its BASIC. For some reason, it was christened BASIC 3.5, even though it contained many more commands than BASIC 4.0 did.

For the first time since 4.0 for the PET, Commodore acknowledged the importance of disk drives, including in the Plus/4 such commands as BACKUP, COLLECT, COPY, DIRECTORY, DLOAD, DSAVE, HEADER, RENAME, and SCRATCH. On the Plus/4 it's not necessary to LOAD "$0",8 to look at a disk directory. You can handle most disk functions with BASIC keywords.

Hi-res graphics functions included BOX, CHAR, CIRCLE, COLOR, DRAW, GRAPHIC, GSHAPE, LOCATE, PAINT, RDOT, RCLR, RGR, RLUM, SCALE, SCNCLR, and SSHAPE. Although the 64 has a hi-res mode, creating a detailed graphics screen generally requires many PEEKs and POKEs. It's much easier to draw hi-res pictures on the Plus/4.

New commands for debugging and helping with programming were added: AUTO, DEC, DELETE, ERR$, HELP, HEX$, KEY, MONITOR, RENUMBER, RESUME, TRAP, TRON, and TROFF. For musical programmers, there are SOUND and VOL.

Some features are fairly standard in other BASICs, but were not previously available to Commodore programmers—for example, ELSE as an option after an IF-THEN. Other examples include PRINT USING and PUDEF, for formatting strings and numbers; GETKEY, which, unlike GET, stops and waits for a single keypress; INSTR, for finding a substring inside another; and, for reading the joystick, JOY.

Finally, there's the DO-LOOP structure, which can completely replace FOR-NEXT loops. It looks like something you'd see in a language like Pascal or C. You put the DO command at the start of a loop and LOOP at the end. The loop will continue forever. One option out of the loop is EXIT. EXIT can be placed anywhere between DO and LOOP. You can also attach a WHILE or an UNTIL to either the DO or the LOOP. DO WHILE A=9, for example, tests the value in A before the loop begins. If A doesn't equal 9, the loop never executes. But if you add the condition to the end, as in LOOP UNTIL A$="Y", then the statements inside the loop must happen at least once.

The Plus/4 and 16 have an excellent BASIC, but the computers never enjoyed the popularity of the VIC or 64. After a brief period of sales in the U.S. and Europe, the remaining inventory was sold to discounters. But their BASIC 3.5 provided the genesis of BASIC 7.0, which is found in the Commodore 128.

The Best Commodore BASIC

When the 64 superseded the VIC, it was mainly the hardware that was upgraded: the VIC-II chip, the SID chip, more memory, and so on. The BASIC remained the same: good old version 2.0.

When the Commodore 128 was introduced in 1985, it offered some major changes and enhancements in hardware—the Z80 chip for running CP/M, 128K of memory, a memory management unit to handle bank switching, a disk drive interface with burst mode, and the 8563 80-column chip—but in most respects the 128 is very similar to the 64. After all, it has to act exactly like a 64 when it's in 64 mode.

The major difference between the 128 (in 128 mode) and the 64, besides the optional 80-column screen and extra memory, is the BASIC. The 128 has more than twice as many commands as the 64. A majority of the new commands were originally developed for BASIC 3.5, so many BASIC programs for the 128 will run with only a few modifications on the Plus/4, and vice versa. Only one keyword from BASIC 3.5 did not make it into BASIC 7.0: RLUM (Read LUMinance). The Plus/4's color palette allows for eight levels of luminance for each of 15 colors, while the VIC, 64, and 128 do not have varying luminances. RLUM reads the luminance level.

The 128 has a SID chip for sound and a VIC-II chip that's only slightly different from the 64's 40-column chip. But, unlike the 64, the 128 doesn't require you to learn a slew of PEEKs and POKEs to use the chips.

For sound effects and music, there are ENVELOPE, FILTER, TEMPO, and the powerful PLAY command (plus SOUND and VOL from BASIC 3.5).

For hi-res graphics, you can use GRAPHIC, CIRCLE, BOX, DRAW, and the other BASIC 3.5 keywords. New commands for graphics and sprites include BUMP, COLLISION, RSPCOLOR, RSPPOS, RSPRITE, SPRCOLOR, SPRITE, SPRSAV, and WIDTH. Typing SPRDEF puts you into a powerful sprite editor utility which allows you to design your own sprites without resorting to graph paper and DATA statements.

Disk commands from BASIC 4.0 include APPEND, CATALOG, CONCAT, DCLOSE, DOPEN, and RECORD. Brand-new commands are BLOAD, BOOT, BSAVE, DCLEAR, and DVERIFY.

To let you move around within the 128K of memory, there's BANK. For accessing the RAM expander, you get FETCH, STASH, and SWAP.

WINDOW and RWINDOW allow you to create screen windows in 40 or 80 columns. FAST and SLOW control the speed of the processor, while SLEEP causes a pause in the program. PEN reads the lightpen and POT reads the paddles (or a KoalaPad), if you own these peripherals. New functions and statements for programmers include BEGIN/BEND, POINTER, RREG, and XOR. And should you ever wish to get rid of all the new commands (or run a commercial program for the 64), there's GO 64.

Despite the inevitable frustrations that come with so many PEEKs and POKEs, BASIC 2.0 is a good, solid language. However, once you've had a chance to take advantage of the 128's improved BASIC, you're very likely to get hooked on its versatility and power. BASIC 7.0 is by far the best Commodore BASIC for an eight-bit machine, and a great boon to BASIC programmers.

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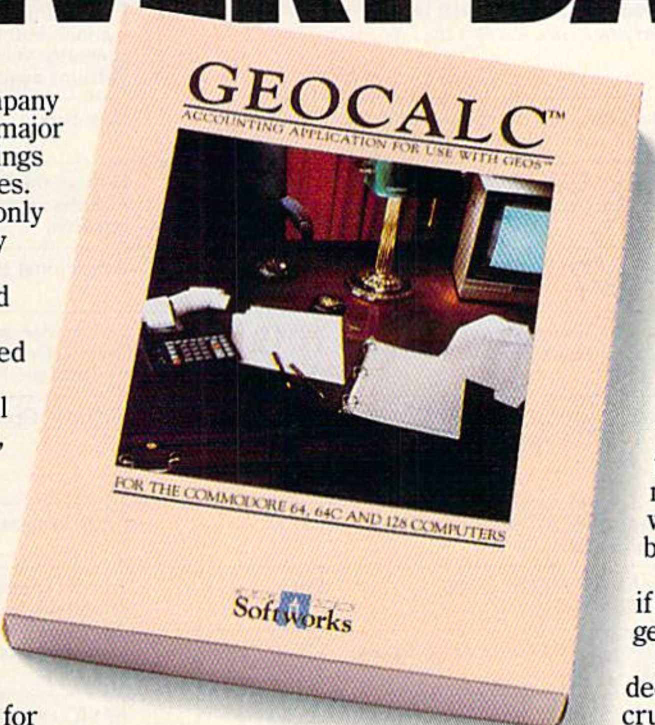

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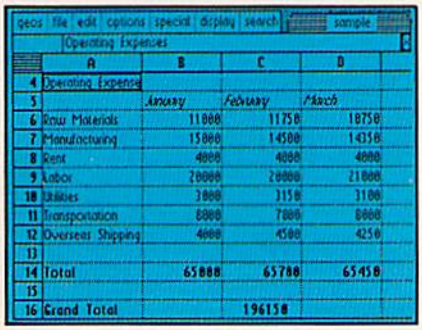
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Operating Expenses

	A	B	C	D
4	Operating Expense			
5		January	February	March
6	Raw Materials	11000	11750	10750
7	Manufacturing	15000	14500	14350
8	Rent	4000	4000	4000
9	Labor	20000	20000	21000
10	Utilities	3000	3150	3100
11	Transportation	8000	7000	8000
12	Overseas Shipping	4000	4500	4250
13				
14	Total	65000	65700	65450
15				
16	Grand Total		196150	

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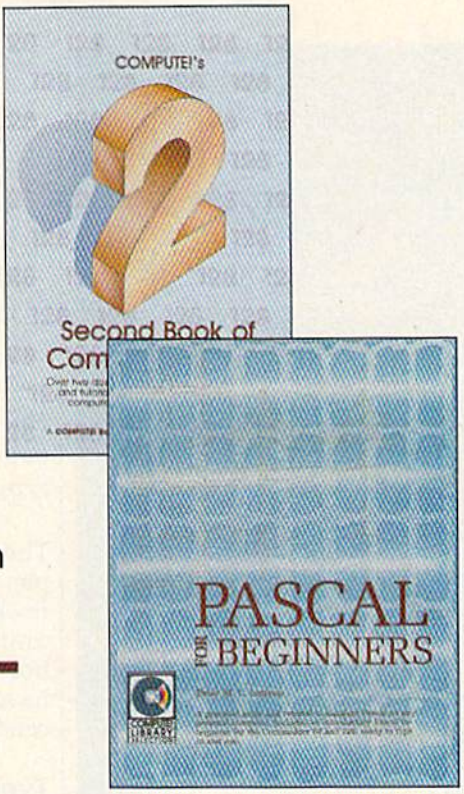
A Buyer's Guide To Programming Languages For The Commodore 64 And 128

This chart lists many of the programming languages currently available for the Commodore 64 and 128. For more details on any of these languages, please write the publisher at the address listed below.

Language	Publisher	Price	Comments
Ada Training Course	Abacus Software, P.O. Box 7211, Grand Rapids, MI 49510	$39.95	Comprehensive subset of Ada language on disk.
COMAL 0.14 and *COMAL 2.0*	COMAL Users Group, USA, 6041 Monona Drive, Madison, WI 53716	0.14 Version for $29.95; 2.0 for $98.95	Version 0.14 includes demonstrations and interactive tutorial on disk, plus reference book; 2.0 is full COMAL implementation on cartridge.
Forth-64 Language	Abacus Software, P.O. Box 7211, Grand Rapids, MI 49510	$39.95	Forth language; follows 1979 Forth standard and parts of 1983 standard.
KMMM Pascal	Wilserv Industries, P.O. Box 456, Bellmar, NJ 08031	$99	Compiles to stand-alone machine language.
Kyan Pascal	Kyan Software, Suite 183, 1850 Union Street, San Francisco, CA 94123	$69.95	Pascal language on disk with tutorial manual. Full implementation that generates stand-alone applications. Versions available for 64 and 128.
Logo	Commodore Business Machines, 1200 Wilson Drive, West Chester, PA 19380	$73.95	Disk-based Logo.
Master Forth	MicroMotion, 8726 S. Sepulveda Blvd., Ste. A-171, Los Angeles, CA 90045	$100	Follows the Forth 1983 standard; includes graphics system. Floating point optional.
PILOT	Commodore, 1200 Wilson Drive, West Chester, PA 19380	$55.95	Educational language on disk.
Power C	Better Working Line, Spinnaker Software, One Kendall Sq., Cambridge, MA 02139	$39.95	C compiler; includes book with disk. Previously titled *C Power* and distributed by Pro Line Software.
PROMAL	Systems Management Associates, 3325 Executive Dr., P.O. Box 20025, Raleigh, NC 27619.	$49.95—end-user version; $99.95—developer's version	On disk. Updated to version 2.1.
Simons' BASIC	Commodore, 1200 Wilson Drive, West Chester, PA 19380	$34.95	BASIC extension on cartridge.
64-TRAN	Trident Software, P.O. Box 180, Glenelg, MD 21737	$50	Fortran compiler that generates relocatable machine code.
Super C Language Compiler	Abacus Software, P.O. Box 7211, Grand Rapids, MI 49510	$79.95	C compiler on disk.
Super Expander 64	Commodore, 1200 Wilson Drive, West Chester, PA 19380	$29.95	BASIC extension on cartridge.
Superforth 64	Parsec Research, Drawer 1766, Fremont, CA 94538	$59	Follows 1979 Forth standard.
Superforth 64 + Artificial Intelligence (AI)	Parsec Research, Drawer 1766, Fremont, CA 94538	$99	Forth language, plus expert systems development module.
Super Pascal	Abacus Software, P.O. Box 7211, Grand Rapids, MI 49510	$59.95	Pascal language development system; also includes graphics toolkit and fast DOS.
Video BASIC-64	Abacus Software, P.O. Box 7211, Grand Rapids, MI 49510	$39.95	BASIC extension adds more than 50 graphics, sound, and utility commands.
WATCOM Pascal	Watcom Products, 415 Phillips St., Waterloo, Ont., Canada, N2L 3X2	$149	Full-function; conforming to both ANSI and ISO-draft standards, with extended Commodore features such as sprites, sound synthesis, and color and bitmapped graphics.

New books from COMPUTE!



COMPUTE! Books is bringing you a brand new line up of books for your Commodore 64 and 128. These recent releases offer you everything from programming hints to exciting games, from educational to home and business applications.

Pascal for Beginners

$14.95 0-87455-068-8
Book/disk combination for the Commodore 64
$29.95 ISBN 0-87455-069-6

This introductory text to standard Pascal on any computer is an ideal tutorial for anyone who wants to learn this powerful computer language. It includes everything you need, including an introductory Pascal interpreter* for the Commodore 64 and 128 in 64 mode, ready to type in and use. Written in plain English and offering numerous program examples, it gently and clearly explains standard Pascal and structured programming. Latter sections include discussions of advanced topics such as files and dynamic data storage. *There is also an optional disk available for $12.95 for the Commodore 64 which includes most of the programs in the book. 688BDSK.*

*The Commodore 64 Pascal interpreter is not full-featured, but still a powerful implementation of Pascal which suits the needs of most beginners.

COMPUTE!'s Music System for the Commodore 64 and 128

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Sidplayer, the feature-packed, popular music player and editor program, is now more versatile and more impressive than before. *Enhanced Sidplayer* for the Commodore 128 and 64 includes two new versions—one for the Commodore 128 running in 128 mode and another for the Commodore 64. Take advantage of every feature the SID chip (the sound chip in the 128 and 64) has to offer. Just like the original, *Enhanced Sidplayer* is easy to learn and use, with many powerful new features. The accompanying disk contains the editor, player programs (including a Singalong program), utilities, and sample music that you can enjoy immediately or change. The new *Sidplayer* plays any songs created by the original *Sidplayer* for the Commodore 64.

User's Guide to *GEOS*: geoPaint and geoWrite

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Learn the ins and outs of *GEOS*, the new icon-based operating system for the new Commodore 64C and the 64, with this step-by-step guide. Everything from creating simple letters with *geoWrite* and pictures with *geoPaint* to merging text and graphics and using desk accessories is clearly and concisely explained.

COMPUTE!'s Second Book of the Commodore 128

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The editors at COMPUTE! Publications have collected some of the best games, programs, and tutorials for the Commodore 128 (in 128 mode) from *COMPUTE!* magazine and *COMPUTE!'s Gazette*. Like *COMPUTE!'s First Book of the Commodore 128*, this book offers a variety of programs and articles for every 128 user. Each program has been fully tested and is ready to type in and use on the Commodore 128 running in 128 mode. *There is also a disk available for $12.95 which includes the programs in the book. 777BDSK.*

Mapping the Commodore 64, Revised

$16.95 ISBN 0-87455-082-3

An update of the bestselling memory map and programming guide. It's a necessity for intermediate and advanced programmers. This definitive sourcebook has been expanded and now covers the new icon-based *GEOS* (Graphics Environment Operating System) with clear descriptions of how to make it work for you. For BASIC and machine language programmers of both the Commodore 64 and 64C.

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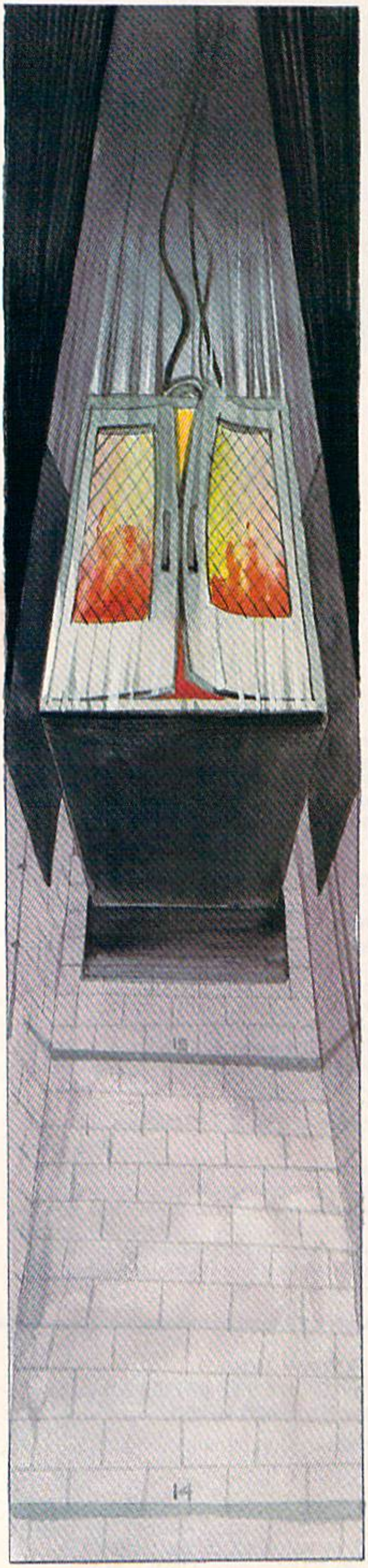


Going Up?

Rick Kilbrai

It's a frantic run for your life in this hotel with seven dangerous runaway elevators. For the Commodore 64. A joystick is required.

The object of "Going Up?" is simple: Climb as high as possible in a towering high-rise building. The underlying difficulty in all this, however, is that all the elevators have gone beserk, so you can ascend only one floor at a time.

Typing It In

Since Going Up? is written entirely in machine language, you'll need to use the "MLX" machine language entry program found elsewhere in this issue. When you run MLX, you'll be asked for the starting and ending addresses for the data you'll be entering. For Going Up?, respond with the following values:

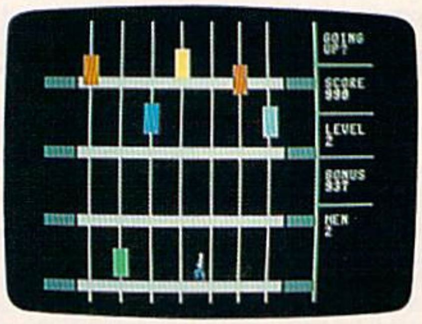
Starting Address: 0801
Ending Address: 1658

When you've finished typing in the data, be sure to save a copy to tape or disk before leaving MLX.

To make it easy to load, save, and copy the program, Going Up? acts like a BASIC program. No SYS or secondary addresses are necessary. The command LOAD"GOING UP",8 (tape users should substitute ,1) loads the game. Type RUN to start the game, and be sure to have a joystick plugged into port 2. When you're ready to begin play, press the fire button. You start on level 1, which contains the first four floors of the building. And you begin with five men.

Runaway Elevators

The man you control starts on the right side of screen. To make it up to the next floor, you must cross the hall, dodge the runaway elevators as you go, and make it to the stairwell on the other side. Once on the second floor, run to the right to the next stairwell. Each set of stairs you climb earns you 100 points.



Dashing across the bottom floor, the player needs to dodge the colorful but dangerous and ever-moving elevators.

It's usually impossible to make it all the way to the other side of the screen without stopping for an elevator. Occasionally, the timing of the elevators may even make you backtrack. But don't delay too long—the bonus timer is counting down from 1000. If it makes it to zero, you'll lose a man. If you beat the clock, however, the time remaining will be tacked onto your score when you cross the fourth floor of each level. As you progress through each level, you'll find that the elevators move faster and faster, making the game more and more challenging. As an additional bonus, you receive an extra man at every fifth new level you reach.

When you lose a man—either by being hit by an elevator or running out of time—you are placed back at the beginning of the hallway you were crossing when you lost him. In addition, the bonus timer is set back to 1000. The game ends when you've lost all your men. Press the fire button to play again.

See program listing on page 93.

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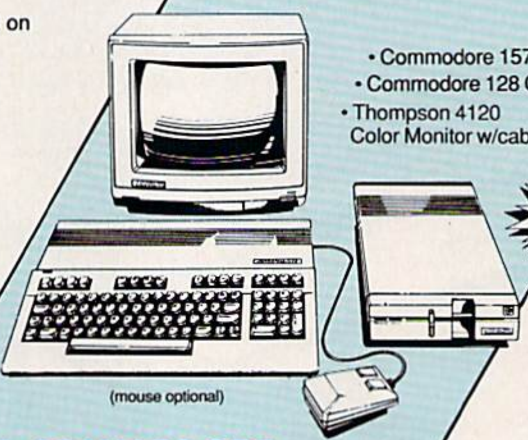

(mouse optional)

COMMODORE HARDWARE

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1541 C Disk Drive	$185	GEOS	$CALL
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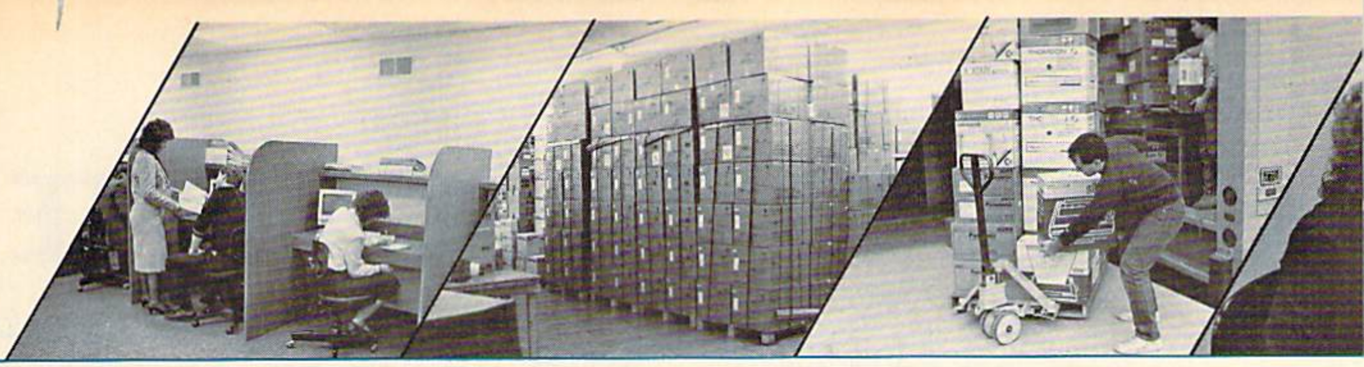

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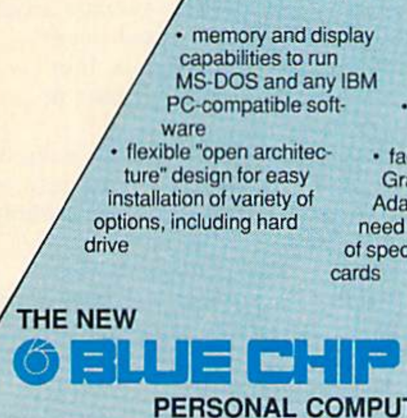

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Here are some suggestions which serve to improve the speed and accuracy of publication for prospective authors. COMPUTE!'s GAZETTE is primarily interested in new and timely articles on the Commodore 128, 64, Plus/4, and 16. We are much more concerned with the content of an article than with its style, but articles should as be clear and well-explained as possible.

The guidelines below will permit your good ideas and programs to be more easily edited and published:

1. The upper left corner of the first page should contain your name, address, telephone number, and the date of submission.

2. The following information should appear in the upper right corner of the first page. If your article is specifically directed to one model of computer, please state the model name. In addition, *please indicate the memory requirements of programs.*

3. The underlined title of the article should start about 2/3 of the way down the first page.

4. Following pages should be typed normally, except that in the upper right corner there should be an abbreviation of the title, your last name, and the page number. For example: Memory Map/Smith/2.

5. All lines within the text of the article must be double- or triple-spaced. A one-inch margin should be left at the right, left, top, and bottom of each page. No words should be divided at the ends of lines. And please do not justify. Leave the lines ragged.

6. Standard typing or computer paper should be used (no erasable, onionskin, or other thin paper) and typing should be on one side of the paper only (upper- and lowercase).

7. Sheets should be attached together with a paper clip. Staples should not be used.

8. If you are submitting more than one article, send each one in a separate mailer with its own tape or disk.

9. Short programs (under 20 lines) can easily be included within the text. Longer programs should be separate listings. *It is essential that we have a copy of the program, recorded twice, on a tape or disk.* If your article was written with a word processor, we also appreciate a copy of the text file on the tape or disk. Please use high-quality 10 or 30 minute tapes with the program recorded on both sides. The tape or disk should be labeled with the author's name and the title of the article. Tapes are fairly sturdy, but disks need to be enclosed within plastic or cardboard mailers (available at photography, stationery, or computer supply stores).

10. A good general rule is to spell out the numbers zero through ten in your article and write higher numbers as numerals (1024). The exceptions to this are: Figure 5, Table 3, TAB(4), etc. Within ordinary text, however, the zero through ten should appear as words, not numbers. Also, symbols and abbreviations should not be used within text: use "and" (not &), "reference" (not ref.), "through" (not thru).

11. For greater clarity, use all capitals when referring to keys (RETURN, CTRL, SHIFT), BASIC words (LIST, RND, GOTO), and the language BASIC. Headlines and subheads should, however, be initial caps only, and emphasized words are not capitalized. If you wish to emphasize, underline the word and it will be italicized during typesetting.

12. Articles can be of any length—from a single-line routine to a multi-issue series. The average article is about four to eight double-spaced, typed pages.

13. If you want to include photographs, they should be either 5×7 black and white glossies or color slides.

14. We do not consider articles which are submitted simultaneously to other publishers. If you wish to send an article to another magazine for consideration, please do not submit it to us.

15. COMPUTE!'s GAZETTE pays between $70 and $800 for published articles. In general, the rate reflects the length and quality of the article. Payment is made upon acceptance. Following submission (Editorial Department, COMPUTE!'s GAZETTE, P.O. Box 5406, Greensboro, NC 27403) it will take from two to four weeks for us to reply. If your work is accepted, you will be notified by a letter which will include a contract for you to sign and return. *Rejected manuscripts are returned to authors who enclose a self-addressed, stamped envelope.*

16. If your article is accepted and you have since made improvements to the program, please submit an entirely new tape or disk and a new copy of the article reflecting the update. We cannot easily make revisions to programs and articles. It is necessary that you send the revised version as if it were a new submission entirely, but be sure to indicate that your submission is a revised version by writing, "Revision" on the envelope and the article.

17. COMPUTE!'s GAZETTE does not accept unsolicited product reviews. If you are interested in serving on our panel of reviewers, contact our Features Editor for details.

Play Bingo

Louvan and David Wood

Whether you're playing with 2 or 200, bingo is always a lot of fun. This computer version makes playing easier than ever—it does the hard work, generating playing cards and calling the numbers. For the Commodore 128, 64, Plus/4, and 16. A printer is recommended but isn't required.

Bingo is an old, very simple game, but it remains as popular as ever. One reason for its enduring popularity is that it's one of the few games that's entertaining for any number of players. "Play Bingo" is a computer version of the game that takes the work out of bingo by generating the playing cards and calling the numbers. And to offer even more lasting fun, the program can play several variations of bingo, as well as the standard version.

The computer is the caller in this computer version of the classic "bingo."

Typing It In

Play Bingo is written in BASIC for the 64, 128, Plus/4, and 16. Plus/4 and 16 users should change line 1 to read:

```
1 F=1
```

128 users should change the line to read:

```
1 F=2
```

When you've finished typing in the program, save a copy to tape or disk.

To start the game, load the program and type RUN. You'll see a menu with a list of 26 game patterns. At this time you may print out bingo cards. (The cards are the same regardless of which game variation you choose to play.) To print out the cards, press CONTROL–P then RETURN. Then select the number of cards you want to print. (Note: Any printer will work with this program.)

If you don't have a printer, you may print them to the screen instead—press S. The cards will be displayed one at a time. Copy them down on paper to make the game cards. Press any key for the next card. Press RETURN to go back to the menu.

Playing A Game

The next step is to choose the game variation that you wish to play. Select A to play standard bingo. To win the the standard game, first you must either complete a horizontal, vertical, or diagonal line of squares, or claim all four corner squares; and then you must call out "bingo." To claim a square, you must wait until the computer "calls out" the number of that square by sounding a tone and flashing the number on the screen. The numbers are separated into five groups labeled b, i, n, g, and o to make identification easier. The FREE square in the middle of the card is considered claimed by every player at the start of the game.

Cross out the squares as the computer calls them. The first player to call "bingo" is declared the winner (after his or her claim is verified). If a player mistakenly claims to have won, he or she is disqualified, and the game continues.

If you're playing a variation other than standard bingo, the pattern of squares which you need to claim to win are displayed in the lower left corner of the screen. There are many different variations, ranging from geometric shapes to letters of the alphabet.

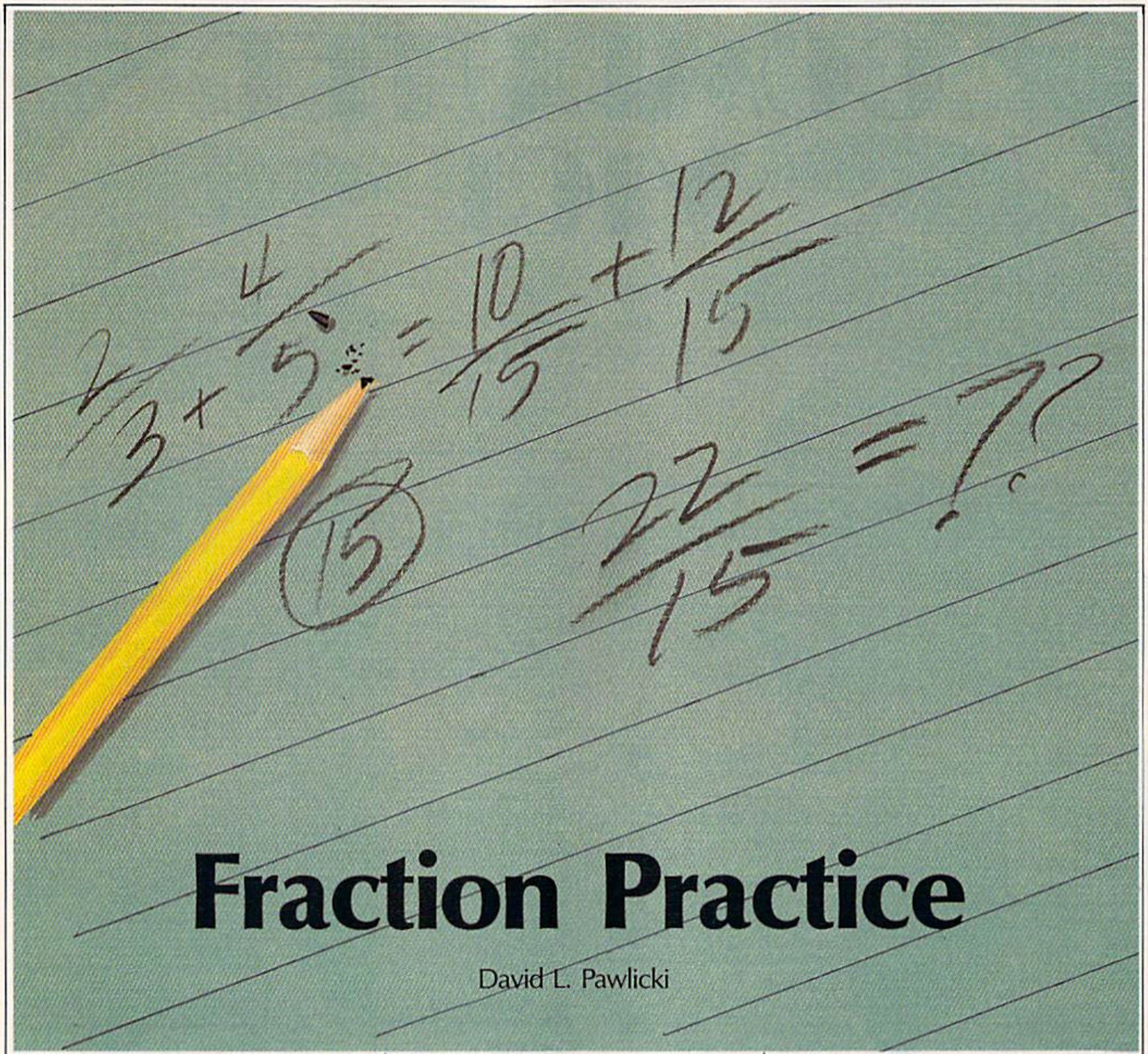
```
   B     I     N     G     O
*******************************
*     *     *     *     *     *
*  8  * 26  * 37  * 60  * 65  *
*     *     *     *     *     *
*******************************
*     *     *     *     *     *
* 15  * 20  * 34  * 51  * 71  *
*     *     *     *     *     *
*******************************
*     *     *     *     *     *
*  5  * 18  *FREE* 54  * 63  *
*     *     *     *     *     *
*******************************
*     *     *     *     *     *
*  7  * 22  * 39  * 50  * 61  *
*     *     *     *     *     *
*******************************
*     *     *     *     *     *
* 13  * 19  * 43  * 55  * 73  *
*     *     *     *     *     *
*******************************
```

The game includes an option to print out your own bingo cards. This sample was generated with a Commodore 1526 printer.

The computer calls out numbers one at a time. To increase or decrease the time between calls, press 1 (the fastest level) through 9 (the slowest). The speed of the game will change after the next number is called.

Press Q to quit, F1 to start a new game, and F7 to pause the game. The program will call the next number before acting on your keypress.

See program listing on page 91.



Fraction Practice

David L. Pawlicki

Dealing with fractions is one of the more conceptually difficult areas of math for young students. Here's a program that offers help by guiding the student through each step. For the Commodore 128, 64, Plus/4, and 16.

Successfully working with fractions requires plenty of practice. The process of adding and subtracting fractions requires several steps, from finding a common denominator to simplifying the final answer. All of these steps need to be reinforced through practice until they become automatic.

"Fraction Practice" generates 20 problems to be solved, leading you, step by step, through each problem until the correct answer is found.

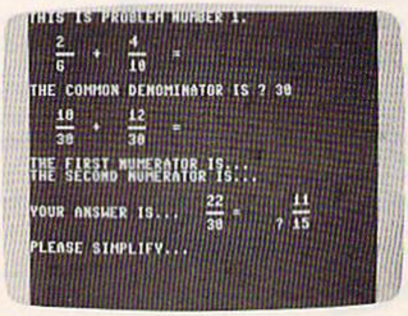
Getting Started

Fraction Practice is written entirely in BASIC and runs on the the Commodore 128, 64, Plus/4, and 16. Note that if you own a Plus/4 or 16, one line of the program needs to be changed. Replace line 10 with this line:

```
10 BA=65301:BO=65305
```

Be sure to save a copy of the program when you're finished typing it in.

To start the program, load it and type RUN. First a title screen is displayed. You're asked if you would like to read the instructions,



The computer guides the student through each step of 20 fraction problems. Both addition and subtraction are covered in this educational program.

which explain how fractions are added and subtracted. (For more details on the procedure and terminology used in fraction math, see "Math with Fractions," accompanying this article.)

Your next choice is whether you want to add fractions or subtract them. After you choose, the first problem is displayed. If the fractions both have the same denominator, you continue on, adding or subtracting. If the denominators differ, you must first select a common denominator. If you select a number larger than the the product of the two denominators in the fractions, or if you choose a number which does not work as a common denominator, you must try again. Once you choose a workable common denominator, you must rewrite the problem using that denominator.

Next, perform the addition or subtraction. If the answer can be reduced, the program will ask for a reduction. If it can be stated as a mixed number (like $1\frac{1}{8}$), the program will ask for a mixed number. After you complete 20 problems, you may choose to work through another set. Note that the values for problems in Fraction Practice are generated randomly to assure both variety and lack of predictable order.

See program listing on page 89.

Math With Fractions

A fraction is made up of two numbers—the upper number, called the *numerator,* and the lower number, called the *denominator.* In the fraction $\frac{3}{8}$, the numerator is 3 and the denominator is 8. To add and subtract fractions, a *common denominator* must be found. This must be a number that is divisible by the denominators in both of the fractions which are to be added or subtracted. For example, to add $\frac{3}{8}$ and $\frac{1}{3}$, a common denominator of 24 may be chosen, because 24 is divisible by both 3 and 8 (multiply the two denominators: $3 \times 8 = 24$). A denominator of 48 could also be chosen, but to make the math easier, Fraction Practice makes you select a common denominator that is no larger than the product of the two denominators.

Once a common denominator is found, the two fractions must be converted into equivalent fractions which use the common denominator. To do this, go back to the original denominators. For 1/3, you multiplied the 3 by 8 to get the new denominator of 24. To get the new numerator, you must multiply the original numerator, 1, by the same number, 8. Thus, 1/3 is equivalent to 8/24. Likewise, 3/8 is equivalent to 9/24 ($8 \times 3 = 24$, $3 \times 3 = 9$).

Now the numerators can be added:

```
3/8  + 1/3 =
9/24 + 8/24 = 17/24
```

The answer, 17/24, cannot be reduced, because there is no number (other than 1) that can be divided into both 17 and 24. So,

```
3/8 + 1/3 = 17/24
```

If the sum of the fractions were, for example, 18/24, you could reduce the fraction. Reduction is possible when both the numerator and the denominator can be divided by the same number. For example, 18/24 is reduced to 3/4 by dividing both the numerator and the denominator by 6.

A Guide To Commodore User Groups

Part 2

Caroline Hanlon

The second half of the user group guide—Part 1 is found in last month's issue—contains the names and addresses of all user groups in states N–W and those groups outside the U.S., including A.P.O. addresses. The list is in alphabetical order by state and then by country; the U.S. groups are in zip code order within the states.

If your group does not appear in Part 1 or 2 of the guide, and you wish to have your group listed, send your group name and address to COMPUTE! Publications, Attn: Commodore User Groups, P.O. Box 5406, Greensboro, NC 27403.

Please remember to include a self-addressed, stamped envelope when you write to a user group for information.

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Developers of Interesting Software for the Commodore 64/128 (DISC), 34 Naves Rd., Hampton, NH 03842
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Bordentown Area Commodore Users Group, P.O. Box 381, Bordentown, NJ 08505
Commodore Computer Collection Club, 72 Pine Dr., Roosevelt, NJ 08555
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The Southern New Mexico Commodore User's Group, P.O. Box 4437, Uni. Park Brch., Las Cruces, NM 88003
Commodore Users Group of Roswell (CUGOR), 304 E. Country Club Rd., Roswell, NM 88201

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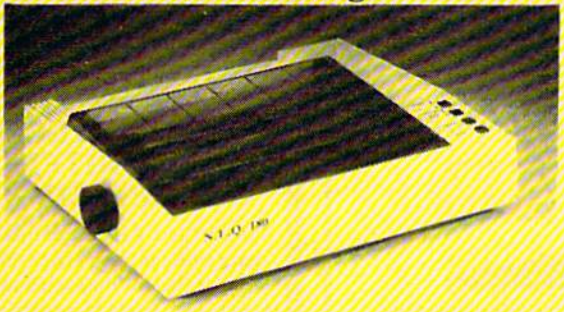

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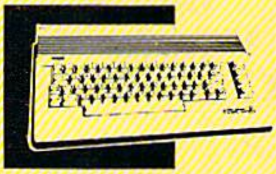

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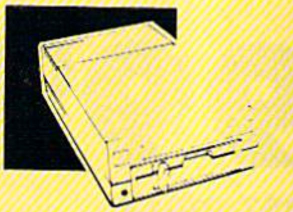

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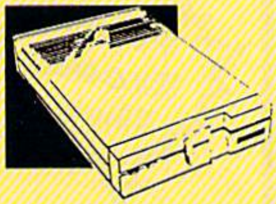

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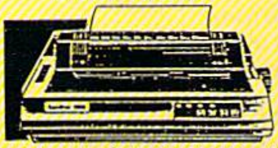

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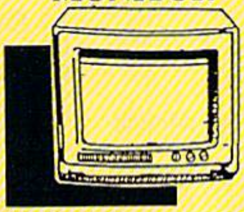

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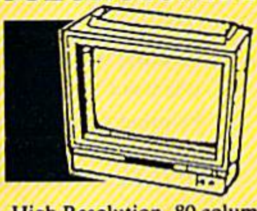

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Beaufort Technical College User Group, Center For Staff And Curriculum Development, P.O. Box 1288, Beaufort, SC 29902

SOUTH DAKOTA

Aberdeen Commodore Club, 115 Church Dr., Aberdeen, SD 57401
Port 64 User Group, 929 Lemmon St., Rapid City, SD 57701

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Commodore Association of the Southeast (CASE), P.O. Box 110386, Nashville, TN 37211
Nashville Commodore User Group, P.O. Box 121282, Nashville, TN 37212
Cleveland Commodore User Group, 2413 Hickory Dr. NW, Cleveland, TN 37311
Commodore Computer Club, P.O. Box 96, Estill Springs, TN 37330
Greeneville Computer Home Users Group, 110 Ed Norton Rd., #20, Greeneville, TN 37743
Commodore Association of the Mid-South, 3318 Keystone Ave., Memphis, TN 38128
Memphis Commodore Users Club, P.O. Box 34095, Bartlett, TN 38134-0095
Raleigh-Bartlett Hackers CUG, James Patrick, 3457 Gatewood Dr., Memphis, TN 38134
Old Hickory Commodore Users Group, 542 Lambuth Blvd., Jackson, TN 38301

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Society of Computer Owners and P.E.T. Enthusiasts (SCOPE), P.O. Box 3095, Richardson, TX 75083
Sherman Commodore Users Group (SCUG), 1200 W. Taylor #118, Sherman, TX 75090
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Galveston Island Computer Users Group (GICUG), 3102 Cove View Blvd., Apt. 7204, Galveston, TX 77551
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Commodore User's Group of Odessa (CUGO), P.O. Box 12491, Odessa, TX 79768

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Southern Utah Commodore Hobbyists, 528 N. Blue Sky Dr., Cedar City, UT 84720

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Capitol Area Commodore Enthusiasts (CACE), 607 Abbotts Ln., Falls Church, VA 22046
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C-64 Programmers of America, Rt. 1 Box 119A, Meadow Bridge, WV 25976
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Mid-Ohio Valley Commodore Club, Inc. (MOVCC), P.O. Box 2222, Parkersburg, WV 26101-2222
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Northern West Virginia C-64 Club, 228 Grand St., Morgantown, WV 26505

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COMM-BAY64, P.O. Box 1152, Green Bay, WI 54305
Price County Computer User Group, Rt. 2, Box 532, Phillips, WI 54555
Coulee County Commodore Club, 501½ St. Cloud St., LaCrosse, WI 54603
Menomonie Area Commodore Users Group, 510 12th St., Menomonie, WI 54701
Eau Claire Area CBM 64 User Group, 1527 W. Mead St., Eau Claire, WI 54703
Clintonville Area Commodore 64s True User Support (CACTUS), 56 Pearl St., Clintonville, WI 54929
Fond du Lac Area Commodore Users Club, P.O. Box 1432, Fond du Lac, WI 54935

Outside The U.S.

APO

Commodore Computer Users Group Heidelberg, Robert H. Jacquot, P.O. Box Gen. Del., APO NY 09102, 06223-5614 *(meets in West Germany)*
Commodore Zama Users Group, c/o General Delivery, APO San Francisco, CA 96503 *(meets in Japan)*
H.U.G. 64, Box 171, 61st M.P. Co., APO NY 09165 *(meets in Hanau, West Germany)*
Stuttgart Local Users Group, c/o SSG Rimestad, HHC VII Corps, Box 99, APO NY 09107-0007 Germany *(meets in West Germany)*

ARGENTINA

PEEK & POKE Commodore Club, Garay 4221, 1636 Olivos, Argentina

AUSTRALIA

Cairns Commodore Users Group, P.O. Box 7, Earlville, Cairns, Qld. 4870, Australia
Commodore Computer Users Group (QLD) Inc., P.O. Box 274, Springwood Qld. 4127, Brisbane, Australia
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Commodore User Group (ACT), P.O. Box 599, Belconnen, A.C.T., Australia 2616
The Griffith Computer Association, c/o Secretary, P.O. Box 425, Griffith 2680, Australia
Hedland Commodore Computer Group, John Noblet, 10 Barker Ct., Port Hedland 6721, Western Australia
Queensland Users Aiding Computer Kids (QUACK), Jim Harford, 2 Jane Ct., Nambour, 4560, Queensland, Australia
Southport Commodore Computer Users Group (SCCUG), Box 790, Southport, Queensland, Australia 4215
Yarra Valley Commodore Users Group, P.O. Box 176, Lilydale, Vic., 3140, Australia

BELGIUM

L'Amiral Club C-64 & Compatibles, c/o Alain Trinteler, P.O. Box 41, B-1090, Brussels, Belgium

BRAZIL

Brasilian Club of VIC-20, Flavio Joao Piagentini, Rua Heitor de Moraes, 856-Pacaembu, Sao Paulo, Brasil 01237
Curitiba Commodore Club (C.C.C), Rua Adolfo Stedile, 52, Bom Retiro, 80.520, Curitiba, Parana, Brasil

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Lethbridge Commodore Users Group, P.O. Box 825-246 MacDermott Rd., Coalhurst, Alberta, Canada T0L 0V0

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Commodore Computer Club, P.O. Box 23396, Vancouver, British Columbia, Canada V7B 1W1
Commodore 64 Soft Swap, 4635 210 St., Langley, British Columbia, Canada V3A-2L3
Global Modem Users Syndicate, 22559 Hinch Cres, Maple Ridge, British Columbia, Canada, V2X 7H5
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Fundy C-64 Users Group, P.O. Box 2203, MPO, Saint John, NB, Canada E0G 2W0

Nova Scotia

Commodore Computer Users Association (NSCCUA), P.O. Box 3426, Halifax South, Nova Scotia B3J 3J1

Ontario

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Sudbury Commodore Assembly Language Extension Group, 1326 Hastings Crescent, Sudbury, Ontario, Canada P3A 2R5
Toronto PET Users Group Inc. (TPUG), 5300 Yonge St., Willowdale, Ontario, Canada M2N 5R2
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Club Commodore Champlain, P.O. Box 522, Boucherville, Quebec, Canada J4B 6Y2

Club Logi-Com, 1033 St. Joseph, Shawinigan, Quebec, Canada G9N 4H5

Commodore 64 Users Exchange (CUE), C.P. 1027, Malartic, Quebec, Canada J0Y 1Z0

C-64 Users Group of Canada, Snowdon, P.O. Box 1205, Montreal, Quebec, Canada H3X 3Y3

Fozfaz 64/128 Software Exchange, 7580 Terbois, St. Leonard, Quebec, Canada H1S 2M4

Montreal Software Connection 64/128, P.O. Box 491, Anjou, Quebec, Canada H1K 4G8

Wise Budget'64, C.P.1027, Malartic, Quebec, Canada, J0Y 1Z0

Saskatchewan

Saskatoon Commodore Users Group, P.O. Box 7831, Saskatoon, Saskatchewan, Canada S7K 4R5

Yukon

64s North of 60, P.O. Box 5438, Whitehorse, Yukon, Canada Y1A 5H4

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Columbia C-64/128 Users Group, Pedro Allina & Hernan Zajec, A.A. 81119, Bogota, Colombia

Columbia 64 Group, c/o Leonardo P. Lopez Z, Cra 5 no. 2623, Palmira, Columbia

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MIDTJYDSK Computer Klub (M.C.K.), Jegstrupvej 86, 8800 Viborg, Denmark

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Rolls Royce International Computer Users Group, Tom Lomax, 17 Greystoke Dr., Bilborough, Nottingham, Nottinghamshire, England NG8 4HW

West Riding Commodore Computer Group, Bernard Flowers, 6 Earlswood Ave., Leeds, England, LS16 8DD

FINLAND

Commodore Micro Amateurs, Matti Aarnio, Linnustajankj 2B7, SF-02940 ESPOO, Finland

User's Club of PTT, c/o Matti Pohtola, Teletutkimuslaitoksen, Mikrotietokonekerho, Kiviaidankatu 2 F, 00210 Helsinki 21, Finland

INDIA

Commodore Users Group, c/o S. Ram Gopal, 1 B, 19th 'D' Main Rd., Rajajinagar First Block, Bangalore 560 010, India

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Commodore 64 Computer Users Group of Rome, c/o Pluchinotta Via di S. Agnese 22, 00198, Rome, Italy

Software Computer Club, Box N-39, 13060 Valdengo (VC), Italy

JAPAN

Commodore Fan Club, Koji Sugimura, 2-1-10-1107 Higashi-Taishi Yao Osaka, Japan, 581

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Commodore Users Exchange (CUE), P.O. Box 152, 25710 Kuantan, Pahang, Malaysia

MEXICO

Club Commodore de Juarez, Calle del Manantial #1448, Ciudad Juarez, Chihuahua, Mexico 32500

Club Commodore del Sureste, P.O. Box 1272-A, Alberto Marin Hdez., Merida, Yucatan, Mexico

Club Herra*Tec C64, Alain Bojmal, Vicente Suarez 25, 06100, Mexico, D.F.

Commodore 64 User's Group, APDO 86, Calle Zaragoza 414, Puerto Vallarta, Jalisco, Mexico 48300

Fox Club Commodore 64 Users Group, Conztanza Garcia #1216, Nuevo Laredo, Tamaulipas, Mexico, CP 88000

GMS Users Group, c/o Luis M. Portales, Potrero del Llano Numero 112 Salamanca, GTO, Mexico 36730

Golden Chips Users Group, Ibsen 67 #2, Mexico D.F., Mexico 11560

Grupo de Usuarios del Noreste (GUNE-64), Rio Pantepec #921, Col. Valle, Monterrey, NL Mexico 66220

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Comiac-Software User Group 64/128, Jarrod Bernadina, Inaguaweg 12, Willemstad, Curacao, Netherlands Antilles

Commodore 64 User Group, Ludwin Statie, Caracasbaaiweg #94, Curacao, Netherlands Antilles

NEW ZEALAND

Hokitika Commodore Computer Users Group, 185 Sewell St., Hokitika, New Zealand

Marlborough Commodore Users Group, Murray Herd, 34 Rousehill St., Renwick Marlborough, New Zealand

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Norwork Crew, Box 1346, 6401 Molde, Norway

PUERTO RICO

South Commodore Users Group, c/o Felix Tarrats, Jr., Campos #22, Ponce, Puerto Rico 00731

SAUDI ARABIA

Commodore League of Riyadh (CLR), P.O. Box 16216, Riyadh 11464, Saudi Arabia

REPUBLIC OF SINGAPORE

The Commodore User Club, Bedok Central P.O. Box 693, Singapore 9146, Republic of Singapore

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Computer Club Sweden, Hans Engstrom, P.O. Box 7040, S-103 86 Stockholm, Sweden

SWITZERLAND

Computer Anwender Club, Postfach 29, 8042 Zurich, Switzerland

WEST GERMANY

UTOPIA, Dana Talley or Sonja Ludwick, Olgastr. #146, 7900 Ulm, West Germany

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Caribbean Commodore Computer Club, Jim Lynch, P.O. Box 318, St. Johns, Antigua, West Indies

All programs listed in this magazine are available on the GAZETTE Disk. See details elsewhere in this issue.

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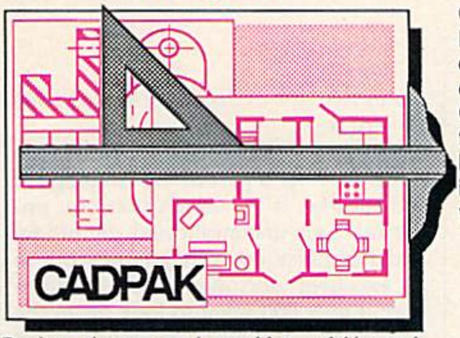

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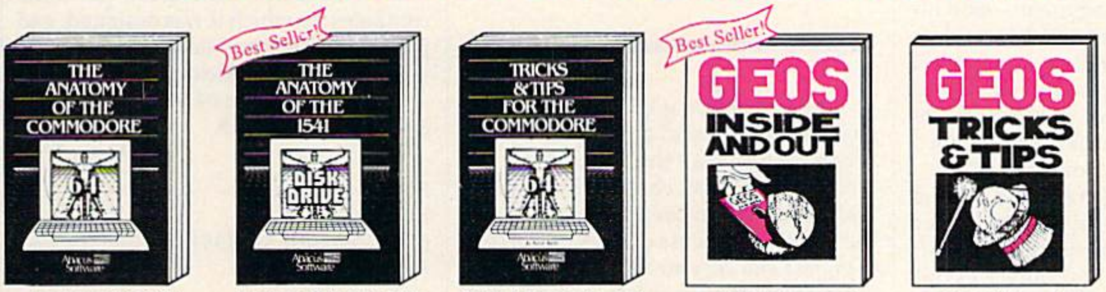

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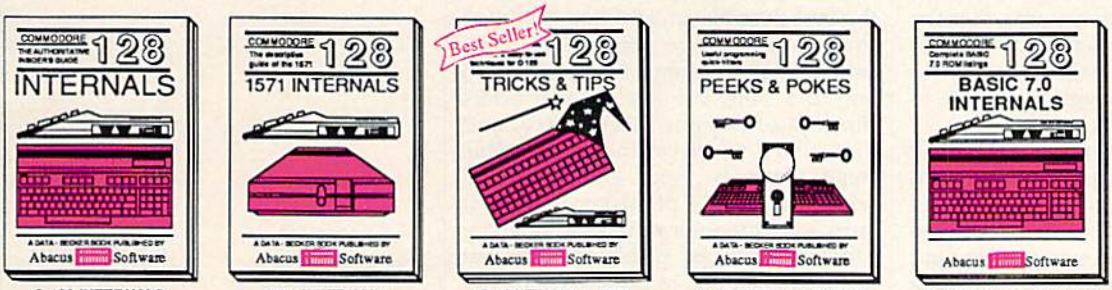

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Abacus

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TAS—Technical Analysis System

It's always a pleasure to see software that makes use of the features of the 128 without compromise, and *TAS* is such a program. That it implements these features and is an easy-to-use and useful program should make *TAS* doubly interesting to owners of the 128—provided, of course, that they also have some interest in the stock market, either intellectual or monetary.

TAS, as its name states, is a technical analysis system for stock market evaluations, and as such, it allows you to apply a variety of statistical evaluation techniques to as many securities as you wish—up to a maximum of 50 securities and 250 trading days per disk. (The number of securities given is for the 1571 disk drive; with the 1541, the maximum number of securities per disk is 25.)

And just to make your trading life a bit easier, *TAS* allows for direct communication with—and downloading information from—either Dow Jones News Retrieval or Warner Computer.

In order to use *TAS*, you should first go to the Reconfigure mode—selected from the opening menu—and indicate the disk drive in which your data disk will reside as well as the type of modem and type of printer you will be using. Once set, these parameters are saved to the master disk and you need never worry about them again.

With two disk drives—the second being set as device 9, drive 0—you may keep the master disk in drive 8 and your data disk in drive 9. Not only will this eliminate disk swapping, but it will also give your computer some of the performance power of the more expensive brands. Although the introduction to the *TAS* documentation warns that the program will not make you a millionaire overnight, it should at least help you save or earn enough to be able to afford a second drive.

Besides supporting two disk drives, *TAS* features autobooting, an 80-column display, numerical keypad entry, and an Escape key that works as an Escape key should—getting you out of an unwanted mode and returning you to the previous menu.

Except for data entry of your own stock figures, *TAS* is almost completely menu-driven, with selections being made by way of the function keys. The opening menu, in addition to the Reconfigure option, offers Maintenance, in which you may format data disks and add, delete, or edit the information in your files; Communications, which allows you to log on to one of the information services to obtain the latest quotations or stock histories; and Graphics, which offers the ability to call up a file from your data disk and see it presented in chart form. Because of a split screen in the latter mode, it's possible to view two graphs simultaneously, should you need to compare two sets of data.

...it tells you what to look for in the performance of a stock, how to go about spotting trends, and how to evaluate trends for the best monetary gain.

As any option is chosen, the screen changes quickly and a new menu is offered, usually at the bottom of the screen, and most choices from these menus can be invoked by using one of the function keys. As always, the accent is on *fast and easy* so that you may take quick stock of your riches and get back to clipping coupons.

In its technical analysis functions, *TAS* allows for Least Squares, in which the best possible straight line is plotted through a series of points—you indicate the data set (high, low, and so on) and *TAS* does the rest. It also offers plotting of Support, Resistance, and Trend lines, which can indicate possible trend reversals; Point and Figure, in which the stock is plotted only when it surpasses predetermined parameters; Moving Averages, which smooths out small fluctuations in order to help you determine the overall performance of a stock; and an Oscillator, which manipulates two sets of data in order to create an indicator.

If these terms seem foreign, it's because they are a part of the language of statisticians. It is enough that you understand an uncomplicated definition, and *TAS* gives you this groundwork in its excellent documentation. In addition, it tells you what to look for in the performance of a stock, how to go about spotting trends, and how to evaluate trends for the best monetary gain.

Perhaps it should again be emphasized that *TAS* promises no quick path to riches. Though this program performs many of the functions usually left to your stockbroker, Abacus would probably be the last to claim that you should think of it as any kind of substitute for those services.

TAS is simply a tool to help you gather and organize information, better your understanding of the trends of that information, present the information in graphic form, and print it out as hardcopy.

These are the goals of *TAS*, and since any software must be judged by how well it accomplishes its goals, *TAS* gets high marks in all respects: easy to learn, easy to use, making full use of the computer for which it was designed, and providing a worthwhile service for those whose interests coincide with its aims.

A Commodore 64 version of *TAS* is available for $39.95.

—Ervin Bobo

Abacus Software
P.O. Box 7219
Grand Rapids, MI 49510
$59.95

Starglider and *Tracker*

Besides being products of Britain's Rainbird Company, the newest games from Firebird have other things in common: Both *Starglider* and *Tracker* are preceded by a 64-page novella to set the scene; both are futuristic in scope; and both will challenge your thinking as well as your joystick skills.

Unlike some games, which use a lengthy preface in an attempt to give meaning and purpose to a lightweight arcade exercise, both *Starglider* and *Tracker* can stand on their own and require no reading material other than the user's guide and the quick-reference card. However, the novella is there, so read and enjoy.

In *Starglider*, you sit before the control panel of an airborne ground attack vehicle—known in the game as AGAV—and your mission is to attack air and ground targets on a far planet and thus stave off an invasion.

Your weapons are a limited number of missiles, a pulse-laser cannon, and a guided television camera for spotting distant enemies. At the center of the control panel is a radar screen, and below it, a compass readout. You'll want to watch both of these closely.

Starglider offers two means of control, joystick and keyboard. The joystick controls the flight altitude and the firing of weapons, while the keyboard controls such items as increasing or decreasing thrust and launching the remote camera.

In any flight simulator, the key to playability is the feeling of speed. In a combat flight simulator such as *Starglider*, this feeling is doubly important, and it is here accomplished in two ways. First of all, as you look out the viewscreen, you see only a band of stars. These pinpoints of light can be updated much more quickly than could a fully detailed scenario—the horizontal band that they form gives you a visual reference when you are banking or turning.

The second method has to do with your targets. These are done in the wire-frame design that will be familiar to anyone who has flown one of the more traditional flight simulators. Once again, the idea is to provide for a faster updating of the screen and the consequent feeling that you really are getting somewhere.

Where you wish to go should be a matter of some concern. Your fuel and weapons are limited and there are an awful lot of alien tanks, floating mines, and, well...other things...that must be destroyed. Though your pulse-lasers may at first seem unlimited, remember that you must make four direct hits to destroy anything.

As it turns out, replenishing your weapons is rather easy—if you can find and enter a silo. Once there, you may recharge your lasers and pick up a few more missiles. You'll need them all.

Recharging your lasers will also replenish your force fields and repair any damage: Since the battle action is at night, there is no difference between ground and sky other than the indication on your altitude meter. Flying at a height that scrapes the belly of your craft on the ground tends to diminish your shields and increase damage to your ship.

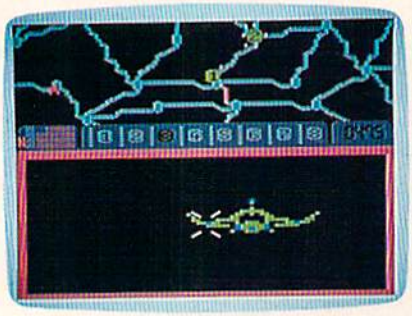
At the end of a game, you'll see your ranking in a Hall of Fame screen. Since this screen is not saved, it's used only as a reference for the current session.

Tracker puts you in charge of a Tactical Remote Assault Corps, hereafter known as TRAC. The fighting vehicles of TRAC are machines that must fly along a sort of trench in an attempt to find and destroy renegade Cycloid patrol craft—who also fly around in the system of trenches known as the Trackway. Once the Cycloid craft are rendered useless, you may proceed to your prime mission, which is to destroy the computer that controls the renegades.

Both Starglider *and* Tracker *are...futuristic in scope...and both will challenge your thinking as well as your joystick skills.*

You begin with three Tracker vehicles situated at various points along the mazelike track, and you switch control from one vehicle to the next by pushing the appropriate number key. Above the screen, a legend keeps you informed as to which vehicle you are currently using.

Utilizing what looks like a split screen, *Tracker* displays a portion of the area of the track (the part currently in use) on the top half of the screen, with the critical junction nodes highlighted in pink. On the lower half of the screen is a long-range scan of the entire track area; it resembles the hex grid used in most computer war games. Once again, strategically vital points are indicated in a contrasting color, and in the center of the map is Centrepoint—your ultimate destination.



As an alternative to the long-range scan, you may invoke the pilot's-eye view as you race along the tracks, slamming off the walls during tight turns. And you must be in this mode in order to fire your weapons and destroy any of the enemy you may encounter.

Strategy is a major factor in the playing of *Tracker*, for while the game relies on a maze, it is not enough that you simply be able to run the maze. You must set a course that will allow you to encounter the Cycloid vehicles, and you'll have to remember that the tracks are too narrow for a U-turn: another reason why the junction nodes are vitally important.

And even though you have 3 vehicles—and may field as many as 8 at one time—the enemy can put 32 Cycloid vehicles on the track, and their main strategy is to box you in and destroy your vehicles one by one.

In *Tracker*, the joystick controls the movements of your fighter and fires the lasers. The keyboard toggles you in and out of map mode, releases ion bombs, and allows for magnifying portions of the map. Games in progress may be saved and finished at a later date.

Both games are heavily documented—a little too heavily for my taste. But, the graphics, sound, strategy, and playability of both *Starglider* and *Tracker* all receive good marks.

—Ervin Bobo

Firebird Licensees
P.O. Box 49
Ramsey, NJ 07446
Starglider $44.95
Tracker $39.95

Parallax

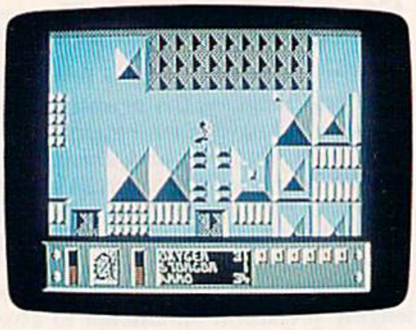
It had appeared to be a promising world. The planet's strange, multilevel construction and obvious high degree of civilization had been excellent indicators. Then the aliens appeared in their fighting machines—destructive geometric nightmares that changed the mission from one of exploration to one of survival.

Worse still, it is now clear that the aliens plan to attack Earth itself. Plan details are being generated in the powerful computer system that spreads throughout the planet's five zones like a giant, malignant web. After their initial reports, your four companion scientist-astronauts from Earth were cut off, isolated somewhere in the zones they'd been exploring. Further, they've been drugged into pitiful states, and are now actually helping the aliens with their dreadful preparations.

...Parallax *and its arcadelike graphics present an entertaining and incredibly challenging puzzle.*

There is but one faint hope. Rescuing your colleagues and restoring them to health might provide crucial information about the attack. Your own skill with computers will surely reveal more. Perhaps the aliens can be stopped, but it will take an enormous effort—an entire world to search, four scientists to find, and a vast computer intellect to thwart. The picture isn't pretty, but there is worse to come. The whole planet has been transformed into an armed camp. Everywhere, great turrets stud the landscape—an ominous backdrop to the thousands of alien fighting craft now swarming and crawling through the skies, streets, and underlevels of the planet. Time and resources are both in short supply. In the end, it will be you and your nimble IBIS ship against a world ready and able to utterly crush you.

Such is the nearly hopeless situation that confronts players of *Parallax* when they boot this impressive game from Mindscape. The program is an import from Ocean Software, a well-known British publisher. Like many recent British games, *Parallax* has excellent graphics. The planetary surface is seen from above, and all structures are rendered in shadowed, three-dimensional detail. Below the main surface, a



deeper plane is visible. As you fly your spacecraft over, under, and through the upper surface, both levels scroll at different rates. The effect of depth and perspective is completely convincing. The interior rooms—where you'll find scientists, robots, computers, and other vital items—are depicted equally well. Game characters—you, the scientists, the robots—are cleverly and humorously designed, but a little difficult to see against the wealth of background detail.

OK, the graphics are good, but how's the game? There's been some criticism of recent British games as consisting of praiseworthy graphics, but little else. I don't necessarily support that opinion, and certainly don't think it applies to *Parallax*. But to help you decide, here's a brief outline of gameplay.

At first glance, *Parallax* appears to offer just the basic components of a fairly good shoot-'em-up. The IBIS ship is hard to fly, but once you get the hang of it, you'll be darting through the levels like a drop of quicksilver. A nice touch is the ability to adjust your speed up and down by flying through special hyperspace tunnels. Your opponents have an immense numerical advantage, but you have a powerful laser with which to punish them, and you have shields which reduce the effectiveness of their counterattacks. You can rack up a huge score against the aliens, easily beating the numbers you'll find when your score is saved onto the disk. Unfortunately, such behavior will do you—and Earth—little good.

To move from zone to zone, and eventually cripple the central attack computer, you must learn to land your ship (no easy feat); maneuver on the ground; disembark to collect scientists, clues, and supplies (oxygen is especially precious); and discover the one computer on each level that will open the next stage to you. The whole process is quite complex and very time-consuming. Clearly, *Parallax* incorporates elements like those found in adventure games. Here, however, there's no building-up of characters or significant interaction between them. Instead, the effect is to create a puzzle that must be solved under severe time constraints. Although

it's not paticularly deep or complex, *Parallax* and its arcadelike graphics present an entertaining and incredibly challenging puzzle. It is, at its center, an action game—one with plenty of frills and features, but pure action, all the same.

—Lee Noel, Jr.

Mindscape
3444 Dundee Rd.
Northbrook, IL 60062
$29.95

Theatre Europe

Theatre Europe for the Commodore 64 simulates the first 30 days of a hypothetical World War III. The onscreen map covers most of Europe, from Ireland in the west to Moscow in the east, north to Oslo and south to Belgrade. Like most games about the next war, *Theatre Europe* places the NATO forces in the role of defender, as the armies of the Warsaw Pact try to sweep across western Europe. If you choose to play the NATO side, your task is to hold off the Warsaw Pact for 30 days, after which U.S. industrial strength will tip the balance of a conventional war. If you command the Warsaw Pact, you must conquer Europe within 30 turns.

As in the real world, the problem in *Theatre Europe* is to meet military objectives without engaging in an all-out nuclear war. When commanding the NATO troops, you must carefully conduct a strong defense, but if it's too strong the Pact might resort to chemical or nuclear weapons. Strategically, NATO's game quickly becomes one of deciding when to stand firm and when to retreat. Holding onto West Germany won't help much if London and Paris are destroyed behind you.

The game plays smoothly and easily. Only 14 units are available for the NATO commander, while there are 18 for the Warsaw Pact. To move a unit, you simply position the cursor over it and press the joystick's fire button. Units move only one square per turn. Attacking is similar, except that you specify which enemy unit your own unit(s) will attack. Each turn, you are given armor, air, and supply reinforcements, which you distribute to your units as you wish. All these actions are performed with the joystick, and all become second nature to you by turn 2.

Where *Theatre Europe* differs from most computer war games is in its routines for air warfare, tactical battles, and strategic warfare. Working from an easy-to-use screen, you allocate air power into seven possible missions. Air Superiority is the most important of these, because if the enemy controls the air, the rest of the missions are useless. But you can also assign points to such essentials as Counter-Air, Interdiction, and Reconnaissance missions, all of which have important effects on your ability to make command decisions. Additionally, you can designate points for Assault-Breaker, Deep-Strike, and Iron-Snake missions. (An Assault-Breaker mission attempts to reduce the capability of a key enemy attacker; Deep-Strike attacks the enemy's command and reinforcements; and Iron Snake takes out the enemy's rail network.) These three special missions are expensive, and they risk nuclear retaliation, but they must be considered if you hope to meet your objectives. Again, assigning missions is a joystick-controlled task.

The tactical battle game is optional. Here, an arcade-style screen appears, with soldiers running back and forth in front of you, tanks moving on and off the screen from the edges, and aircraft flying through the sky. You use the joystick to switch from machine-gun to tank-destroyer to anti-aircraft mode, then use it to shoot the enemy. If you do well on the Action Screen, a bonus is applied to all your attacks for the turn. I wish, though, that the Action Screen activities were more interesting; unlike the rest of the game, they do little to help us understand contemporary warfare.

As in the real world, the problem in Theatre Europe *is to meet military objectives without engaging in an all-out nuclear war.*

Where *Theatre Europe* shines is in its routines for strategic warfare. On any turn, you may launch a strategic chemical or nuclear attack, or, alternatively, you may activate the Reflex System, whereby any enemy strikes are countered automatically, at the whim of your computer. Filled with sound and graphics effects, the Special Missions Phase gives *Theatre Europe* its major appeal, albeit a rather gruesome one. If you launch a chemical missile, a report appears, telling you of the expected loss of civilian life. If you decide on a nuclear strike, the game becomes scary.

First, you are given 30 seconds to dial a phone number (a real one, printed in the rules book). When you do so, you hear an extremely disturbing simulation of the terror associated with a nuclear strike. If you still decide that the strike is in order, you type a code word (provided in the documentation), and a new screen appears. The cursor points to Standby, and the sound is ominous but controlled. Point it to Single Strategic Launch, or (worse) to Fire-Plan Warm Puppy, and the game emits a loud and chilling alarm. Once you launch your missile, the screen shows a picture of a clean white city with green grass and a blue sky, into which streak three missiles. A mushroom cloud later, the screen goes blank, and then your merciless reporter tells you how much damage you've done. The entire sequence is extremely well-designed, and it is anything but enjoyable. Seeing it once should cure you of any desire to exchange nuclear strikes.

Sometimes, though, you are certain that you have no choice. The strength of *Theatre Europe* is that it teaches how such a choice could conceivably be made, teaching us by forcing us to make that choice ourselves. Thankfully, the game does not condone such a choice, but it does help us to understand it. *Theatre Europe* is a fine game—playable, educational, and disturbing. It helps us to hope that the war will never happen.

—Neil Randall

Datasoft
19808 Nordhoff Pl.
Chatsworth, CA 91311
$34.95 (plus $2 shipping and handling if ordering by mail)

Deceptor and *Desert Fox*

Over the past couple of years, several software publishers have begun offering good-quality programs at substantially reduced prices to entice Commodore users to buy more software. For example, Mastertronics introduced the under-$10 package for the Commodore 64 a couple of years ago. They have since been joined by Firebird with its Silver Disk line, Mindscape with its Thunder Mountain series, and Tri Micro with its French Vanilla line, to name just a few.

In addition, some publishers are lowering the prices on their older packages (see "Fine-Tuning the Software Market" in the April issue), while mail-order houses advertise once-expensive software for as low as $4.99 per package. For producers of new software, especially games that are unquestionably good, but not necessarily state-of-the-art, the question is simple: How is it possible to crack the market? With its release of *Deceptor* and *Desert Fox,* two new packages for the Commodore 64 retailing for $14.95 (but offered in some ads for $9.95), the Accolade Avantage line is providing an answer.

Desert Fox is the more innovative of the two. Visually appealing and extremely playable, this game offers an interesting alternative to the more elaborate war games produced by such companies as SSI, MicroProse, and SSG. Whereas those games attempt to simulate battles in great detail, *Desert Fox* provides a very simple reenactment of the essentials of the campaign against Rommel. The single-screen map covers only the area between Tobruk and Sollum, and your objective is to protect your supply depots from the German commander.

The game is controlled entirely by joystick. To move your force (you have only one to move), you adjust your radio bearings. If you are heading into an enemy force of any kind—mine field, convoy, Stuka, ambush, or tank battle—a synthesized voice will tell you. Your task is to avoid Rommel and not get destroyed as you move around the map saving your depots.

Once you run into the enemy, the game shifts into action mode. Each of the attack types mentioned above has its own action game: In a mine field you maneuver around mines, in a Stuka attack you shoot down aircraft, in an ambush you try to get through the canyon without being damaged, and so on. The graphics in each subgame are well done, and your success or failure here will determine your success or failure in the campaign as a whole.

As long as such games offer several hours of challenge and entertainment at a reasonable cost, as Deceptor *and* Desert Fox *very ably do, I will keep going back to them.*

Deceptor is equally attractive. An arcade game, it offers excellent sound effects and *Zaxxon*-style 3-D graphics. Basically, you play the role of a Deceptor, a robot capable of transformation into land vehicle, air vehicle, or humanoid. Your mission is to discover what the "elders" have destined you for, and to do so you must go through four separate sub-missions. At the end of each sub-mission, you confront the Guardians of the Gates, various kinds of monsters you must destroy in order to go further. To destroy the monsters, you need ammunition, and you find the ammunition scattered about during your voyage.

The Deceptor begins as a land vehicle, changing to an air vehicle when you press the fire button, and back to a land vehicle when it touches the ground once more. Each sub-mission provides ingenious ways for you to destroy yourself, as timing and careful steering become increasingly important. Getting past the first two Guardians (there are four in total) is reasonably easy, but the third, a Hydrahead, is so difficult that it begins to frustrate. I have yet to reach the fourth, but I fully expect a task that borders on the impossible. Then again, I'm somewhat less than a joystick genius.

Obviously, *Deceptor* is not a breakthrough program, even less so than *Desert Fox.* But both games are highly entertaining, and both are easy to learn and to play. As much as I enjoy the in-

creasing complexity of many computer games, I find myself more and more frequently returning to the simpler games when I don't particularly want to overexercise my brain. As long as such games offer several hours of challenge and entertainment at a reasonable cost, as *Deceptor* and *Desert Fox* very ably do, I will keep going back to them. With these two packages, Accolade reaffirms that good quality at a sound price is still a viable objective—even for software publishers.

—Neil Randall

Avantage/Accolade
20813 Stevens Creek Blvd.
Cupertino, CA 95014
$14.95 each

Free-Form Filer

David Myles

It's never been easier to store recipes, magazine indexes, financial information, or addresses. This free-form database features power through simplicity—an impressive tool for the 64. A disk drive is required.

"Free-Form Filer" is like a deck of index cards that you can easily add to and edit. Advanced features let you arrange the cards in the order you want, hunt for key phrases, and print a card to a printer. When you have everything in the file just the way you want it, simply press one key to save the entire file to disk.

The program is written to be intuitive, so it's very easy to learn how to use the program. Type information any way you want—the program's automatic centering will keep all your data nice and neat.

Free-Form Filer is written entirely in machine language; you'll need to use the "MLX" machine language entry program found elsewhere in this issue to enter it. When MLX asks for a starting and ending address, respond with the values indicated:

Starting Address: 0801
Ending Address: 0F08

Be sure to save a copy to disk with the name FREE-FORM FILER before exiting MLX. It's important to use this name because it is the name that Free-Form Filer uses when it saves itself back to disk.

Free-Form Filer stores information by adding to itself. That is, the information you enter into the Free-Form Filer database becomes part of the program, and the program grows longer as you add more information. For this reason, *you must use a separate copy of Free-Form Filer for each database you create*. For example, if you want to set up an address file, a recipe file, and a household inventory, then each set of information needs to be entered into its own copy of the Free-Form Filer program. Furthermore, because the program always saves itself back to disk with the same name, *there can be only one copy of the Free-Form Filer program on a disk.*

You should save one copy of the program with no data added as a master copy, then save a working copy on each disk on which you wish to create a database. Because the program is written to load the same way a BASIC program does, you can save additional copies simply by using the standard SAVE command. Remember that all copies *must* have the name FREE-FORM FILER. It would be wise to indicate on the disk's label what type of information is contained in the copy of Free-Form Filer on that particular disk.

Making A Note

Load Free-Form Filer the way you would load a BASIC program (LOAD "FREE-FORM FILER",8); then type RUN. You'll see a menu at the bottom of the screen:

Hunt Re-try Add Print Fwd Back
Change Dlete Tobuff Save Insbuff

This menu is always visible, so you don't have to worry about memorizing a set of commands. At this point, Free-Form Filer asks you to select from the menu. To start, we want to add to the file, so press A. You'll see a message which says that a carriage return (RETURN) stores the line, and that a RETURN on a blank line ends data entry. To see how it works, type these lines, pressing RETURN after each:

FREE-FORM FILER
FEATURES AUTOMATIC CENTERING

Then, press RETURN on a blank line. Free-Form Filer makes a *card* with the information that you entered. This card is the first in the deck. (In Free-Form Filer, a card corresponds to one screen of information—up to 23 lines of text.)

Press A again to make another card. Then type

TYPIGN ERRORS ARE EASY TO CORRECT.

and press RETURN twice. Now press B (Back) to view the first card. It's impossible to back up beyond this card. Press F to go forward. You'll see the second card again. To correct the misspelled word, *TYPIGN*, press C (Change). Correct the word by using the cursor keys to move to the error, and then typing over the incorrect letters. When you've made the change, be sure to press RETURN before moving the cursor off the screen line.

Each time you enter a line, it's saved in the computer's memory. The computer uses all these lines to build the index card. It's easy to enter duplicate lines—just press RETURN several times on the same line. Be sure not to press RETURN on a blank line until you've pressed RETURN on all the lines you want to be saved on the card—this applies when you're entering data for the first time and when you're editing it.

If, while entering information on a card, you notice a mistake in a previous line, do not cursor up and correct the error. Instead, finish entering the rest of the information for the card, press RETURN on a blank line to enter the card, and then use the C option to go back and change the mistake.

Because blank lines are used to terminate data entry, it's impossible to use them to separate text on the screen. If you want to separate lines, enter a shifted space (hold down SHIFT while pressing the space bar) as the only character on the line. Alternatively, you can use a character like a period or minus sign.

Free-Form Filer makes it easy to arrange the order of the cards. Press B until you back up to the first card. Then press T (To buffer). The first card is now being held in a buffer. Now press F (Forward) to go past the second card. Press I (Insert buffer). The contents of the buffer are now placed after the second page. (Whenever you press I, the contents of the buffer are stored in a new card *in front of* the card currently on the screen.) Use B and F to see that the first card has been moved to the end.

You should be aware that anytime you use the C option to change a card, that card will be moved to the end of the deck. If the order of the cards is important to you, then you'll have to follow the procedure to move the card back to its desired position after changes are made.

If you decide that you want to throw out a card, press D (Delete). Free-Form Filer will ask if you're sure. If you press Y, the card will be deleted.

Printing, Searching, And Saving

Sooner or later, you'll probably want a printout of your data. When you do, just press P for a printed version of the card currently displayed on your screen.

The most powerful feature of Free-Form Filer is *Hunt*. When you want to search for a word or phrase, just press H. (For Hunt to work properly, you should be positioned at the first card in the deck before pressing H.) The program will ask for the phrase. Type it in, following it with a RETURN. Free-Form Filer will find and display the first card with the phrase you indicated. To search for the next occurrence, press R (Retry).

When you've finished editing your cards, press S to save them to disk. Free-Form Filer scratches its program file from disk and replaces it with the program plus all the notecards you have entered. The next time you want to edit or read your cards, just load Free-Form Filer—all your cards will be there.

Be very careful that you don't hit the RUN/STOP–RESTORE combination while using Free-Form Filer. If you do, all the changes made since the program was loaded will be lost when you run the program again to restart it. The cards will still appear on the screen if you flip through the file, but the changes will not be saved to disk. To reenter the changes, you must move to the first card in the file, then use the C option and press RETURN on every line of every card.

By saving Free-Form Filer to several disks, you can keep several different types of files. If you ever want to clear out all the cards in a deck to start a new file, just use D (Delete) on each card.

See program listing on page 90.

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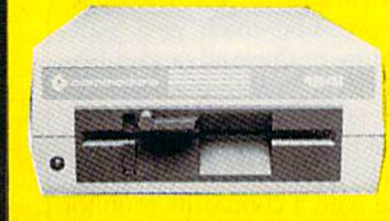

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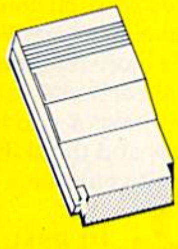

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simple answers to common questions

Tom R. Halfhill, Staff Editor

Each month, COMPUTE!'s Gazette tackles some questions commonly asked by Commodore users. If you have a question you'd like to see answered here, send it to this column, c/o COMPUTE!'s Gazette, P.O. Box 5406, Greensboro, NC 27403.

Q. I write a lot of educational programs for my little brother and his friends. They seem to enjoy them a lot, so I got the idea that maybe other people would enjoy them, too. If I sent in a printout of a couple of them, would you print them in your magazine?

A. COMPUTE!'s Gazette and our companion magazines, COMPUTE!, COMPUTE!'s Apple Applications, and COMPUTE!'s Atari ST Disk & Magazine, are always looking for good programs to publish. Most of our programs are written by hobbyists like you. We pay competitive rates on acceptance, plus royalties for programs which appear on our disks, and these royalties can amount to a considerable sum.

Programs must be submitted on a disk or cassette, not just as a printout. For full details on submitting material, see the "Author's Guide" published from time to time in COMPUTE!'s Gazette.

Q. I own a Commodore 64 and a 128, and I was wondering if there is a way I could change the appearance of both of these models to make them more attractive. What crossed my mind was to send them back to Commodore and have them put my 128 into a 128D shell, and figure something out for the 64 (without the disk drives).

A. It would be impossible to get Commodore to put your 128 into the new 128D shell, even if the components would fit. The amount of labor this would require would probably be worth more than the value of the computer.

An alternative is to investigate the system organizers which are sold by some independent companies for the Commodore 64 and 128. These products are advertised occasionally in COMPUTE!'s Gazette and other magazines; look through your back issues. One product that comes to mind is a shelflike unit that fits over the 128. It provides support for the video monitor, space for two floppy disk drives, a cooling fan, rear-mounted power outlets, and a built-in surge suppressor. This improves the appearance of your system by integrating the components and reducing the usual clutter of power supplies and cables.

Another approach is recommended only if you feel qualified as a technician and handyman: Build your own custom case. You could make an elegant case out of wood or a more modern-looking shell out of sheet metal or plastic. But unless you have a good workshop full of tools and the skills to use them, the result could be a disaster.

Q. In past issues of COMPUTE!'s Gazette, you printed several questions and answers about the lack of double-precision math in Commodore 64 or 128 BASIC. Apparently there is no way to get this much precision on these computers. If so, which reasonably priced computer *does* provide double or even multiple precision? I am interested in multiplying 50-digit numbers with complete accuracy. I have been unable to find an answer to this question; please help.

A. There are at least three alternatives to investigate: IBM PC compatibles, the Atari 520ST, and the new Amiga 500.

PC compatibles such as the Blue Chip and Tandy 1000EX are now available for as low as $600. Also, Atari has announced a PC clone that is supposed to be available this summer for $499. Most PC clones come with GW-BASIC, which has double-precision variables. For even greater mathematical accuracy, consider Borland International's new *Turbo BASIC* compiler; it offers up to 53-bit precision variables.

The Atari 520ST is now available with a single-sided disk drive and monochrome monitor for as little as $499. It comes with ST BASIC, which is supposed to have double precision, but really doesn't. However, there are numerous languages—including easy-to-use BASIC compilers—that do offer double-precision math.

Finally, the Amiga 500 comes with Amiga BASIC, an excellent BASIC interpreter which is very similar to Microsoft BASIC for the Macintosh and to IBM BASICA. Double-precision math is a standard feature of these advanced BASICs. The Amiga 500 is expected to sell for $600–$700 with a disk drive. An RGB color monitor would be about $300 more, but the Amiga is usable with a composite monitor if you already have one for your 64.

Q. I keep hearing rumors about a Commodore 64 emulator for the Amiga. Have you heard anything more about this?

A. A source at Commodore says this project is underway by an outside developer, not by Commodore itself. When it will be finished (and how well it will function) is still anybody's guess. If the emulator is designed to work entirely in software—as we have heard—we're still skeptical that it can run at full speed and retain full compatibility. But we're quite willing to be convinced otherwise.

ML Base

Sorting And Searching Capabilities Added To BASIC

John Brox Shadle, Assistant Editor

Dramatically increase the searching and sorting power of BASIC with this machine language extension for the 64. Two new flexible commands are just what you need to set up your own customized database program. Two demonstration programs included.

A year ago, I filled the memory of my 64 with random strings and alphabetized them with a common BASIC sorting routine. I checked the index variables every few hours to see how the work was going. Finally, after 22 hours, all the strings were sorted.

What held down the speed of the sort? Mostly garbage collection. Any sorting routine will have several string assignments, all in nested loops, that are executed many, many times. Each one of these assignments causes a new string to be generated. Soon, garbage collection takes place to get rid of old, unused strings. Unfortunately, garbage collection can take a very long time, and it was happening over and over when I sorted my random strings.

Another reason my sorting program was so slow is that BASIC is so slow. BASIC is designed to be easy to use and very general. But because it's easy for humans to understand, it's difficult for the computer to understand. It takes a lot of time for the computer to translate each BASIC statement into something it can use.

Fortunately, BASIC lets us call machine language subroutines to do the things that we need done quickly. "ML Base" adds routines specifically designed to find and manipulate information at machine language speed.

Sorting And Searching

ML Base does two types of work—sorting and searching. It works with one- and two-dimensional numeric and string arrays. The sort can sort numbers in either ascending or descending order, and it can put strings in alphabetical or reverse-alphabetical order.

ML Base can also *co-sort* two arrays. Co-sorting allows you to sort one array and move the entries in the other array to reflect the sorting. Here's an example:

Zimmer, Bert	**555-1234**
Ames, William	**555-4536**

Assume the names are stored in one array and the telephone numbers in the other. Bert Zimmer's name is element 1 of the names array. His phone number is element 1 of the numbers array. William Ames' name is element 2 of the names array, and his phone number is element 2 of the numbers array.

If we sort the names, William's name will become element 1 in the names array and Bert's name will become element 2. Unfortunately, the next time you try to call Bert, you'll get William instead—the phone numbers didn't move with the names. Co-sorting is the solution: Whenever an element gets moved in one array, the corresponding element is moved in another array. If you co-sort, you'll get Bert when you call him.

ML Base can also search arrays. The string search reports each and every occurrence of a string. ML Base finds not only whole strings, but also partial matches—if you search for *oh*, ML Base will find it in *John* and in *Ohio*.

The numeric search lets you select between finding exact matches of a chosen number, finding numbers less than the chosen number, and finding numbers greater than the chosen number.

To let you know when ML Base is working, it blinks a character in the upper left corner of the screen. This is a busy light to show you that something is happening.

ML Base gives you the machine language base you need to build useful database programs. This table shows the difference in speed between BASIC and BASIC with ML Base:

	BASIC	ML Base
Sort 500 strings :	**14 min. 18 sec.**	**19 sec.**
With co-sort:	**15 min. 47 sec.**	**24 sec.**
Sort 500 numbers :	**14 min. 25 sec.**	**23 sec.**
With co-sort:	**14 min. 25 sec.**	**24 sec.**
Search 1000 strings:	**6 sec.**	**0.23 sec.**
Search 1000 numbers:	**6 sec.**	**0.35 sec.**

Typing It In

There are three programs included with this article. The first is the ML Base program; the second and third are demo programs.

Program 1, ML Base, is written entirely in machine language, so you'll need to use "MLX," the machine language entry program found elsewhere in this issue to enter it. When you run MLX, it will ask for a starting and an ending address for the data you'll be entering. For ML Base, respond with these values:

Starting Address: C000
Ending Address: C6CF

Be sure to save a copy of ML Base to tape or disk before exiting MLX.

Programs 2 and 3 are written in BASIC. You don't need to type them in to use ML Base, but they do demonstrate how to use ML Base in your own BASIC programs. If you type these programs in, be sure to save them to tape or disk. If you're using disk, both the demo program and the ML Base machine language program must be on the same disk. If you're using tape, you'll need to put a copy of Program 1, ML Base, right after the demo program you're using. Also, to reflect that you're using tape, you'll have to change line 30 in the demos from ,8 to ,1. In both Program 2 and Program 3, line 30 assumes that you have stored the ML Base machine language with the filename ML/BASE.OBJ. If you used some other name, change line 30 in each program to reflect the actual name of the machine language program.

Dimensioning Arrays

When you use ML Base, dimension your single dimensional arrays as usual. The order of the arrays in the dimension statement makes no difference at all. Two-dimensional arrays must be dimensioned with special care. Think of a two-dimensional array as a set of file cards with several lines of data on each card. Each card is numbered from 0 to N, and each line on a card is numbered from 0 to M. N and M are set in the DIM statement. The correct dimension statement is:

DIM NA$(M,N)

A definition of DIM NA$(N,M) would not be correct. In fact, it could lead to some great difficulty in debugging.

If you intend to co-sort one array with another array, both need to have the same number of cards—that is, the second number in the DIM statement must be the same for both arrays.

When you're using ML Base, don't forget that all arrays begin with element number 0, not element number 1.

Using The Commands

Since arrays are usually dimensioned larger than the information they will contain, ML Base makes use of a reserved integer variable ND% (for *eND*) to tell it where to stop processing. Prior to any calls to ML Base, you must set ND% to the card number where you want it to stop. You must set ND% even if the array is full.

A call to the ML Base routine is made up of three segments. These segments are separated by colons. The first is a POKE to location 828. The number POKEd into this location is the line number (the number that appears first in a two-dimensional array) upon which the search or sort will be performed. This number will be 0 for all one-dimensional arrays. The second segment is always SYS 49152. This calls the machine language ML Base routine. The third segment gives the details of the operation which must be performed.

Here is the syntax for a sort:

POKE 828,*line number* :SYS 49152: SORT, *direction, array name( )*

The *direction* parameter must be either the letter *A* or the letter *D*. An *A* indicates that this is to be an ascending sort, while a *D* signals a descending sort. If you wish to co-sort an array, specify it at the end, after another comma. Here's an example call:

POKE 828,3: SYS 49152: SORT,A,N( ) ,DR$( )

This will sort the numeric array *N* in ascending order by line number 3. The string array *DR$* will be co-sorted with it.

Here's the syntax for a search:

POKE 828,*line number* :SYS 49152: SEARCH, *range, array name( )*

For searches, ML Base makes use of two reserved variables, SR and SR$. The variable *SR* is used to specify the number which will be searched for in a numeric search. *SR$* serves the same purpose in string searches. Reports are made to your program in a reserved one-dimensional array RP%( ). *This array must be the first array dimensioned in your program.* Array element RP%(0) is used to report the number of cards that contained the number or string for which you searched. The remaining elements in RP%( ) will contain the card numbers of each match.

For example, if you search the array TR$ for the string *cats*, and if RP%(0) = 2 after the search, then two occurrences of *cats* were found in array TR$. If RP%(1) = 5 and RP%(2) = 115, the string can be found on the 5th and the 115th cards of TR$.

The *range* parameter in the SEARCH statement must be either H, L, or E. An *H* means that you want to search the array for numbers higher than the number in SR. *L* means search for numbers lower than SR. *E* means search for numbers equal to SR. For string searches, this parameter must always be set to E.

Any BASIC program which uses the ML Base routine must first load it into memory. See lines 10 and 20 in the demo programs for an example of how to do this.

Two Demonstrations

"Demo 1" shows most of the features of ML Base. The program asks you to enter a two-dimensional string array with two lines. Line 0 will contain a name; line 1, an address. You will also input a salary into a one-dimensional numeric array. You may then sort alphabetically by either name or address, and you may sort the salaries into either ascending or descending order. You may then search for a particular name or address, or a particular salary or the salaries above or below a chosen number. The string array, which contains the names and addresses, and the numeric array, which contains the salaries, are kept in sync with co-sorting.

"Demo 2" allows you to make as many random strings as you wish, then it sorts them. You'll see just how fast ML Base is.

See program listings on page 96.

Directory Filer Plus

Robin C. Trulock and Rodney L. Barnes

In the April 1986 issue of this magazine, we published "Directory Filer," a disk utility that allows you to delete, lock, and unlock files, move filenames where you wish, and insert dividers to group files together. "Directory Filer Plus" takes the original program several steps further by adding a rename command, help screen, and formatted directory print routine. It also fixes a few minor bugs. For the sake of readers who did not see Directory Filer, we are publishing a complete version of the enhanced program rather than line additions to the original. This program, like the original, runs on the Commodore 64, Plus/4, and Commodore 16.

How often have you searched the directory of a disk for a particular file, certain that you have the right disk, yet have been unable to find that file? Or maybe you've had difficulty running a program because you don't recall which file is the boot program. When a file is saved to disk, it's listed in the first available directory location, not always the location you might wish it to have. A file that has been scratched creates a gap which may become the next available location. After a while, finding a particular file can be difficult.

"Directory Filer Plus" solves these problems, allowing you to organize your disk directories just the way you like.

Directory Filer Plus is written in BASIC. Since the program contains a short machine language program in DATA statements, it's a good idea to use "The Automatic Proofreader," found elsewhere in this issue, when you type the program. As listed, the program works with the 64. If you use a Plus/4 or 16, type in Program 1 and add the following lines:

```
KF 10 N$="ZZ":COLOR 0,1:COLOR
      {SPACE}4,1:NR=205:NC=202
      :KB=239:POKE806,115
FE 15 C=0:FORA=133TO136:FORB=0
      TO3STEP3:C=C+1:KEYC,CHR$
      (A+B):NEXTB,A
```

After typing in the program, be sure to save a copy. To use Directory Filer Plus, load it and type RUN. The program asks you to insert the disk that you wish to organize. (You may abort the program at any time by pressing RUN–STOP.) Insert the disk and press RETURN. The program reads the directory and displays the first 40 filenames, the first one highlighted by a blue bar.

By using the cursor keys, you can move the cursor bar to any filename. Pressing HOME returns the bar back to the first file. If your disk holds more than 40 files, press N (next) to advance to the next page and P (previous) to back up a page.

After you've reorganized your directory, you must press f1 to write the directory to disk.

The Commands

• Lock

To lock a file, press the < (less-than sign) key. You'll see a less-than sign appear to the right of the line with the filename. Press the same key on a locked file, and it will be unlocked. A locked file cannot be scratched through normal methods.

• Delete

To delete a file, press the space bar. The computer responds with ARE YOU SURE? (Y/N). Press Y to delete the file. Delete works on both locked and unlocked files, so it should be used with some caution.

• Insert Divider

To insert a divider at any point in the directory, press the minus key (−). This allows you to group your files logically.

• Move

To move a filename from one screen location to another, press RETURN. Move the cursor to the destination and press RETURN again. The selection is inserted *above* the filename highlighted by the cursor bar. It's even possible to move a filename from one page to another if your disk has more than 40 files.

• Write Directory

Press f1 to write the reorganized directory to your disk. This must be done at the end of your editing session to save the changes you have made.

• Help

Press f7 at any time to view the help screen. When you've finished viewing the screen, press RETURN to resume editing.

• Rename

Press R to rename the file under the cursor. You will be asked for the new name. The program will not allow you to choose a name that conflicts with the name of another file. The Rename function can be performed on dividers to allow names for the file groups.

• Directory Print

Press f3 to print out a formatted directory listing. The program asks you to turn your printer on. Press RETURN after doing so, or press RUN–STOP to cancel.

See program listing on page 88.

commodore
64c $149.95*
128 .... $199.95*
*WITH ANY OTHER PURCHASE
1541c $669.95
1571 .... $219.95
commodore modem/300
300 BAUD $28.00
1670 .... $110.00
1351 .... $39.95
QUANTUM LINK $5
1764 RAM .... $CALL
1802c $199.95
1902 .... $249.95
Trade In Your 1000 Towards A 2000!
AMIGA 1000 with AMIGA 1080 Color Monitor
$995
GENLOCK ... $225.00
DIGI-VIEW $150
1010DRIVE ... $200.00
1680MODEM ... $160.00
FUTURE SOUND $160
2 MEG ... $425.00
256K ... $80.00
ENHANCER $10
1 MEG WITH CLOCK $260.00
star micronics PRINTERS
NP-10 *139.95
NX-10 *179.95
NL-10 *229.95
NX-15 *299.95
*WITH PURCHASE OF TWO RIBBONS
commodore
IBM CAMPATIBLE
• 512K
• 360K Dual Sided Drive
• CGA Board
• One year warranty
• Parallel Port
• Serial Port
• GW BASIC
• DOS 3.2
FREE SIDEKICK BY BORLAND
PC10-1 $699.95
DUAL DRIVE 640K
PC10-2 $850
20 MEG...$450 Installed
30 MEG...$500
ORDERS ONLY 800-433-7756
CUSTOMER SERVICE 313-427-0267
HOURS (E.S.T.):
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Saturday – 10:00 A.M. to 6:00 P.M.
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Disk Vacuum

Mark Tuttle

This handy utility can save hours of your time, allowing you to quickly and selectively delete unwanted disk files. For the 64.

Scratching obsolete files from your disks can take a very long time. Unlike the Commodore 128, the 64 has no SCRATCH command. For every file that you wish to delete, you must type this line:

OPEN 1,8,15,"S0:filename":CLOSE 1

"Disk Vacuum" makes the process easier. As it steps through each directory entry, it displays the filename and asks if you would like to delete it. After you've selected the files you want to scratch, the deletions are made and the disk is validated. If you wish to clean another disk, simply insert the disk and type RUN.

Note: If you use the *GEOS* operating system for the 64, *do not* use this program on disks containing *GEOS* files.

Typing It In

Disk Vacuum is written in BASIC. Because it contains a machine language subroutine and several unusual characters, be sure to use "The Automatic Proofreader" when you enter the program. If you have difficulty typing in the special characters, consult "How to Type In COMPUTE's Gazette Programs." Both the Proofreader and the typing guide can be found elsewhere in this issue.

See program listing on page 95.

Hi-Res Graphics On The 128

Part 1

Rob Kennedy

Are you taking advantage of the graphics potential of your 128? It's easy to do with the powerful statements included in BASIC 7.0. In this tutorial, the author provides many useful examples and two demo programs to help you get started programming your own colorful graphics.

The 64 is a powerful graphics machine, but to get the best of its displays, you need to use high-resolution graphics. And that's a difficult and tedious process—especially in BASIC. The 128 solves this problem with BASIC 7.0's comprehensive set of graphics statements. This article is intended to introduce and explain several of those statements, and to show you how to use them.

The first statement that you must be familiar with in order to use high-resolution graphics is GRAPHIC. It's the most important of the graphics statements for one simple reason: None of the others can be used until this one has been executed.

The format of the statement is:

GRAPHIC ***mode, clear, split***

Here is a list of the possible values for the *mode* parameter:

0	40-column text
1	standard bitmapped graphics
2	standard bitmapped graphics with a text window
3	multicolor bitmapped graphics
4	multicolor bitmapped graphics with a text window
5	80-column text

The text window provided by modes 2 and 4 is a portion of text screen below the graphics display. This kind of setup is known as a *split screen*. Although it's possible to get split screens on the 64, it's not easy.

The differences between standard bitmapped and multicolor bitmapped modes lie in resolution and in versatile use of color. Standard bitmapped mode has twice the resolution of a multicolor screen (320 pixels horizontally as opposed to 160). However, multicolor mode is more versatile when it comes to displaying colors.

The optional *clear* parameter in the GRAPHIC statement allows you to choose whether you would like the graphics screen to be cleared after it has been set up. A value of 1 specifies that you want the screen cleared, while a value of 0 indicates that it should not be cleared. In most cases, you'll probably want the screen to be cleared.

The optional *split* parameter is meaningful only with modes 2 and 4, the split-screen modes. It allows you to indicate the starting line number for the text section of a split screen. You can allot any amount of text to accompany the hi-res display, but the more lines of text you use, the fewer there are available to the graphics portion of the screen. If you don't supply a value for this parameter, BASIC assumes a default of 19, which gives you five lines of text at the bottom of the screen.

Here's an example setup:

GRAPHIC ***2, 0, 20***

The *2* specifies a split screen with standard bitmapped graphics at the top and text at the bottom. The *0* indicates that you don't want the screen cleared. The *20* causes the text portion of the screen to begin 20 rows from the top of the screen. Press the cursor-down key several times until you see the cursor. To return to normal text mode, type GRAPHIC 0.

Another variation of the GRAPHIC statement is

GRAPHIC CLR

When you first execute a GRAPHIC statement with a mode parameter in the range 1–4, the computer sets aside 9K of memory at the bottom of the BASIC program storage space to make room for color memory and the bitmap for the hi-res screen. The GRAPHIC CLR statement deallocates this memory so that it is again available for program storage. If you use GRAPHIC statements in your programs, it's a good idea to execute a GRAPHIC CLR before exiting to BASIC. This gives the user access to all the memory that's available.

Selecting Colors

Once you've set up your screen format with the GRAPHIC statement, you need to select the colors with which you will be working. This is done with the COLOR statement. Its format is

COLOR ***source number, color number***

The *source number* specifies which color source will be changed.

The following values are allowed:

0	background color
1	foreground color
2	multicolor 1
3	multicolor 2
4	border color
5	character color (40- and 80-column)
6	80-column background color

Note that some changes, such as selecting a new border or background color, will be immediately apparent. Other changes, such as selecting a new foreground or multicolor value, will be apparent only when something new is drawn on the hi-res screen. Color sources 2 and 3 are used only in the multicolor graphics modes. Color source 1 can be used in both standard bitmapped and multicolor bitmapped modes.

The *color number* parameter can range from 1 to 16, corresponding to the 16 colors normally accessed using the CONTROL or Commodore keys in conjunction with the top row of the keyboard. Here are a few examples you can try:

COLOR 0,1	sets the background to black
COLOR 4,3	sets the border to red
COLOR 5,2	sets the character color to white

Points And Lines

The first drawing statement that we'll discuss is DRAW. The syntax is

DRAW ***color source, X1, Y1 TO X2, Y2 ...***

The ellipsis marks (...) at the end indicate that the *TO* part of the statement can be repeated indefinitely. The *color source* can be 0 or 1 in standard bitmapped mode, or 0–3 in multicolor bitmapped mode. *X1* and *Y1* give the position of the first dot in a line. *X2* and *Y2* refer to the final point in the line. If you have more than one point in your DRAW statement, the points are connected by lines. Type NEW; then try this example:

```
10 GRAPHIC 1,1
20 COLOR 0,1:COLOR 4,1
30 DRAW 1,50,100
```

When you type RUN, you'll see a dot on the left side of the screen. Type GRAPHIC 0 to return to a text screen. Now, substitute this line for the previous line 30:

```
30 DRAW 1,1,1 TO 318,200
```

Run the modified program. Instead of having a dot, you have a line going across the screen. X coordinates may range from 0 to 319; Y coordinates, from 0 to 199. Change line 30 to read

```
30 DRAW 1,100,1 TO 150,190 TO 50,190
   TO 100,1
```

The program now draws a triangle. The first point (100,1) is the top of the triangle. The second (150,190) is the bottom right, and the third (50,190) is the bottom left. The fourth point—which is the same as the first—is necessary to close the triangle. Try the line without the TO 100,1 to see the effect.

Drawing Boxes

It's possible to draw boxes with the DRAW statement, but since boxes are perhaps the most commonly drawn shape, BASIC 7.0 includes a special BOX statement. This statement requires only two points—an upper left corner and a lower right corner—so BOX statements are significantly shorter than equivalent DRAW statements. Here's the syntax for BOX:

BOX ***color source, X1, Y1, X2, Y2, angle, paint***

The *color source* value can be 0 or 1 for standard mode or 0–3 for multicolor mode. *X1* and *Y1* designate the upper left corner of the box. *X2* and *Y2* designate the lower right. The optional *angle* value can range from 0 to 360. The angle controls the tilt of the box. (Use 0 for no tilt.) The *paint* option can be used to automatically fill the box with the color in the color source. Set the paint parameter to 1 for filled boxes or to 0 for outlined boxes.

For a demonstration, replace line 30 in the sample program above with this line and type RUN:

```
30 BOX 1,50,10,260,185
```

This draws a large box on the screen. Now try this:

```
30 BOX 1,20,50,70,100,135,1
```

This draws a filled, rotated box. Try this one:

```
30 BOX 1,100,100,200,200,,1
```

Notice the double commas? We omitted the angle parameter—but we must retain its placeholding comma when specifying the subsequent paint parameter.

Circles

The final drawing statement is CIRCLE, and it's also the most powerful. The syntax for the statement is

CIRCLE ***color source, X, Y, XR, YR, sa, ea, angle, inc***

The *color source* ranges are the same as for DRAW and BOX. The *X* and *Y* coordinates define the center of the circle. *XR* is the horizontal radius. You can also specify a value for *YR*, the vertical radius. Having two different radii makes it possible to use the statement to draw ovals as well as circles.

The *sa* value is the starting arc. It defines the angle at which the circle will begin drawing. The default is 0 degrees, which is directly above the center point. The *ea* value is the angle where the circle will end. The default is 360, for a full circle. By using these two arcs, it's possible to draw curved line segments.

The *angle* parameter specifies the rotation of the circle or oval in degress clockwise. The default is 0 degrees. This parameter allows ovals to be tilted in the same way as boxes.

The *inc* parameter is the increment in degrees of arc per line segment. (Remember that a full circle consists of 360 degrees.) It controls the smoothness of the line forming the circle. The default value for this parameter is 2. (Thus, default "circles" are actually 180-sided polygons, but the effect looks round on the video screen.) Use larger numbers to draw pentagons, squares, triangles, and other regular polygons. For example, use an inc value of 45 to draw ocagons (360 degrees / 8 sides = 45 degrees per side).

Try replacing line 30 in the sample program with these lines:

```
30 CIRCLE 1,100,100,50
30 CIRCLE 1,50,100,50,40
30 CIRCLE 1,100,100,50,30,,,45,5
```

PAINTing Pictures

The PAINT statement is used to fill enclosed areas of the screen with a specified color. The syntax for PAINT is:

PAINT ***color source, X, Y, mode***

Color source values have the same range as other graphics statements. The *X* and *Y* parameters designate a point within the area that you want filled. There are two *modes* for painting. Mode 0 paints an area defined by the color source selected. Mode 1 paints an area defined by any nonbackground source. In other words, mode 0 causes all colors except the color source to be painted over. Mode 1 causes only blank areas to be painted over. Use PAINT with care. A "runaway"

PAINT statement can blot out a carefully drawn screen image.

The WIDTH Statement

Sometimes you may wish that the lines drawn by the DRAW, BOX, and CIRCLE commands were thicker. The WIDTH statement allows you to select between two different line thicknesses. The syntax is

WIDTH *n*

where *n* is 1 (the default) or 2 (for thicker lines). WIDTH affects only lines drawn after the WIDTH statement is used. It doesn't change anything already on the screen.

Characters On The Hi-Res Screen

The CHAR statement can be used to puts characters onto the hi-res screen. The syntax is

CHAR *color source, X, Y, string, reverse*

The *color source* parameter takes its usual ranges of values (0–1 for standard mode or 0–3 for multicolor mode). The X parameter specifies the horizontal column (0–39 for 40-column mode or 0–79 for 80-column mode) where the text is to be positioned, and Y specifies the vertical row (0–24). The *string* parameter is the string to be printed. It can be either a literal variable (such as "HELLO") or a string variable (such as A$). However, CHAR cannot print numbers or numeric variables. When the optional *reverse* parameter is set to 1, the string is displayed in reverse mode. The following program shows different ways to use the CHAR statement:

```
10 GRAPHIC 3,1
20 COLOR 0,1:COLOR 4,1:COLOR 1,2:COLOR 2,3
30 CHAR 1,10,1,"your string"
40 CHAR 1,10,2,"your string",1
50 A$="HELLO":CHAR 1,10,4,A$
60 CHAR 1,10,5,CHR$(14)+A$,1
```

A Multicolor Advantage

To see the advantage of multicolor mode, type in this program:

```
10 GRAPHIC 1,1
20 COLOR 0,1:COLOR 4,1:COLOR 1,2
30 CIRCLE 1,50,50,50:PAINT 1,50,50
40 COLOR 1,3:CIRCLE 1,75,50,50:PAINT 1,120,50
```

This sets up a standard bitmapped screen. Run the program. You'll see how the colors bleed. Now type NEW and then enter this program:

```
10 GRAPHIC 3,1
20 COLOR 0,1:COLOR 3,1:COLOR 1,2:COLOR 2,3
30 CIRCLE 1,25,50,25,50:PAINT 1,25,50,1
40 CIRCLE 2,37,50,25,50:PAINT 2,55,50,1
```

Line 10 sets the screen to multicolor bitmapped mode and clears the screen. Line 20 sets up the colors. Line 30 draws the first circle, then fills it with PAINT. Line 40 draws the second circle and fills it in.

The X coordinates are all half what they were in the standard mode program—because there is only half the horizontal resolution (0–159).

I've included two short demo programs that illustrate each of the statements we've just reviewed. Study them carefully and you'll have a good understanding of the powerful graphics capabilities of the 128.

See program listings on page 95.

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Advertisement

BASIC for beginners

The Advantages Of GET

Larry Cotton

This month we'll discuss the BASIC statement GET. This statement is used to gather keyboard information from the user. In some ways it's similar to the INPUT command. We'll compare GET and INPUT a little further on. The GET statement can't be used in immediate mode. Try it—you'll get an ILLEGAL DIRECT ERROR. GET must be used from within a program.

Every time you press a key on your computer, a code is put in a reserved area of memory known as the *keyboard buffer*. Without a buffer, a fast typist could actually get ahead of the computer. The buffer is designed to hold up to ten keystrokes, waiting for a program or the BASIC editor to pick them off one at a time.

GET retrieves a character from the buffer and stores it in a specified variable. Remember that variables can be either *numeric* like N (numbers only) or *string* like S$ (letters and numbers). Type this:

```
100 GET S$
110 PRINT S$
```

When you type RUN to start the program, the computer sees the GET statement in line 100, which causes it to look at the keyboard buffer. Finding nothing there (the last thing you typed was RUN, which was used by the computer's BASIC interpreter), it prints a blank line and ends the program with the READY prompt and the flashing cursor. Note that GET (unlike INPUT) does *not* wait for you to hit a key.

The "nothing" that the computer finds when you don't hit a key is called an empty or *null* string—and is usually written as two quotation marks with nothing in between (" "). Taking advantage of this, we can add the following line to make the program wait for a key to be pressed:

```
105 IF S$=" " THEN 100
```

When you run the modified program, the computer gets a null string (" ") from the keyboard buffer (there's nothing in it), assigns it to S$, and moves on to the next line. Line 105 says that if S$ is a null string, go back to line 100 and try again. If you don't type anything, the computer remains in this loop indefinitely.

Type a single character (the program won't wait for you to press RETURN). That character is assigned to S$, which is printed on the screen before the program ends.

Now let's add a line to the end of the program so it will go back to the beginning automatically:

```
120 GOTO 100
```

Run this and try typing all sorts of characters. Observe the results. Numbers work just as well as letters because a string variable can be either. Press RUN/STOP to break out of the program.

GETting Numbers

What happens if you want to GET just a number? Change S$ to N in the first three lines of the previous program and run the program again. Trouble. What is this strange message—*TYPE MISMATCH ERROR*—in line 105? The problem is that N is a *numeric* variable, and the double quotes are a null *string*. Thus, there is a type mismatch (numeric vs. string) error.

We must change the " " to a 0, which is the value of all numeric variables before they're assigned values. Now line 105 says **IF N=0 THEN 100**.

Run the program again. As it loops, type a number. Works great, right? Right, as long as you type only numbers. It doesn't work if you type a zero, and it crashes if you type a letter.

Well, we're certainly getting our lesson in debugging programs. How, then, does one GET numeric variables without the risk of bringing the program to a screeching halt with a syntax error? That's a topic for a future column. You can either use INPUT for now or, if you'd like to get a head start, look up the VAL statement in your BASIC reference manual.

GETting Strings

Use NEW to get rid of the last program and type this:

```
100 PRINT "WOULD YOU LIKE TO
    PLAY AGAIN?"
110 GET A$: IF A$=" " THEN 110
200 PRINT "CONTINUATION OF
    PROGRAM"
```

Run the program, and when asked if you would like to play again, type *YES*. What happens? At first, the computer GETs only null strings and loops until you start typing. As soon as the keyboard buffer receives the code for the *Y* in *YES*, A$ becomes *Y*, and the program continues at line 200. The *E* and *S* are not used.

So far, so good. But suppose the user types *NO*. No matter what the user types, the program continues. To see what the user typed, add these lines:

```
120 IF A$="Y" THEN 200
130 END
```

Now only if the user types *Y* or *YES* or any word that begins with a *Y*, will the program's flow be diverted to line 200, where the program continues. If he or she types *N*, *NO*, or anything other than *Y*, the IF-THEN statement in line 120 fails, control passes to line 130, and the program ends.

Since GET retrieves only one character at a time from the buffer, it's a good idea to add *(Y/N)* to the end of line 100's PRINT statement to show that you don't have to type in the entire word *YES* or *NO*.

Here's a way to GET more than one character (first, type NEW get rid of the last program):

```
100 PRINT "QUICKLY TYPE THREE
    CHARACTERS"
```

```
110 FOR J=1 TO 2000: NEXT
120 GET A$, B$, C$
130 PRINT A$: PRINT B$: PRINT C$
```

If you type the three characters while the computer is in the delay loop at line 110, the character codes are stored in the keyboard buffer. Try typing more than three characters to see how the buffer works.

Line 120 shows that, by using commas, GET permits retrieving more than one character from the buffer. When the loop is finished, the three characters are printed to the screen as A$, B$, and C$. If you want to print the strings on the same screen line, change line 130 to

```
130 PRINT A$;B$;C$
```

GET (like INPUT) is often used to suspend a program's execution while, say, a program's instructions are read. Here's how that is done:

```
160 PRINT "PRESS ANY KEY TO
    BEGIN"
170 GET X$: IF X$="" THEN 170
```

Line 170 puts the computer in a loop, the only escape from which is pressing a key on the keyboard.

If you want to confine the user's response to one particular key, lines 160 and 170 could be

```
160 PRINT "PRESS B TO BEGIN"
170 GET R$: IF R$<>"B" THEN 170
```

Now, when the program gets to line 170, it goes into a loop. The only way to move on is to press B.

Sometimes, you may want to confine your responses to a few characters. This is often found in menus, which are lists of program options:

```
100 PRINT "PRESS 1 TO SEE MAIN
    STREET"
110 PRINT "PRESS 2 TO SEE ELM
    STREET"
120 PRINT "PRESS 3 TO SEE STEEPLE
    STREET"
130 GET A$
140 IF A$="1" THEN 200
150 IF A$="2" THEN 300
160 IF A$="3" THEN 400
170 GOTO 130
```

Lines 200, 300, and 400 would contain the routines which would, say, display street maps. Note that we did not include, in line 130, **IF A$="" THEN 130**. If nothing or anything but 1, 2, or 3 is pressed, line 170 sends control back to line 130 for another try.

GET Vs. INPUT

Couldn't we have used INPUT as well? Yes, except the user would have to press RETURN in addition to the selection number. Line 130 would look like this:

```
130 INPUT A$
```

So how does one know when to use INPUT and when to use GET? Here are a few guidelines to help you decide:

- INPUT includes, as we've seen, a complimentary question mark and a flashing cursor, which you may not want to display. GET doesn't include either.
- INPUT requires that the user press the RETURN key to complete the entry. GET doesn't.
- INPUT can get up to 255 characters at a time. GET retrieves only one at a time.
- INPUT is easier for the programmer. GET is easier for the user.
- INPUT ignores information after commas and colons. GET accepts both.
- INPUT allows the cursor-control and clear-screen keys to work, which can alter or erase an otherwise well laid-out screen. An advantage of the INPUT statement is that it recognizes the DELete key.

This list is not complete; there are other differences between GET and INPUT that we haven't mentioned. Suffice it to say that, when programming, you should be very careful with INPUT statements—try to replace them with GET whenever possible, since GET is much less vulnerable to user error.

GETting More Than One Character

The disadvantages of GET mentioned above can be overcome. For instance, here's a way to combine the characters the user types (NEW your last program):

```
100 PRINT "PRESS * TO END ENTRY"
110 GET A$: IF A$="" THEN 110
120 IF A$="*" THEN 150
130 B$=B$+A$
140 GOTO 110
150 PRINT B$
```

When you run this, line 110 loops until a key is pressed. When it is, line 120 checks to see if it's an asterisk. If so, control goes to line 150. If not, line 130 takes over, forming B$ by adding tacking A$ onto the end of B$. Line 140 sends control back to the GET statement in line 110.

Note that when the computer GETs a particular variable (in this case A$), it resets that variable back to a null string before looking at the keyboard buffer. Thus before you type another letter, A$ is a null string, and we're back in a loop at line 110. Now when you type, say, a *T*, A$ becomes *T*, and is added to whatever B$ is—now *I*. Thus you have formed a word—B$ becomes *IT*.

When you finally type an asterisk, A$ becomes *, and line 110 sends control to line 150, which prints out the *concatenated* string, B$. The string can consist of characters and spaces to form sentences.

We can print to the screen as we type. It's not necessary to form a concatenated string as we did above. For our last demonstration this month, NEW your last program and enter this:

```
100 PRINT "{CLR}"
110 GET U$: IF U$="" THEN 110
120 PRINT U$;
130 GOTO 110
```

This program loops until a character is typed. U$ becomes that character and is printed in line 120. Note very carefully the semicolon after U$ which causes the next character to be printed right after the previous one.

When line 130 sends control back to GET another character, U$ is reset to a null string, is set to the character of the key that is pressed, and is then printed immediately after the previous character, thus forming words and sentences. Even the RETURN key works.

GET is one of the most common and easy-to-use commands in the BASIC language. When you plan for user involvement in your programs, by all means, try the GET statement.

machine language for beginners

Tools Of The Trade

Richard Mansfield
Editorial Director

Machine language (ML) programmers use some special tools: assemblers, disassemblers, monitors, threading disassemblers, and unassemblers. An assembler is always necessary—an unassembler, rarely—but knowing what these various programs can do will help you get started with ML.

An *assembler* translates your machine language program into numbers. It's this group of numbers which the computer can run as a program when you SYS to it. But you first write a program in human-understandable commands, mixing words and numbers:

```
10 *= 880
20 LDA #147
30 JSR 65490
40 RTS
```

The program above will clear the screen when you SYS to 880, the program's starting address. The 147 is the character which clears the screen, and 65490 is the address in ROM which prints whatever character is currently in the accumulator. This program is called *source code*; you cannot simply type RUN and have the computer execute it (RUN executes BASIC programs). First the source code must be turned into executable ML *object code*. To do this you allow another program, an *assembler*, to transform the source into object code. After you run your assembler, it will POKE the following numbers into addresses 880–885:

```
169 147 32 210 255 96
```

These numbers are the executable object code which was assembled from your source code. Then, when you SYS 880, your screen will clear because the computer can directly interpret the meaning of these numbers. (The microprocessor chip has no idea at all what to do about such words as LDA, but it *does* know how to act when it comes upon the number 169.) The 169, 32, and 96 are special; they are *ML instructions* which tell the microprocessor brain at the heart of your Commodore to do precise things. It knows how to do 56 things altogether; there are thus 56 instructions available to the ML programmer.

BASIC Loaders

The instruction 169 means *Put the following number into the accumulator* (from the series of numbers making up the ML program). So, 147 goes into the accumulator and the microprocessor moves to the next instruction. The 32 means *Jump to SubRoutine* (JSR), so the control of your program is transferred to a built-in routine which prints the clear-screen command and then returns to your ML again. (The 210 255 is a two-byte address which, in ML, represents 65490.) At this point, the 96 instruction, RTS (ReTurn from Subroutine), causes the computer to leave the ML mode and return to BASIC mode. You'll see the familiar READY onscreen as the computer awaits your next BASIC instruction.

Sometimes you'll see this in a BASIC program:

```
10 DATA 169,147,32,210,255,96
```

accompanied by a loop which picks off the numbers FOR I = 880 TO 885:READ A: POKE I,A:NEXT. This is called a *BASIC loader* and is an effective way to stash an ML subroutine into an otherwise BASIC program. After these numbers are POKEd, a BASIC program can SYS 880 any time it wants to and expect that the screen will clear. (If you're a 128 user, you need to use 2816 as the starting address for short ML routines expected to work with BASIC.) You have thus combined BASIC and ML. Programmers often learn ML just to be able to place various ML subroutines within BASIC programs. Pure ML subroutines can greatly speed up BASIC's execution. This is particularly valuable when you're programming games, but it is also worth doing for such things as sorting, searching, and other tasks which can, in BASIC, use up too much of the computer's (and the user's) time.

Apple Pie Transformations

A *disassembler* is the opposite of an assembler. It translates the raw numbers back into understandable commands. In other words, it turns object code back into source code. But what good is that? After all, a cook wouldn't use some kind of anti-stove which would turn an apple pie back into raw fruit.

In practice, there are a few uses for a disassembler. When you're learning, it's sometimes instructive to take a look at a commercial program or even the BASIC inside your computer to see how expert ML programmers have solved various problems. Also, if you really get stuck, and looking at your source code simply isn't helping you to see what's going wrong, disassembly sometimes will. Source and disassembly are fundamentally the same thing, but in a slightly different form—no comments, no labels, no multiple-statement lines—just a string of instructions and their arguments.

Here's what a simple disassembly looks like:

```
880 LDA #147
882 JSR 65490
885 RTS
```

A *threading* disassembler disassembles, but in a special way: Whenever it comes upon a JMP (JuMP, like a GOTO in BASIC), branch (short jump), or a JSR, it continues disassembly at the subroutine or branch target. So, in our example, a threading disassembler would reach JSR 65490 and then begin to disassemble the code located at 65490. Essentially, it follows the program thread, the various paths the computer would follow during execution, rather than simply disassembling straight up through memory without regard to jumps and other redirections.

Nonsense Labels

An *unassembler* is another flavor of disassembler. Like the others, it provides a list of instructions and arguments (addresses or numbers), but it replaces key addresses (all targets of JSRs and branches, for example) with nonsense words. These words, made up automatically during unassembly, serve as primitive kinds of labels and can help you to make sense of someone else's program. After the unassembly, you can then use search-and-replace to change all the nonsense labels into meaningful ones. Here's what an unassembly of our example program might look like:

```
10 *= 880
20 X0001 LDA #147
30 JSR X0002
40 RTS

X0001 = 880
X0002 = 65490
```

You would know that 880 was the start of the whole program and (using a map of your computer's ROM) that 65490 was the location to PRINT a character. So, you could replace X0001 with the word START and X0002 with PRINT:

```
START LDA #147
      JSR PRINT
      RTS
```

After some fiddling around, you can construct a fairly good replica of what the original programmer's source code might have looked like.

An assembler, though, is all you really need. The various disassemblers can come in handy, but you'll likely find that you generally approach debugging by setting BRK (BReaK, like BASIC's STOP) points within your program and checking things out to see if you can locate the problem. If you have a *monitor* (a collection of debugging tools) which allows single-stepping through your code, that's a major help sometimes. Ultimately, studying your own source code is usually the most effective way of tracking down bugs. And trying to follow the twists and turns of someone else's program, even if you've got a reconstructed unassembly, isn't something you'll do for hours at a time. It's tiring and of limited value.

The best way to learn ML is to get a good book, a good assembler, and start writing your own short programs. Longer programs are short programs clustered together and forced to work in harmony with each other. After some weeks of study, you'll probably surprise yourself with how much you can accomplish in ML, and how quickly you're learning it.

Impatient INPUTs

Anthony Chandler

The INPUT statement, used regularly in games, quizzes, and application programs, has a major drawback: It will wait forever for a user response. Now you can specify any amount of response time—up to 99 seconds—with this short machine language subroutine for the 64. For use in BASIC programs; no knowledge of machine language is required.

BASIC's INPUT statement waits for a series of keypresses followed by the RETURN key. If nothing is typed, BASIC will wait forever—or until the power is turned off. Sometimes it would be helpful if we could tell the INPUT statement how long we were willing to wait for a response. This would be useful in quizzes and trivia games. It could also be handy for tutorials and product demonstrations in stores. "Impatient INPUTs" offers a solution: It lets you set a time limit for inputs.

When you use Impatient INPUTs, the number of seconds remaining for an answer appears in the top right corner of the screen. The clock makes audible ticks as it counts down. If there has been no response by the time the clock counts down to zero, an *Out of Time* message appears and a gonglike sound is heard.

Typing It In

Impatient INPUTs is a machine language (ML) program in the form of a BASIC loader. Because it creates an ML program, it must be typed in accurately. Use "The Automatic Proofreader," found elsewhere in this issue, to insure accurate entry. Be sure to save a copy to tape or disk before you run the program. This is necessary because the loader erases itself after you type RUN.

After saving a copy, enter LOAD *"filename"*,8 (for tape users, LOAD *"filename"*,1). Then type RUN.

Impatient INPUTs installs itself in memory, using only 160 bytes of BASIC memory. It remains inactive until your BASIC program uses it.

BASIC Subroutines

To use Impatient INPUTs, you should have the following three subroutines added to your BASIC program. As listed, these begin at line 5000, but they may be renumbered if they conflict with the numbering of your program.

The first routine activates the timer by performing a SYS to the Impatient INPUTs routine:

```
5000 REM ACTIVATE TIMER
5010 POKE 251,COL:POKE 252,
     VOL:POKE 253,TA
5020 SYS 1020:RETURN
```

COL is the color for the countdown timer. Choose the background color if you want the timer to be invisible. VOL is the volume of the sound of the clock's tick. Choose 0 for inaudible and 15 for loud. TA is the time allowed (in seconds). This can range from 1 second to 99 seconds. These three variables should be initialized early in your program.

The second routine deactivates the timer. It should be called after each timed INPUT statement. When it returns, two variables are set. FLG has a value of 1 if the operator pressed RETURN during the alloted time. Otherwise FLG is set to 0. TR is the time remaining. If an answer is not given in time, this value will be 0. This variable can be used for scoring, giving more points to swifter answers.

```
5100 REM TIMER OFF
5110 SYS 65418
5120 POKE 1062,32:POKE 1063
     ,32
5130 TR=1+PEEK(253)-INT(PEE
     K(253)/16)*6
5140 IF TR=100 THEN TR=0
5150 FLG=PEEK(254):RETURN
```

The third subroutine produces a gong sound. It is based on a sound from the *Commodore 64 Programmer's Reference Guide*. You can replace it with any sound effect you like. If you prefer to have no sound at all, substitute the line 5200 RETURN for this subroutine.

```
5200 S=54272:REM GONG
5210 FOR L=0TO24:POKE S+L,0
     :NEXT
5220 POKE S+1,130:POKE S+5,
     9
5230 POKE S+15,30:POKE S+24
     ,VOL
5240 POKE S+4,21
5250 FOR T=1TO300:NEXT
5260 POKE S+4,20
5270 FOR T=1TO500:NEXT
5280 FOR L=0TO24:POKE S+L,0
     :NEXT
5290 RETURN
```

Timed INPUT

Once these subroutines are in your program, it's easy to program an impatient INPUT. Remember to install the Impatient INPUTs routine by loading and running the Impatient INPUTs program before loading the BASIC program that will use timed INPUTs. Here's an example program that uses Impatient INPUTs:

```
100 POKE 53280,6:POKE 53281
    ,6:PRINT"{BLK}":PRINTCH
    R$(147);
110 COL=1:VOL=8:TA=10
200 PRINT"ANSWER IN TEN SEC
    ONDS -"
210 PRINT"WHAT MAKE IS THIS
     COMPUTER"
220 GOSUB 5000:INPUTA$:GOSU
    B 5100
230 IF FLG THEN 250
240 PRINT"SORRY! YOU RAN OU
    T OF TIME.":GOSUB 5200:
    GOTO 270
250 IF A$="COMMODORE" THEN
    {SPACE}PRINT"CORRECT! Y
    OU HAD";TR;"SECONDS LEF
    T.":GOTO 270
260 PRINT"WRONG!"
270 END
```

Before running this program, be sure to add the three subroutines listed above (lines 5000–5290).

Line 100 sets the screen colors and line 110 sets the timer variables.

Lines 200 and 210 show the prompts. In line 220, the GOSUB 5000 activates the timer. Each GOSUB 5000 must have a matching GOSUB 5100 or the timer will continue indefinitely. If you press RUN/STOP before the GOSUB 5100 is executed, the timer will keep on going. If this happens to you, type SYS 65418 to stop it.

Line 230 tests the FLG variable to see if the RETURN key was pressed in time. If it was, the program goes to line 250 to check the answer. If FLG is 0, then line 240 prints the out-of-time message and sounds the gong.

With this program, if the correct answer was typed in, but the RETURN key was not pressed, the answer is considered incorrect. If you'd rather accept this answer, you can add this line:

```
235 IF A$="COMMODORE"THEN P
    RINT"RIGHT, BUT YOU FOR
    GOT TO PRESS RETURN.":G
    OTO27Ø
```

Untimed INPUT

It's easy to mix timed INPUTs with untimed INPUTs. If you'd rather have a particular INPUT untimed, just leave out the GOSUB 5000 and the GOSUB 5100 that surround timed INPUTs.

See program listing on page 95.

computing for families

Classrooms Without Walls: School-to-School Telecommunications

Fred D'Ignazio

Computer-to-computer telecommunications is booming. Big businesses exchange financial data over the phone. Newspapers send stories and wire photos around the globe. Services like CompuServe, The Source, Delphi, and GEnie boast hundreds of thousands of subscribers. And myriads of microcomputer fans are signing onto online bulletin boards as their electronic grapevine.

Everybody is doing it. Everybody, that is, except schools. Some schools subscribe to online library and data services, but most schools are still in the telecommunications dark ages.

It's not for lack of microcomputers. Even the poorest elementary schools have at least one computer. But these computers are not plugged into their telephones. There are many reasons, cost being the biggest problem: cost for a modem, for telecommunications software, for phone line installation and monthly charges, for long-distance charges, for online service subscription fees, and so on. Another hurdle is training. Few school teachers or administrators know how to get their computers online; most are frightened by the many technical obstacles—baud rates, data bits, duplexes, and the like—which lie strewn in their path.

So most school computers stay isolated from the rest of the world. Or they sit huddled together in a single classroom talking only among themselves.

Why Bother?

Why should educators try to change this situation? What justification is there for a school going online?

The biggest reason is the obvious one: The world outside the classroom is going online. In the future, most information—pictures, sounds, print, and so on—will be exchanged electronically via computer. Schools should get their feet wet now so they can become savvy consumers of online information in the future, and so they can tap into this growing multimedia flow of information and communication.

And their first steps can be cautious and simple.

The most surprising thing is that a school can become an adept telecommunications user without subscribing to a costly online service or making a long-distance phone call. The secret is for schools to communicate, computer-to-computer, among themselves. One school computer can call another school computer on the phone. And voilà: Students and teachers have entered the world of online telecommunications.

How do you get started?

You need three things: a computer, a modem, and access to a telephone line. If you don't have a newer "modular jack" on the line, you can tap in by using an acoustic coupler instead of a modem. You make the phone call yourself, then rest the earpiece and mouthpiece of the phone in two little rubber cups in the coupler. The coupler talks to your computer. And your computer can talk over the phone.

Simple And Inexpensive

We have 13 schools in Jefferson County, Alabama, carrying on computer-to-computer conversations. In a time of severe budget cuts, there was no money to install new computer lines in the schools, so parents and local phone-company officials volunteered to come in evenings and weekends to wire extensions to existing lines using cables and parts purchased at local Radio Shack stores.

Modems and couplers are getting cheaper all the time. You can now buy a 300 or 1200-baud (the standard) unit for less than $100 at a mail-order house. Modem commands are simple, too. You type something like "ATDT" and a phone number to make a call, and when you are done, you type "ATH" or "hanging up."

I can describe how to make telecommunications simple and inexpensive. But I can barely describe the *thrill* you'll get when your students make contact with students in another school. As soon as your computer calls another computer, you can begin typing. Your words will be sent over the telephone line to the other students' computer display screen, and their words will appear on your screen. It's a wonderful experience to watch your students' expressions as the cursor comes to life and starts spelling words on the screen—not under the computer's control but under the control of another human being. Suddenly the walls of your classroom melt away and disappear, and you and your students are part of a bigger world, sharing your day with other students who are just as eager as you to communicate and get to know each other.

If you have been wanting to get online with your computer, this may be just the thing you're looking for. All I can say is: Try it. You'll love it.

A Hard Disk Drive

Todd Heimarck
Assistant Editor

We recently received a review model of Xetec's $899 Lt. Kernal hard disk drive for the Commodore 64 and 128. This Xetec drive stores up to 20 megabytes of data.

That's a lot of information. To put it in perspective, a VIC-20 with an 8K expander provides 11.5K of available RAM; a Commodore 64 normally has 38K of memory useable from BASIC; and a Commodore 128 has 119K of free memory. The 1750 RAM Expansion Module for the 128 holds 512K. A 1541 floppy disk drive gives you 664 blocks free with each block containing 254 bytes of data. A 1571 drive has double the capacity of the 1541.

Now imagine a typist who can type 50 words per minute, with an average word five characters long. That's 250 bytes per minute and, say, 48 productive minutes per hour. Our typist can generate 12,000 bytes per hour. Also, imagine a typical database record, with name, address, city, state, zip, and some other information that adds up to 250 bytes per entry.

Here's how the hardware stacks up:

Unit	Storage capacity (bytes)	Time for typist to fill memory (hours)	Number of database records
VIC (with 8K)	11,776	1	47
64	38,912	3	155
128	121,856	10	487
1541 drive	168,646	14	674
1571 drive	337,312	28	1,349
1750 RAM module	524,288	44	2,097
Xetec drive	20,971,520	1,748	83,886

If you hired our imaginary typist to work a 40-hour week, he or she could fill a VIC or a 64 before lunch the first day, a 128 or a 1541 in less than two days, or a 1571 in three and a half days. The 1750 RAM Expander would take slightly more than a week to fill. But it would take our typist *ten months* to fill up the Xetec hard drive. With a record size of 250 bytes in our imaginary database, the hard drive could store several lines of information about every person in a city of 80,000. To put it another way, if you have 200–300 single-sided 1541 disks that are roughly half-full, you could copy the contents of all those disks onto the Xetec drive.

Installing And Using It

To install the hard drive, you open up your 64 and clip a couple of wires to specific points inside. On the 128, you remove a chip, place it in a circuit board, and then plug the board into the socket formerly occupied by the chip. In either case, wires lead out to a large cartridge that occupies the expansion slot. A cable connects the cartridge to the hard drive. Since the cartridge acts as part of memory, the data transfer rate to and from the hard drive is incredibly high—roughly 50–100 times faster than it is with a standard 1541.

The serial bus remains available for floppy drives, printers, and other peripherals. The user port is available for modems, an important feature since hard drives are very popular among operators of bulletin board systems.

The cartridge that links the computer with the hard drive adds a variety of new disk commands. There are also programming utilities for doing things like renumbering programs. Some commands and utilities are built into the cartridge, while others are stored on the Lt. Kernal drive.The operating system also has provisions for a new kind of random-access relative file, with files holding a maximum of 65,535 records—each of which can hold up to 3072 bytes.

Forethought and planning are required to use 20 megabytes of storage effectively. A programming mistake that affects millions of bytes could be potentially disastrous. For example, let's say you have 50 disks, full of programs, and you copy them to the hard drive. If you don't plan ahead, you'll end up with a huge disk directory, one with perhaps thousands of filenames.

To avoid this situation, you can take advantage of the drive's 11 logical units (numbered 0–10), which act as separate disk drives. Each logical unit can be subdivided into 16 user areas (0–15), which gives you a total of 176 independent directories with which to work. You could segregate files and programs, putting games in one area, word processing files in another, and so on.

Is a hard disk drive worth the investment? Casual users might not need all that memory. But for serious programmers and software developers, 20 megabytes of storage space opens up a lot of possibilities.

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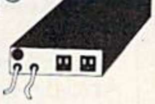

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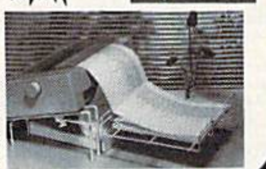

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Flight Simulation Scenery

SubLOGIC has released another in a series of scenery disks for use with either *Flight Simulator II* or *Jet* on the Commodore 64 and 128. *Scenery Disk #7* covers the East Coast of the U.S. from Washington, D.C., through Key West, Florida, and features miles of coastline, rivers, roads, railroads, and racetracks, plus transmitter towers with blinking lights and elevated bridges that cast shadows. There are detailed areas for sightseeing such as Tampa, Miami, Washington, D.C.—including the Washington Monument, the White House, the Capitol Buidling, and the Pentagon—and a space shuttle on the pad at Cape Canaveral.

Scenery Disk #7 offers over 130 airports, including a dozen military airports. Seven airports support ATIS and 22 have refueling facilities.

Either *Flight Simulator II* or *Jet* is required to use *Scenery Disk #7.*

The suggested retail price is $19.95.

SubLOGIC Corporation, 713 Edgebrook Dr., Champaign, IL 61820

Circle Reader Service Number 193.

1571 Disk Drive Utilities

A new software package from Free Spirit Software offers a wide variety of utilities for the 1571 drive. *Super Disk Utilities* has two-drive and single-drive backup systems, a file copier for one or two drives, a CP/M Plus disk backup system, a disk editor that traces files and edits in hex or ASCII simultaneously, direct DOS commands, and other features. The utilities include file unscratch, autoboot, lock and unlock files, write-protect, analyze disk format, track or bulk erase, and rename disk or file. You can also format disks in 1541, 1571, or IBM System 34 format.

Super Disk Utilities is for the Commodore 128 with a 1571 disk drive and costs $39.95.

Free Spirit Software, 538 S. Edgewood, LaGrange, IL 60525

Circle Reader Service Number 194.

64 Games, Accounting

Nationwide Computer Industries has introduced three new programs for the Commodore 64. *Time Traveler* creates a printout of the major happenings each year back to the year 1900, including cost of an average house, average annual income, prices, presidents, and sports. You can print a calendar for the month in which you were born or discover what was going on at any time.

Retail price for *Time Traveler* is $39.95. You can get a sample printout with your name and information accurate for the day you were born by sending your name, date of birth, $3.00, and a self-addressed, stamped envelope.

In *Lie Detector,* you and up to seven other players must interrogate 24 suspects to discover who committed a murder, as well as where, why, and how it was done. The detectives compete against each other using the lie detector to help find the guilty person. You pick a suspect, take his or her statement, and then guess what part of the statement is true. The lie detector reveals who is lying. You proceed until one of the detectives solves the case. There are over 6,000 scenarios in the game.

Lie Detector retails for $15.00.

Business Accounting is an integrated accounting program for the Commodore 64 that includes an inventory system, accounts receivable, a point-of-sale invoicing system, and general ledger. It allows cash disbursement, cash receipts, and general journal entries. The program also creates monthly, quarterly, and year-to-date statements.

A cartridge that speeds up the program and loads and saves other programs more quickly is included.

The retail price for *Business Accounting* is $99.95.

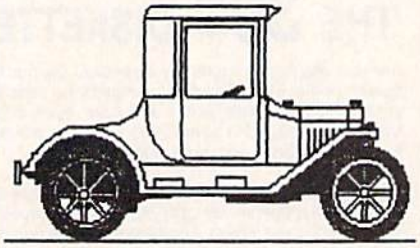
Nationwide Computer Industries, 205 McCormick Ave., Hawkinsville, GA 31036

Circle Reader Service Number 195.

GEOS Graphics

Users of the *GEOS* operating system and application products for the 64 and 128 from Berkeley Softworks can now buy ready-to-use graphic images that can be copied directly into *geoPaint* and *geoWrite* documents without conversion.

Diskart1, Diskart2, and *Diskart3* are collections of images from Those Designers, each selling for $8.50 per disk. *Diskart1* is an assortment of Graphic Goodies, Holidays, Weather Stuff, and *geoPaint* tips. *Diskart2* is an assortment of more Graphic Goodies and Holidays, as well as Musical Stuff, U.S. Map, Workdisk Labels, and more *geoPaint* tips. *Diskart3* is a collection of cars and airplanes. An instruction sheet is included with each disk.



A sample graphic from one of the Diskart *disks for use with* GEOS *on the 64 and 128.*

Those Designers, 3330 Lewis Ave., Signal Hill, CA 90807

Circle Reader Service Number 196.

Arcade Games

Pitfall! and *Demon Attack,* two classic arcade games, are now available for the Commodore 64 and 128 and the Atari 800 XE/XL on one flippy disk. In *Pitfall!* you guide explorer Pitfall Harry through a jungle maze in search of treasures. Along the way you encounter quicksand, a bottomless pit, crocodiles, fire, and a killer scorpion.

Demon Attack involves intergalactic war, and you must defend yourself against space invaders. Your main defense against the rapidly multiplying enemy is your laser cannon.

Both games are available on one disk, with the Atari version on one side of the floppy disk and the Commodore version on the other.

Retail price is $14.95.

Activision, 2350 Bayshore Frontage Rd., Mountain View, CA 94043

Circle Reader Service Number 197.

Graphics Aids

Inkwell Systems has released a collection of clip art for use with the *Flexidraw* and *Doodle* high-resolution drawing programs. *The Graphics Galleria* consists of different volumes of clip art and illustrations, with each volume concentrating on one particular theme, such as

borders and signs, clip-art potpourri, holiday themes, or maps of the world. The *Flexidraw* format is on one side of the disk, and the *Doodle* format is on the other. If you have other graphics programs, you may want to purchase the *Graphics Integrator 2* program to use *Graphics Galleria* with your program.

Each volume of *The Graphics Galleria* retails for $24.95.

Graphics Integrator 2 is a package that converts graphics program formats, adds pictures to word processing, creates picture slide shows with multiple effects, and prints pictures for both black-and-white and color printers. *Integrator 2* converts picture formats among the following graphics packages: *GEOS, Doodle, Print Shop, Print Master, Koala, CADPAK 64, Billboard Maker, Newsroom, ComputerEyes, Super Sketch, Animation Station, Blazing Paddles,* and *Flexidraw. Graphics Integrator 2* offers screen menus and an instruction manual. It can be used with *PaperClip* to insert pictures into the document or with slide show presentations for multiple effects like sparkle, shutter, and door.

Graphics Integrator 2 retails for $29.95.

Both *The Graphics Galleria* and *Graphics Integrator 2* are available for the Commodore 64 and 128. *Flexidraw* is a product of Inkwell Systems.

Inkwell Systems, P.O. Box 85152 MB290, 5710 Ruffin Rd., San Diego, CA 92138

Circle Reader Service Number 198.

Power From Avantage

Accolade has released *Power*, an arcade-style galactic war game for the Commodore 64. As a part of Accolade's Avantage midpriced software line, *Power* has a suggested retail price of $14.95.

The player is pitted against the Demoid Empire, with a goal to save Earth from terrorist attack. The action includes infiltrating an occupied asteroid and disabling a converter before it can be destroyed by the Demoids. Using joystick-controlled missiles and light phasers, the player defends and attacks simultaneously. There are seven levels of play and five skill levels.

Accolade, 20813 Stevens Creek Blvd., Cupertino, CA 95014

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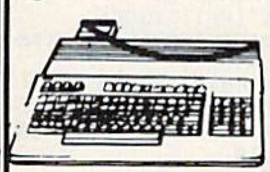

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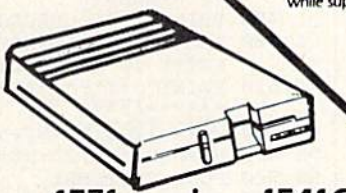

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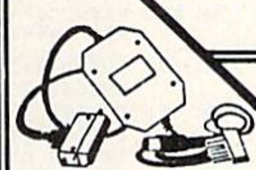

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BEFORE TYPING . . .

Before typing in programs, please refer to "How To Type In COMPUTE!'s GAZETTE Programs," which appears before the Program Listings.

Directory Filer Plus

Article on page 64.

```
RR 10 N$="ZZ":POKE53281,0:POKE
      53280,0:NR=214:NC=211:KB
      =198:POKE808,225
KF 15 GOSUB2000
CA 20 GOTO470
EB 30 POKENR,1:PRINT:PRINT"
      {CYN}ARE YOU SURE? (Y/N)
      "
PJ 40 POKEKB,0
RX 50 GETK$:IFK$=""THEN50
XH 60 POKEKB,0:RETURN
MF 70 GOSUB100:POKENR,1:PRINT:
      PRINT"{CYN}*** WORKING *
      ***{4 SPACES}":RETURN
SD 80 POKENR,1:PRINT"{CYN}":PR
      INTMID$(M$,4,16):RETURN
GB 90 M$="":POKENR,1:PRINT:PRI
      NT"{30 SPACES}":GOSUB120
      :RETURN
AS 100 POKENR,RL+2:PRINT:PRINT
       TAB(CL*20);"{YEL}"MID$(
       N$(RL+(I+1)*CL+D-1),4,1
       6)
GQ 110 RETURN
XR 120 POKENR,R+2:PRINT:PRINTT
       AB(C*20);"{CYN}{RVS}";M
       ID$(N$(R+(I+1)*C+D-1),4
       ,16)
SS 130 RETURN
EP 140 PRINT"{CLR}{YEL}"HE$;
MP 150 IFD>1THENPOKENC,21:PRIN
       T" P = PRIOR SCREEN "
EC 160 IFD=<N-40THENPOKENC,21:
       PRINT" N = NEXT SCREEN
       {2 SPACES}"
XG 170 I=INT((N-D-1)/2+.5):IFI
       >19THENI=19
RC 180 GOSUB80:POKENR,3:PRINT"
       {YEL}"
DC 190 FORX=DTOD+I
HS 200 PRINTMID$(N$(X),4,16)",
       ";
GX 210 PRINTT$(ASC(N$(X))ANDNO
       T248);
QE 220 IF(ASC(N$(X))AND64)=64T
       HENPRINT"<";
KP 230 IFASC(N$(X+I+1)+CHR$(0)
       )=0THEN280
MA 240 PRINTTAB(20);MID$(N$(X+
       I+1),4,16)",";
GB 250 PRINTT$(ASC(N$(X+I+1))A
       NDNOT248);
KD 260 IF(ASC(N$(X+I+1))AND64)
       =64THENPRINT"<";
PK 270 PRINT
SQ 280 NEXT:IFR>I+1THENR=I+1
MK 285 IFR<1THENR=1
BR 290 GOSUB120:RETURN
AC 300 GOSUB40:CL=C:RL=R
GS 310 IFK$=CHR$(13)ORK$="{F1}
       "ORK$="-"ORK$=","ORK$="
        "ORK$="{STOP}"THENRETU
       RN
HF 313 IFK$="R"THENRETURN
RH 315 IFK$="{F7}"THENRETURN
KG 317 IFK$="{F3}"THENRETURN
DB 320 IFK$="{HOME}"THENR=1:C=
       0
QD 330 IFK$="{RIGHT}"ORK$="
       {LEFT}"THENC=NOTCAND1
SD 340 IFK$="{DOWN}"ORK$="{UP}
       "THENR=(R+1+2*(K$>"
       {DOWN}"))
PK 350 IFC>N-1THENR=1:C=0
FC 360 IFR>I+1THENR=1
AH 370 IFR<1THENR=I+1
AG 380 IFN$(R+(I+1)*C+D-1)=""T
       HEN330
FA 390 IF(CL<>C)OR(RL<>R)THENG
       OSUB100:GOSUB120
BJ 400 IFK$="P"ANDD>1THEND=D-4
       0:GOSUB140
KH 410 IFK$="N"ANDD=<N-40THEND
       =D+40:GOSUB140
CP 420 GOTO300
ME 430 POKENR,7:PRINT:PRINT"
       {RIGHT}{3 SPACES}{YEL}A
       RE YOU SURE? (Y/N)
       {4 SPACES}{RIGHT}"
DR 440 GOSUB40:IFK$="Y"THEN144
       0
EQ 450 IFK$="{STOP}"THEN440
KD 460 RETURN
JD 470 PRINT"{CLR}{DOWN}{CYN}U
       ***********************
       ***I
GQ 480 PRINT"B{5 SPACES}{YEL}D
       IRECTORY FILER{CYN}
       {6 SPACES}B"
QC 490 PRINT"B{26 SPACES}B"
CS 500 PRINT"B {YEL}INSERT DIS
       KETTE IN DRIVE{CYN} B"
KR 510 PRINT"J****************
       ************K
CX 520 FORX=1TO6:N$=N$+N$:NEXT
DK 530 N$=MID$(N$,2):N$=N$+N$
MK 540 FORX=828TO861
FM 550 READY:POKEX,Y:NEXT
RA 560 FORX=1TO30:Z$=Z$+CHR$(0
       ):NEXT
XQ 570 DIMN$(144),S(18),T$(4):
       D=1:N=0:F=0:B=1:R=1:C=0
BQ 575 DIMB%(144)
KQ 580 FORX=0TO17:READY:S(X)=Y
       :NEXT
HH 590 T$(1)="S":T$(2)="P":T$(
       3)="U":T$(4)="R"
ES 600 LN$=CHR$(130)+CHR$(18)+
       CHR$(18)+"-------------
       ---"+LEFT$(Z$,11)
PP 610 PRINT"{DOWN}U**********
       *********************I"
DB 620 PRINT"B {YEL}PRESS
       {RVS}RETURN{OFF} TO CON
       TINUE{CYN} B"
XM 630 PRINT"J****************
       ************K"
GK 640 GOSUB40:IFK$="{STOP}"TH
       ENGOSUB430
PP 650 POKENR,7:PRINT:PRINT"
       {RIGHT}{4 SPACES}{YEL}R
       EADING DISK NAME
       {5 SPACES}{RIGHT}"
XH 660 OPEN15,8,15,"I0":OPEN1,
       8,3,"$"
CP 670 SYS828:INPUT#15,EN$,EM$
       :IFEN$="00"THEN710
KK 680 POKENR,7:PRINT
AC 690 PRINT"{RIGHT}{3 SPACES}
       {YEL}DISK READ ERROR #
       {SPACE}"EN$"{2 SPACES}
       {RIGHT}"
SS 700 PRINT:GOTO1480
JE 710 HE$=MID$(N$,143,16)+","
       +MID$(N$,161,2)
RM 720 POKENR,3:PRINT:PRINT"
       {RIGHT}{3 SPACES}"HE$"
       {4 SPACES}{RIGHT}"
QB 730 POKENR,7:PRINT:PRINT"
       {RIGHT}{4 SPACES}READIN
       G ENTRY #"N"{2 SPACES}
       {2 RIGHT}"
JP 740 SYS828:FORX=1TO254STEP3
       2:Y=ASC(MID$(N$,X,1))AN
       D127
CQ 750 IFY=0THEN770
BA 760 N=N+1:N$(N)=MID$(N$,X,3
       0)
BH 770 POKENR,7:PRINT:POKENC,2
       0:PRINTN
PD 780 NEXT
RB 790 IFST=0THEN730
AK 800 PRINT"{UP}{RIGHT}
       {4 SPACES}TOTAL ENTRIES
       ={8 RIGHT}"
QX 810 FORX=1TO1500:NEXT
GS 820 CLOSE1
EB 825 IFN=0THENPRINT"{CLR}":G
       OTO1410
CD 830 M$="":GOSUB140
PC 840 GOSUB300:F=R+(I+1)*C+D-
       1
FK 850 IFK$="-"THEN990
CG 860 IFK$=" "ANDN>1THEN1040
EF 870 IFK$=","THEN1120
FB 875 IFK$="R"THEN1600
FE 880 IFK$="{STOP}"THEN1190
XB 890 IFK$="{F1}"THEN1230
MF 895 IFK$="{F3}"THEN1700
JD 897 IFK$="{F7}"THENGOSUB200
       0:GOSUB140:GOTO840
BR 900 M$=N$(F):GOSUB80
DC 910 GOSUB300:T=R+(I+1)*C+D-
       1
XJ 920 IFF=T-1ORF=TTHENGOSUB90
       :GOTO840
RJ 930 GOSUB70
JD 940 IFF>TTHENV=-1
DP 950 IFF<TTHENV=1:T=T-1
SQ 960 N$(F)=N$(F+V):F=F+V:IFF
       <>TTHEN960
GD 970 N$(T)=M$
BF 980 GOTO830
XS 990 IFN<144THEN997
BE 995 POKENR,1:PRINT:PRINT"
       {CYN}TOO MANY FILES":FO
       RX=1TO2000:NEXT:GOSUB90
       :GOTO840
CF 997 GOSUB70:B=0
KR 1000 N=N+1:FORX=NTOF+1STEP
        1
SK 1010 N$(X)=N$(X-1):NEXT
EA 1020 N$(F)=LN$
ES 1030 GOTO830
KJ 1040 GOSUB30:IFK$<>"Y"THENG
        OSUB90:GOTO840
ER 1050 GOSUB70:B=0
JB 1060 N=N-1:FORX=FTON
RE 1070 N$(X)=N$(X+1):NEXT
SM 1080 N$(N+1)=""
RC 1090 IFN<C+1THENC=0
FF 1100 IFF=N+1THENR=R+(R>1)
GA 1105 IFD>NTHEND=D-40
HF 1110 GOTO830
CA 1120 A=ASC(N$(F))
KX 1130 IFA=130THENA=194:GOTO1
        150
QG 1140 IFA=194THENA=130
DQ 1150 N$(F)=CHR$(A)+RIGHT$(N
        $(F),29)
RX 1160 POKENR,RL+2:PRINT:PRIN
        TTAB(CL*20+18);
JX 1170 PRINT"{YEL}"CHR$(-60*(
        A=194));CHR$(-32*(A=13
        0))
QP 1180 GOTO840
RE 1190 GOSUB100
JM 1200 GOSUB30:IFK$="Y"THEN14
        10
```

```
HH 1210 IFK$="{STOP}"THEN1200
CR 1220 GOSUB90:GOTO840
KR 1230 GOSUB100:GOSUB30:IFK$<
        >"Y"THENGOSUB90:GOTO84
        0
CK 1240 POKENR,1:PRINT:PRINT"
        {CYN}WRITING DIRECTORY
        {2 SPACES}"
RK 1250 IFN/8=INT(N/8)THEN1270
CP 1260 N=N+1:N$(N)=Z$:GOTO125
        0
QS 1270 S=0:T=18:S(N/8+.5)=255
        :N=1:OPEN2,8,2,"#"
JJ 1280 IFS(S+1)=255THENT=0
DM 1290 PRINT#15,"B-P";2;0
SH 1300 PRINT#2,CHR$(T);CHR$(S
        (S+1));:P=2
BJ 1310 FORX=NTON+7:PRINT#15,"
        B-P";2;P
RG 1320 PRINT#2,N$(X);:P=P+32:
        NEXT:N=X
HR 1330 PRINT#15,"U2";2;0;18;S
        (S):INPUT#15,EN$,EM$:I
        FEN$="00"THEN1370
CJ 1340 POKENR,1:PRINT
XD 1350 PRINT"{CYN} DISK WRITE
        ERROR # "EN$
ED 1360 FORT=1TO2000:NEXT:GOTO
        1440
OA 1370 S=S+1:IFS(S)<>255GOTO1
        280
FQ 1380 IFBTHEN1410
QD 1390 PRINT#2,CHR$(0);CHR$(2
        55);Z$:PRINT#15,"U2";2
        ;0;18;18
DF 1400 POKENR,1:PRINT:PRINT"
        {CYN}VALIDATING BAM
        {4 SPACES}":PRINT#15,"
        V0"
PD 1410 CLOSE2:PRINT#15,"I0":C
        LOSE15
SA 1420 POKENR,1:PRINT:PRINT"
        {CYN}ANOTHER DISK? (Y/
        N)"
BE 1430 GOSUB40:IFK$="Y"THENRU
        N
DE 1440 PRINT"{CLR}":POKENR,7:
        PRINT
QS 1450 PRINT"{CYN}U**********
        ****************I"
FD 1460 PRINT"B{4 SPACES}{YEL}
        PROGRAM TERMINATED
        {4 SPACES}{CYN}B"
AP 1470 PRINT"J***************
        ***********K"
DJ 1480 CLOSE1:CLOSE2:CLOSE15
JD 1490 SYS65418
EX 1495 END
CP 1500 DATA 160,2,177,45,153,
        137,0,200,192,6,208,24
        6,162
SQ 1510 DATA 1,32,198,255,32,2
        28,255,164,142,145,140
        ,200
KH 1520 DATA 132,142,196,139,2
        08,242,76,204,255
HG 1530 DATA 1,4,7,10,13,16,2,
        5,8,11,14,17,3,6,9,12,
        15,18
BQ 1600 NN$="":POKENR,1:PRINT:
        INPUT"{CYN}NEW NAME ";
        NN$:GOSUB90:IFNN$=""TH
        EN830
AP 1610 NN$=LEFT$(NN$,16):GOSU
        B70
GK 1620 IFLEN(NN$)<16 THEN NN$
        =NN$+CHR$(160):GOTO162
        0
RX 1630 DU=0:FORX=1TON:IFNN$=M
        ID$(N$(X),4,16)THENDU=
        1:X=N
SF 1640 NEXT:IFDU=0THEN1670
EJ 1650 POKENR,1:PRINT:PRINT"
        {CYN}DUPLICATE NAME "N
        N$:FORX=1TO2000:NEXT:G
        OTO830
QK 1670 M$=N$(F):N$(F)=LEFT$(M
        $,3)+NN$+RIGHT$(M$,LEN
        (M$)-19):GOTO830
JP 1700 POKENR,1:PRINT:PRINT"
        {CYN}TURN PRINTER ON -
        PRESS RETURN"
DF 1710 GOSUB40:IFK$="{STOP}"T
        HENGOSUB90:GOTO840
HF 1715 IFK$<>CHR$(13)THEN1710
RF 1720 GOSUB90:OPEN4,4:IFST<>
        0THEN1700
AH 1730 POKENR,1:PRINT:PRINT"
        {CYN}LINE UP PAPER AND
        PRESS RETURN"
RM 1740 GOSUB40:IFK$="{STOP}"T
        HEN1790
FC 1745 IFK$<>CHR$(13)THEN1740
DE 1750 GOSUB90:GOSUB70:B%(0)=
        664:FORX=1TON
JJ 1752 B%(X)=ASC(MID$(N$(X),3
        0,1))*256+ASC(MID$(N$(
        X),29,1)):B%(0)=B%(0)-
        B%(X)
MB 1754 NEXT:PRINT#4,CHR$(15);
        CHR$(145);HE$;" ";N;"F
        ILES";B%(0);"FREE":PRI
        NT#4
PD 1760 FORX=1TO30:X$="":FORY=
        1TO4
JC 1765 W=(Y-1)*30+X:IFW>NTHEN
        1780
DJ 1767 W$=STR$(B%(W)):W$=RIGH
        T$(W$,LEN(W$)-1)
CP 1769 IFLEN(W$)<4THENW$=W$+"
        ":GOTO1769
HP 1770 X$=X$+W$+MID$(N$(W),4,
        16)
ME 1780 NEXTY:PRINT#4,X$:NEXTX
        :PRINT#4
DP 1790 CLOSE4:GOSUB90:GOTO840
GP 2000 PRINT"{CLR}{CYN}";
SG 2010 PRINT" U**************
        **********************
        I"
PF 2020 PRINT" B{6 SPACES}
        {YEL}DIRECTORY FILER C
        OMMANDS{CYN}{6 SPACES}
        B":GOSUB4010
SX 2040 PRINT" B{3 SPACES}
        {YEL}N{5 SPACES}NEXT S
        CREEN OF FILES{CYN}
        {7 SPACES}B"
CD 2050 PRINT" B{3 SPACES}
        {YEL}P{5 SPACES}PREVIO
        US SCREEN OF FILES
        {CYN}{3 SPACES}B":GOSU
        B4010
BE 2060 PRINT" B{3 SPACES}
        {YEL}-{5 SPACES}INSERT
        DIVIDER ABOVE FILE
        {CYN}{2 SPACES}B"
FD 2070 PRINT" B{3 SPACES}
        {YEL}R{5 SPACES}RENAME
        THIS FILE{CYN}
        {11 SPACES}B"
HE 2075 PRINT" B{3 SPACES}
        {YEL},{5 SPACES}LOCK/U
        NLOCK THIS FILE{CYN}
        {6 SPACES}B":GOSUB4010
MG 2080 PRINT" B {YEL}<CRSR>
        {2 SPACES}MOVE CURSOR
        {CYN}{16 SPACES}B"
FS 2090 PRINT" B {YEL}<HOME>
        {2 SPACES}MOVE CURSOR
        {SPACE}TO TOP{CYN}
        {9 SPACES}B"
SG 3000 PRINT" B {YEL}<STOP>
        {2 SPACES}ABORT CURREN
        T DIRECTORY{CYN}
        {4 SPACES}B":GOSUB4010
DE 3020 PRINT" B {YEL}<RETN>
        {2 SPACES}MOVE FILE/BE
        FORE THIS FILE{CYN} B"
        :GOSUB4010
RJ 3030 PRINT" B {YEL}<SPACE>
        {SPACE}DELETE THIS FIL
        E{CYN}{11 SPACES}B":GO
        SUB4010
QX 3035 PRINT" B {YEL}<F1>
        {4 SPACES}REWRITE THE
        {SPACE}DIRECTORY{CYN}
        {6 SPACES}B"
KA 3040 PRINT" B {YEL}<F3>
        {4 SPACES}PRINT FORMAT
        TED DIRECTORY{CYN}
        {2 SPACES}B"
MD 3043 PRINT" B {YEL}{RVS}<F7
        >{4 SPACES}DISPLAY THI
        S HELP SCREEN
        {2 SPACES}{OFF}{CYN} B
        ":GOSUB4010
SX 3045 PRINT" B{7 SPACES}
        {YEL}PRESS {RVS}RETURN
        {OFF} TO CONTINUE{CYN}
        {5 SPACES}B"
XG 3050 PRINT" J**************
        **********************
        K"
SM 3090 GOSUB40:IFK$<>CHR$(13)
        THEN3090
BJ 4000 RETURN
FE 4010 PRINT" B{36 SPACES}B":
        RETURN
```

Fraction Practice

Article on page 40.

```
PE 10 BA=53281:BO=53280:REM ON
       THE PLUS 4/16, USE BA=6
       5301:BO=65305
MA 20 X=RND(-TI):DEFFNC(X1)=IN
       T(10*RND(1))+1
HQ 30 POKEBA,1:POKEBO,0:PRINTC
       HR$(142)
HQ 40 PRINT"{CLR}{2 DOWN}{BLU}
       {6 SPACES}WELCOME TO
       {RVS}FRACTION PRACTICE
       {OFF}."
AQ 50 PRINT"{2 DOWN}{4 SPACES}
       DO YOU NEED INSTRUCTIONS
       (Y/N)";:INPUTI$
MX 60 POKEBA,0:POKEBO,1
DG 70 PRINT"{CLR}{DOWN}TO ADD
       {SPACE}OR SUBTRACT FRACT
       IONS, YOU MUST
JF 80 PRINT"{DOWN}FIRST GIVE A
       COMMON DENOMINATOR (UNL
       ESS
JC 90 PRINT"{DOWN}THE TWO DENO
       MINATORS ARE ALREADY THE
PK 100 PRINT"{DOWN}SAME). THE
       {SPACE}COMMON DENOMINAT
       OR MUST BE
CH 110 PRINT"{DOWN}NO LARGER T
       HAN THE TWO DENOMINATOR
       S
GA 120 PRINT"{DOWN}MULTIPLIED
       {SPACE}TOGETHER. THEN G
       IVE EACH NEW
RX 130 PRINT"{DOWN}NUMERATOR A
       ND FINALLY, GIVE THE AN
       SWER."
HC 140 PRINT"{DOWN}YOU MAY THE
       N BE ASKED TO SIMPLIFY
       {SPACE}YOUR
QP 150 PRINT"{DOWN}ANSWER.
```

```
FH 160 PRINTTAB(12)"{DOWN}PRES
       S ANY KEY...
AQ 170 GET Q$:IF Q$=""THEN170
SG 180 PRINT"{CLR}{3 DOWN}
       {RIGHT}IF YOU NEED TO
       {RVS}E{OFF}SCAPE BACK T
       O THE"
RG 190 PRINT"{DOWN}{RIGHT}STAR
       T OF ANY PROBLEM,";
CM 200 PRINT" JUST ENTER {RVS}
       E:{OFF}"
JK 210 PRINT"{DOWN}{RIGHT}REME
       MBER... TO {RVS}E{OFF}S
       CAPE, ENTER {RVS}E:
       {OFF}."
PH 220 PRINT"{2 DOWN}{RIGHT}WH
       ICH OPERATION WOULD YOU
        CARE TO TRY?
QK 230 PRINT"{2 DOWN}
       {12 SPACES}1 = ADDITION
       , OR
FQ 240 PRINT"{DOWN}{12 SPACES}
       2 = SUBTRACTION ";
GS 250 INPUTM:IF M<1 OR M>2 TH
       EN180
FF 260 PRINT"{CLR}":POKEBA,4:P
       OKEBO,7+5*16:P=0
HH 270 X=FNC(X1):Y=FNC(X1):IFX
       >=YTHEN270
KR 280 A=FNC(X1):B=FNC(X1):IFA
       >=BTHEN280
MS 290 IF M=2 AND X/Y<=A/B THE
       N270
SA 300 P=P+1:IF P>20 THEN940
RQ 310 PRINT"{CLR}{YEL}THIS IS
        PROBLEM NUMBER"P"
       {LEFT}.{DOWN}":PRINT"
       {2 SPACES}"XTAB(10)A
MK 320 P$="+":IFM=2THENP$="-"
AB 330 PRINT"{3 SPACES}CC
       {2 SPACES}"P$"
       {3 SPACES}CC{3 SPACES}=
       ":PRINT"{2 SPACES}"YTAB
       (10)B
AS 340 PRINT"{DOWN}THE COMMON
       {SPACE}DENOMINATOR IS "
       ;
SQ 350 IF Y=B THEN PRINTY:T=Y:
       GOTO470
HA 360 INPUT T
HH 370 IF T=E THEN310
HQ 380 IF T=0 THEN PRINT"THE D
       ENOMINATOR CAN'T BE ZER
       O.{3 UP}":GOTO340
XR 390 IF T>B*Y THEN PRINT"PLE
       ASE FIND A SMALLER ONE.
       {5 SPACES}":GOTO340
JK 400 FOR D=1 TO B*Y
AH 410 IF (B*Y)/D=INT((B*Y)/D)
        AND INT((B*Y)/D) THEN4
       40
CR 420 NEXT D
KA 430 GOTO460
AE 440 IF T/B=INT(T/B) AND T/Y
       =INT(T/Y)THEN470
GX 450 NEXT D
GG 460 PRINT"SORRY, THAT NUMBE
       R WON'T WORK...{3 UP}":
       GOTO340
MP 470 PRINT"{2 DOWN}
       {3 SPACES}CC{2 SPACES}"
       P$"{3 SPACES}CC
       {3 SPACES}=":PRINTTAB(2
       )TTAB(10)T
RG 480 PRINT"{DOWN}THE FIRST N
       UMERATOR IS...{4 UP}
       {24 LEFT}";
DG 490 INPUT S1
HF 500 IF S1=E THEN310
KE 510 PRINT"{UP}{2 SPACES}"S1
SP 520 IF S1<>T/Y*X THEN PRINT
       "{4 DOWN}SORRY, TRY
       {2 SPACES}AGAIN...
       {3 UP}":GOTO480
KR 530 PRINT"{4 DOWN}THE SECON
       D NUMERATOR IS...{5 UP}
       {17 LEFT}";
EP 540 INPUT S2
EK 550 IF S2=E THEN310
XP 560 PRINTTAB(8)"{UP}
       {2 SPACES}"S2
MM 570 IF S2<>T/B*A THEN PRINT
       "{5 DOWN}SORRY, TRY AGA
       IN...{6 UP}" :GOTO530
BD 580 PRINT"{7 DOWN}YOUR ANSW
       ER IS...{3 SPACES}CC";:
       PRINT"{UP}{4 LEFT}";:IN
       PUTS3
RQ 590 IF S3=E THEN310
AB 600 PRINTTAB(18)"{UP} "S3
KG 610 PRINT"{DOWN}"TAB(18);:I
       NPUT T1:PRINTTAB(18)"
       {UP} "T1
ER 620 IF T1=E THEN310
HM 630 IF(M<>1 OR S3=S1+S2)AND
        (M<>2 OR S3=S1-S2)THEN
       650
FR 640 PRINT"{DOWN}WRONG NUMER
       ATOR...{11 UP}":GOTO580
RP 650 IF T1<>T THEN PRINT"
       {DOWN}WRONG DENOMINATOR
       {11 UP}":GOTO580
SD 660 IF S3<T1 THEN790
MQ 670 PRINT"{DOWN}PLEASE CHAN
       GE TO A MIXED NUMBER
       {3 UP}{9 LEFT} = ";:INP
       UTM1
BD 680 IF M1=E THEN310
EG 690 IF M1<>1THENPRINT"
       {2 DOWN}TRY AGAIN...
       {22 SPACES}{2 UP}":GOTO
       670
GS 700 PRINTTAB(27)"{2 UP}
       {LEFT}N{H}{DOWN}
       {3 LEFT}{2 SPACES}{H}
       {DOWN}{2 LEFT}{P}L
       {2 UP}";:IFS3=T1THENPRI
       NT"{2 DOWN}":GOTO910
SG 710 INPUTS5:IF S5=E THEN310
XH 720 PRINT"{UP}"TAB(28)" "S5
EJ 730 IF S5<>S3-T1 THENPRINT"
       {3 DOWN}TRY AGAIN...
       {22 SPACES}{3 UP}":GOTO
       700
FC 740 PRINTTAB(30)"CC{DOWN}
       {4 LEFT}";:INPUTT5
JP 750 IF T5=E THEN310
FQ 760 PRINT"{UP}"TAB(28)" "T5
JH 770 IF T5<>T1 THEN PRINT"
       {DOWN}TRY AGAIN...
       {16 SPACES}{3 UP}
       {4 LEFT}"TAB(26);:GOTO7
       40
CS 780 S3=S5
XJ 790 FOR G=(B*Y)TO 2 STEP -1
AJ 800 IF S3/G=INT(S3/G) AND T
       1/G=INT(T1/G) THEN820
JP 810 NEXT G:GOTO 910
JJ 820 PRINT"{DOWN}PLEASE SIMP
       LIFY...{16 SPACES}
       {3 UP}{11 LEFT}=
       {3 RIGHT}{UP}";
AP 830 PRINTTAB(28);:INPUT S4:
       PRINT"{UP}"TAB(28)" "S4
       "{2 SPACES}":PRINTTAB(3
       0)"CC"
QQ 840 IF S4=E THEN310
DG 850 PRINTTAB(28):INPUT T2
QR 860 IF T2=E THEN310
BX 870 PRINT"{UP}"TAB(28)" "T2
FM 880 IF S4=S3/G AND T2=T1/G
       {SPACE}THEN GOTO910
DK 890 PRINT"{DOWN}INCORRECT..
       .PLEASE SIMPLIFY AGAIN
       {SPACE}{4 UP}{8 LEFT}";
       :GOTO830
QJ 900 PRINT"INCORRECT...
       {5 SPACES}":GOTO830
ES 910 PRINT"{3 DOWN}{RVS}WELL
        DONE!{OFF}"
JB 920 GOSUB990
JS 930 GOTO270
CM 940 PRINT"{3 DOWN}DO YOU WI
       SH ANOTHER SET OF PROBL
       EMS"
BD 950 PRINT"{DOWN}(Y/N)";
BM 960 INPUT Q$
AA 970 IF Q$<>"Y"THENPRINT"
       {CLR}":END
EC 980 GOTO180
PX 990 FORV=1TO400:NEXTV:RETUR
       N
```

BEFORE TYPING . . .

Before typing in programs, please refer to "How To Type In COMPUTE!'s GAZETTE Programs," which appears before the Program Listings.

Free-Form Filer

See instructions in article on page 56 before typing in.

```
0801:0B 08 0A 00 9E 32 30 36 2E
0809:33 00 00 00 00 0F AD 0D 57
0811:08 85 FD AD 0E 08 85 FE BB
0819:A9 01 8D 00 0F 8D 00 C0 5F
0821:8D 21 D0 A9 03 8D 20 D0 54
0829:85 1F A9 80 8D 8A 02 A0 3C
0831:00 84 8D 84 FB A9 0F 85 86
0839:8E 85 FC 85 8C A9 00 85 7A
0841:21 85 8B 20 BD 0A 20 2D 3A
0849:0C 20 30 0C 20 E4 FF F0 B3
0851:FB C9 53 D0 03 4C 90 09 BC
0859:C9 52 D0 03 4C FF 08 C9 69
0861:46 D0 03 4C 6C 09 C9 42 4B
0869:D0 03 4C 7F 09 C9 50 D0 05
0871:03 4C D2 0D C9 44 D0 03 45
0879:4C 3B 09 C9 43 D0 03 4C EB
0881:21 09 C9 41 D0 03 4C 08 E4
0889:09 C9 54 D0 03 4C D4 09 24
0891:C9 49 D0 03 4C F7 09 C9 41
0899:48 D0 B1 EA 20 BD 0A A9 9C
08A1:0F 85 8C A0 00 20 39 0C 35
08A9:A2 00 20 CF FF 95 4C C9 C4
08B1:0D F0 09 E8 E0 0B 90 F2 7B
08B9:A9 0D 95 4C E0 01 B0 04 C9
08C1:4C 30 08 EA A0 00 A2 00 FD
08C9:A5 4C 85 4B C8 F0 1A B1 15
08D1:8B F0 1E C5 4B D0 F5 C8 56
08D9:F0 13 E8 B5 4C C9 0D F0 34
08E1:13 D1 8B F0 F2 A2 00 F0 83
08E9:E6 E6 8C D0 E2 E6 8C D0 62
08F1:E9 4C 87 0A 20 A3 0A 20 5F
08F9:D2 0A 4C 4A 08 EA 20 B2 03
0901:0A A4 FB 4C C7 08 EA 20 D9
0909:BD 0A 20 63 0D 20 5C 0B 63
0911:A4 FD A5 FE 85 8C 20 A3 DB
0919:0A 20 D2 0A 4C 4A 08 EA B9
0921:20 B2 0A 20 63 0D A9 01 D6
0929:85 20 20 BD 0A 20 42 0C 47
0931:20 0B 0B 20 E5 0B 4C 0B 78
0939:09 EA 20 B2 0A 20 36 0C 03
0941:20 E4 FF F0 FB C9 59 F0 56
0949:03 4C 30 08 20 E5 0B A5 CA
0951:8D C5 FD D0 09 A5 8E C5 2A
0959:FE D0 03 4C 30 08 A4 8D BC
0961:A5 8E 85 8C 20 D2 0A 4C 10
```

```
Ø969:4A Ø8 EA A4 FB A5 FC 85 4Ø
Ø971:8C 2Ø 7Ø ØA 2Ø A3 ØA 2Ø 44
Ø979:D2 ØA 4C 4A Ø8 EA A4 8D 68
Ø981:A5 8E 85 8C CØ ØØ DØ EC 18
Ø989:C9 ØF DØ E8 FØ E3 EA 2Ø F9
Ø991:E7 FF A5 FD 8D ØD Ø8 A5 82
Ø999:FE 8D ØE Ø8 2Ø FD ØD A9 8D
Ø9A1:Ø8 AA 85 4Ø A9 Ø1 85 3F B2
Ø9A9:AØ FF 2Ø BA FF A9 11 A2 27
Ø9B1:93 AØ ØD 2Ø BD FF A9 8Ø 1B
Ø9B9:85 9D 2Ø A4 ØD 2Ø A4 ØD 83
Ø9C1:A9 3F A6 FD A4 FE 2Ø D8 67
Ø9C9:FF 2Ø C4 ØA 2Ø C4 ØA 4C 91
Ø9D1:3Ø Ø8 EA 2Ø B2 ØA A9 Ø5 73
Ø9D9:8D 2Ø DØ 85 1F 2Ø Ø8 ØC C2
Ø9E1:2Ø E5 ØB 2Ø 3F ØC A5 8D E3
Ø9E9:85 FB A5 8E 85 FC A9 ØØ CE
Ø9F1:85 21 4C 4A Ø8 EA A5 1F 93
Ø9F9:C9 Ø5 FØ Ø6 2Ø 45 ØC 4C 2B
ØAØ1:4A Ø8 2Ø A4 ØD A5 FD 18 9D
ØAØ9:65 28 85 1D 85 3D A5 FE C7
ØA11:65 1C 85 1E 85 3E A9 ØØ E9
ØA19:A8 91 8D 91 1D 88 CØ FF 3D
ØA21:DØ Ø4 C6 FE C6 1E B1 FD 77
ØA29:DØ F1 A9 Ø1 AØ ØØ 91 8D 1D
ØA31:A5 3D 85 FD A5 3E 85 FE 28
ØA39:2Ø C4 ØA AØ ØØ A9 CØ 85 87
ØA41:29 84 28 C8 DØ Ø4 E6 29 2A
ØA49:E6 8E B1 28 91 8D C9 Ø1 84
ØA51:DØ F1 C6 1F A9 Ø3 8D 2Ø A9
ØA59:DØ E6 8D DØ Ø2 E6 8E A4 BB
ØA61:8D A5 8E 85 8C 2Ø A3 ØA Ø6
ØA69:2Ø D2 ØA 4C 4A Ø8 EA C8 59
ØA71:FØ Ø5 B1 8B FØ ØE 6Ø E6 95
ØA79:8C DØ F7 88 CØ FF DØ F2 2A
ØA81:C6 8C DØ EE 68 68 2Ø 7C C6
ØA89:ØA 84 FB 84 8D A5 8C 85 2D
ØA91:FC 85 8E A9 ØØ 85 21 2Ø 6A
ØA99:BD ØA 2Ø 33 ØC 4C 4A Ø8 74
ØAA1:6Ø EA 2Ø 7C ØA C9 Ø1 DØ B6
ØAA9:F9 84 8D A5 8C 85 8E 6Ø DF
ØAB1:EA A5 21 DØ Ø5 68 68 4C BC
ØAB9:3Ø Ø8 6Ø EA A9 93 2Ø D2 51
ØAC1:FF 6Ø EA 48 C6 FD A5 FD 47
ØAC9:C9 FF DØ Ø2 C6 FE 68 6Ø 6Ø
ØAD1:EA A9 ØØ 85 2Ø 85 4Ø A9 5F
ØAD9:ØØ 85 3F 2Ø 7Ø ØA C9 Ø1 79
ØAE1:FØ 16 C9 ØD FØ ØE E6 3F CA
ØAE9:A5 3F C9 26 9Ø ED A9 Ø1 CC
ØAF1:85 2Ø DØ E3 E6 4Ø DØ DF E2
ØAF9:EA EA 2Ø BD ØA A9 17 38 7B
ØBØ1:E5 4Ø 4A AØ ØØ AA 18 2Ø 68
ØBØ9:FØ FF A4 8D A5 8E 85 8C Ø4
ØB11:A5 2Ø DØ 2B A9 ØØ 85 3F 66
ØB19:2Ø 7Ø ØA C9 Ø1 FØ Ø8 C9 DE
ØB21:ØD FØ Ø4 E6 3F DØ F1 A9 B3
ØB29:28 38 E5 3F 4A AA A9 2Ø 82
ØB31:CA 3Ø Ø5 2Ø D2 FF DØ F8 8C
ØB39:2Ø 7C ØA C6 3F 1Ø F9 2Ø 7A
ØB41:7Ø ØA C9 Ø1 FØ Ø9 2Ø D2 1A
ØB49:FF C9 ØD DØ F2 FØ C1 84 E3
ØB51:FB A5 8C 85 FC A9 Ø1 85 CE
ØB59:21 6Ø EA 78 A9 6A 8D 14 23
ØB61:Ø3 A9 ØB 8D 15 Ø3 58 DØ D3
ØB69:3B 48 A5 D6 C9 18 BØ ØA 6B
ØB71:A5 D3 C9 27 FØ 25 C9 26 DØ
ØB79:9Ø ØB A9 ØD 8D 77 Ø2 A9 98
ØB81:Ø1 85 C6 DØ 1B AØ 26 B1 B8
ØB89:D1 C9 2Ø FØ 13 A5 D8 18 Ø7
ØB91:65 D3 85 D3 A9 ØØ 85 D8 6E
ØB99:A9 14 2C A9 1D 2Ø D2 FF B8
ØBA1:68 4C 31 EA AØ ØØ 2Ø CF E8
ØBA9:FF 2Ø A4 ØD 91 FD C9 ØD 52
ØBB1:DØ F4 2Ø D2 FF 2Ø C4 ØA B2
ØBB9:B1 FD C9 2Ø FØ Ø5 2Ø A4 E3
ØBC1:ØD DØ E3 2Ø C4 ØA A9 Ø1 B3
ØBC9:91 FD 2Ø A4 ØD A9 ØØ 91 17
ØBD1:FD 2Ø C4 ØA 78 A9 31 8D 82
ØBD9:14 Ø3 A9 EA 8D 15 Ø3 58 BD
ØBE1:6Ø EA EA EA 2Ø 89 ØD AØ DØ
ØBE9:ØØ C8 DØ Ø4 E6 FC E6 3C C1
ØBF1:B1 FB 91 3B DØ F3 98 18 65
ØBF9:65 3B 85 FD A9 ØØ 65 3C 76
ØCØ1:85 FE 2Ø C4 ØA 6Ø EA 2Ø B3
ØCØ9:89 ØD AØ ØØ 84 28 A9 CØ 16
ØC11:85 29 C8 DØ Ø4 E6 29 E6 51
ØC19:3C B1 3B 91 28 C9 Ø1 DØ 77
ØC21:F1 84 28 A5 29 38 E9 CØ 71
ØC29:85 1C 6Ø EA A2 ØØ 2C A2 D5
ØC31:ØB 2C A2 67 2C A2 7C 2C B5
ØC39:A2 8E 2C A2 A2 2C A2 B4 B5
ØC41:2C A2 C9 2C A2 F6 8A 48 62
ØC49:BD 63 ØC BC 64 ØC AA 18 27
ØC51:2Ø FØ FF 68 AA BD 65 ØC 5F
ØC59:FØ Ø6 2Ø D2 FF E8 DØ F5 D7
ØC61:6Ø EA ØB 1Ø 9C 53 45 4C CF
ØC69:45 43 54 3A ØØ 17 Ø5 9C 26
ØC71:48 9F 55 4E 54 2Ø 9C 52 D3
ØC79:9F 45 2D 54 52 59 2Ø 9C 72
ØC81:41 9F 44 44 2Ø 9C 5Ø 9F A2
ØC89:52 49 4E 54 2Ø 9C 46 9F CB
ØC91:57 44 2Ø 9C 42 9F 41 43 8A
ØC99:4B ØD 2Ø 2Ø 2Ø 2Ø 2Ø 9C FE
ØCA1:43 9F 48 41 4E 47 45 2Ø 9A
ØCA9:9C 44 9F 4C 45 54 45 2Ø FF
ØCB1:9C 54 9F 4F 42 55 46 2Ø 2A
ØCB9:9C 53 9F 41 56 45 2Ø 9C A1
ØCC1:49 9F 4E 53 42 55 46 2Ø 79
ØCC9:ØØ ØB ØB 9C 53 4F 52 52 9E
ØCD1:59 2C 2Ø 4E 4F 54 2Ø 4C E2
ØCD9:49 53 54 45 44 ØØ Ø4 ØD 81
ØCE1:9C 41 52 45 2Ø 59 4F 55 91
ØCE9:2Ø 53 55 52 45 3F 9F ØØ 1D
ØCF1:ØB ØD 9C 53 45 41 52 43 B2
ØCF9:48 49 4E 47 2Ø 46 4F 52 D1
ØDØ1:3F 2Ø 9F ØØ ØØ ØD 9C 4C 7Ø
ØDØ9:4F 57 2Ø 4F 4E 2Ø 4D 45 6C
ØD11:4D 4F 52 59 9F ØØ ØB ØB A3
ØD19:9C 48 4F 4C 44 49 4E 47 6D
ØD21:2Ø 49 4E 2Ø 42 55 46 46 A3
ØD29:45 52 ØØ ØØ Ø1 9C 43 2E A9
ØD31:52 2E 2Ø 53 54 4F 52 45 Ø3
ØD39:53 2Ø 4C 49 4E 45 2D 2Ø 25
ØD41:49 46 2Ø 4C 49 4E 45 2Ø 88
ØD49:45 4D 5Ø 54 59 2C 2Ø 45 A9
ØD51:58 49 54 53 ØD ØD 9F ØØ 85
ØD59:ØC 11 9C 45 4D 5Ø 54 59 53
ØD61:9F ØØ 2Ø 3C ØC A9 ØD 2Ø 54
ØD69:D2 FF 2Ø D2 FF A5 FE C9 7C
ØD71:9C BØ Ø5 2Ø 42 ØC FØ Ø7 D3
ØD79:C9 9E 9Ø Ø6 A2 ØA 2C A2 CA
ØD81:Ø3 2C A2 Ø8 8E 2Ø DØ 6Ø F3
ØD89:A5 8D 85 3B A5 8E 85 3C EC
ØD91:6Ø 53 3Ø 3A 46 52 45 45 A5
ØD99:2D 46 4F 52 4D 2Ø 46 49 AB
ØDA1:4C 45 52 48 E6 FD DØ Ø2 D4
ØDA9:E6 FE A5 FE C9 AØ 9Ø 15 A2
ØDB1:C6 FE A9 FD 85 FD C8 A9 63
ØDB9:ØØ 91 FD 98 88 91 FD 68 7Ø
ØDC1:68 68 4C 9Ø Ø9 C9 9F 9Ø FB
ØDC9:Ø5 A9 Ø2 8D 2Ø DØ 68 6Ø 5F
ØDD1:EA 2Ø B2 ØA A9 ØØ 2Ø BD AB
ØDD9:FF A9 Ø4 AA AØ FF 2Ø BA 89
ØDE1:FF 2Ø CØ FF A2 Ø4 2Ø C9 4B
ØDE9:FF E6 2Ø 2Ø ØB ØB A9 ØD A8
ØDF1:2Ø D2 FF 2Ø D2 FF 2Ø E7 91
ØDF9:FF 4C 3Ø Ø8 2Ø BD ØA A9 63
ØEØ1:Ø1 A2 Ø8 AØ ØF 2Ø BA FF BF
ØEØ9:A9 12 A2 92 AØ ØD 2Ø BD 33
ØE11:FF 2Ø CØ FF A9 Ø1 2Ø C3 A2
ØE19:FF 4C CC FF 1F FØ ØE A5 6Ø
ØE21:2A C9 E8 B1 C1 BØ 1C 2Ø 26
ØE29:C2 FC ØØ 88 DØ F2 Ø6 2A F6
ØE31:9Ø ØE BD 2A FF ØØ 2Ø A5 59
ØE39:FD ØØ BD 3Ø FF ØØ FØ Ø3 F3
ØE41:2Ø A5 FD ØØ CA DØ D5 6Ø 3C
ØE49:2Ø CD FC ØØ AA E8 DØ Ø1 24
ØE51:C8 98 2Ø C2 FC ØØ 8A 86 AB
ØE59:1C 2Ø 48 FA ØØ A6 1C 6Ø 77
ØE61:A5 1F 38 A4 C2 AA 1Ø Ø1 4B
ØE69:88 65 C1 9Ø Ø1 C8 6Ø A8 F8
ØE71:4A 9Ø ØB 4A BØ 17 C9 22 74
ØE79:FØ 13 29 Ø7 Ø9 8Ø 4A AA F1
ØE81:BD D9 FE ØØ BØ Ø4 4A 4A 47
ØE89:4A 4A 29 ØF DØ Ø4 AØ 8Ø CB
ØE91:A9 ØØ ØØ AA BD 1D FF ØØ 8F
ØE99:85 2A 29 Ø3 85 1F 98 29 5B
ØEA1:8F AA 98 AØ Ø3 EØ 8A FØ EE
ØEA9:ØB 4A 9Ø Ø8 4A 4A Ø9 2Ø 1E
ØEB1:88 DØ FA C8 88 DØ F2 6Ø FF
ØEB9:B1 C1 2Ø C2 FC ØØ A2 Ø1 7D
ØEC1:2Ø FE FA ØØ C4 1F C8 9Ø D1
ØEC9:F1 A2 Ø3 CØ Ø4 9Ø F2 6Ø 9C
ØED1:A8 B9 37 FF ØØ 85 28 B9 B7
ØED9:77 FF ØØ 85 29 A9 ØØ ØØ F9
ØEE1:AØ Ø5 Ø6 29 26 28 2A 88 91
ØEE9:DØ F8 69 3F 2Ø D2 FF CA E4
ØEF1:DØ EC A9 2Ø 2C A9 ØD 4C 57
ØEF9:D2 FF 2Ø D4 FA ØØ 2Ø Ø1 E9
ØFØ1:ØØ ØØ ØØ ØØ ØØ ØØ ØØ ØØ 1F
```

Play Bingo

Article on page 37.

```
FB 1 F=Ø:REM F=1 FOR +4/16, F=
     2 ON THE 128
RM 2 BA=53281:BO=5328Ø:S=1Ø24:
     C=55296:IFF=1THENBA=653Ø1
     :BO=653Ø5:S=3Ø72:C=2Ø48
SC 3 NDX=198:IFF=1THENNDX=239
DD 4 IFF=2THENNDX=2Ø8
JE 5 IFFTHENKEY1,CHR$(133):KEY
     7,CHR$(136)
HF 1ØØ PRINT CHR$(142)CHR$(8)C
       HR$(5):POKEBO,9
SS 11Ø DIM D(26,5),A(75):SD=54
       272:R=RND(-TI):DL=4ØØ
GA 12Ø A$=CHR$(167)+CHR$(18):B
       $=CHR$(146)+CHR$(165)
AE 13Ø FOR I=Ø TO 19:CP$=CP$+C
       HR$(17):NEXT:CP$=CHR$(1
       9)+CP$
JE 14Ø IFF<>1THENFORI=SDTOSD+2
       4:POKEI,Ø:NEXT
PA 15Ø IFF<>1THENPOKESD,135:PO
       KESD+1,33:POKESD+5,Ø:PO
       KESD+6,1Ø:POKESD+24,15
MA 16Ø FOR I=Ø TO 24:FOR J=Ø T
       O 4:READ D(I,J):NEXT J,
       I
RR 17Ø FOR I=1 TO 75:A(I)=I:NE
       XT
XD 18Ø FOR I=75 TO 1 STEP-1:R=
       INT(RND(1)*I)+1:A=A(I):
       A(I)=A(R):A(R)=A:NEXT:C
       T=Ø
GM 19Ø PRINT CHR$(147);CHR$(14
       9):POKE BA,7+4*16
MH 2ØØ PRINT:PRINT:PRINT TAB(1
       Ø)"P L A Y{3 SPACES}B I
        N G O"
EM 21Ø PRINT TAB(1Ø)"{7 Y}
       {3 SPACES}{9 Y}":PRINT
AJ 22Ø PRINT"{3 SPACES}BINGO O
       R 4CR."A$"A"B$"
       {4 SPACES}LETTER
       {3 SPACES}T{2 SPACES}"A
       $"N"B$
AH 23Ø PRINT"{3 SPACES}DIAMOND
       {3 SPACES}Z{2 SPACES}"A
       $"B"B$"{4 SPACES}LETTER
       {3 SPACES}Y{2 SPACES}"A
       $"O"B$
EG 24Ø PRINT"{3 SPACES}PLUS SI
       GN +{2 SPACES}"A$"C"B$"
       {4 SPACES}POSTAGE STPS"
       A$"P"B$
GD 25Ø PRINT"{3 SPACES}INSIDE
       {SPACE}FR+4C "A$"D"B$"
       {4 SPACES}LETTER
       {3 SPACES}X{2 SPACES}"A
       $"Q"B$
XC 26Ø PRINT"{3 SPACES}OUTSIDE
        FRAME"A$"E"B$"
       {4 SPACES}LETTER
```

```
       {3 SPACES}H{2 SPACES}"A
       $"R"B$
CD 270 PRINT"{3 SPACES}LAYERCA
       KE{4 SPACES}"A$"F"B$"
       {4 SPACES}LETTER
       {3 SPACES}N{2 SPACES}"A
       $"S"B$
PX 280 PRINT"{3 SPACES}CHECKER
       BOARD "A$"G"B$"
       {4 SPACES}KITE
       {8 SPACES}"A$"T"B$
XP 290 PRINT"{3 SPACES}DOGHOUS
       E{5 SPACES}"A$"H"B$"
       {4 SPACES}LETTER
       {3 SPACES}P{2 SPACES}"A
       $"U"B$
MP 300 PRINT"{3 SPACES}COVERAL
       L{5 SPACES}"A$"I"B$"
       {4 SPACES}WINDOW
       {6 SPACES}"A$"V"B$
EH 310 PRINT"{3 SPACES}UMBRELL
       A{5 SPACES}"A$"J"B$"
       {4 SPACES}LETTER
       {3 SPACES}S{2 SPACES}"A
       $"W"B$
AP 320 PRINT"{3 SPACES}DOUBLE
       {4 SPACES}W{2 SPACES}"A
       $"K"B$"{4 SPACES}NINE S
       POTS{2 SPACES}"A$"X"B$
HR 330 PRINT"{3 SPACES}SCHOONE
       R{5 SPACES}"A$"L"B$"
       {4 SPACES}LETTER
       {3 SPACES}K{2 SPACES}"A
       $"Y"B$
RG 340 PRINT"{3 SPACES}LETTER
       {4 SPACES}A{2 SPACES}"A
       $"M"B$"{4 SPACES}FENCE
       {SPACE}POSTS "A$"Z"B$
FC 350 PRINT:PRINT"{3 SPACES}P
       RINT CARDS{2 SPACES}"A$
       "CTRL-P"B$
CD 360 PRINT:PRINT"{3 SPACES}S
       PEED CONTROL"A$"1-9"B$
ME 370 GET I$:A=ASC(I$+CHR$(Ø)
       )-66
EA 380 IF A=-5Ø THEN GOSUB1Ø8Ø
       :GOTO18Ø
BH 390 IF A<-1 OR A>24 GOTO37Ø
MC 400 POKE BA,Ø:PRINT CHR$(14
       7):POKE BA,7+4*16
DH 410 FOR Y=Ø TO 24:POKE S+Y*
       4Ø,116:POKE S+39+Y*4Ø,1
       Ø3:NEXT
KE 420 FOR X=Ø TO 39:FOR Y=Ø T
       O 16 STEP 4:AD=S+X+4Ø*Y
PA 430 POKE AD,119:IF X=Ø THEN
        POKE AD,79
MB 440 IF X=39 THEN POKE AD,8Ø
KM 450 NEXT Y
HD 460 AD=S+X+19*4Ø:POKE AD,11
       1:IF X=39 THEN POKE AD,
       122
PG 470 IF X=Ø THEN POKE AD,76
RA 480 AD=AD+5*4Ø:IF X>6 THEN
       {SPACE}POKE AD,111:IF X
       =39 THEN POKE AD,122
BQ 490 NEXT X
XK 500 POKE S+42,2:POKE S+2Ø2,
       9:POKE S+362,14:POKE S+
       522,7:POKE S+682,15
GG 510 IF A=-1 GOTO58Ø
RA 520 FOR I=Ø TO 4:X=D(A,I):F
       OR J=Ø TO 4
GB 530 B=X AND 16:B=-(B<>16):X
       =X*2 AND 31
BJ 540 POKE C+8Ø1+J+I*4Ø,B+16*
       6
JP 550 POKE S+8Ø1+J+I*4Ø,87
FB 560 NEXT J,I
MH 570 GOTO6ØØ
XD 580 D$=CHR$(29)+CHR$(215)+"
       {3 SPACES}"+CHR$(215)
ES 590 PRINT CP$;CHR$(144);D$:
       PRINT:PRINT CHR$(29);"B
       INGO":PRINT:PRINT D$;
GF 600 PRINT CP$:PRINT CHR$(3Ø
       )TAB(7)"MATCH THIS"TAB(
       27);"NEW GAME"A$"F1"B$
MX 610 PRINT TAB(7)"PATTERN"TA
       B(19)CHR$(5)"COUNT"CHR$
       (3Ø);
BJ 620 PRINT TAB(27)"PAUSE
       {3 SPACES}"A$"F7"B$
JB 630 PRINT TAB(7)"TO WIN"TAB
       (27)"QUIT{4 SPACES}"A$"
       Q "B$
FD 640 PRINT CP$:PRINT:PRINT C
       HR$(5)
FP 650 FORI=Ø TO 999:NEXT
XC 660 IF A<14 THEN RG=Ø
GX 670 IF A>13 AND A<19 THEN R
       G=1
GS 680 IF A>18 AND A<22 THEN R
       G=2
DH 690 IF A=22 THEN RG=3
GE 700 IF A=23 THEN RG=4
JP 710 IF A=24 THEN RG=5
AF 720 FOR I=1 TO 75:X=A(I):FL
       =Ø
DS 730 ON RG GOSUB98Ø,1ØØØ,1Ø2
       Ø,1Ø4Ø,1Ø6Ø
RB 740 IF FL GOTO96Ø
PC 750 IFF<>1THENPOKESD+4,17:P
       OKESD+4,16:GOTO77Ø
PX 760 IFF=1THENVOL7:SOUND1,91
       7,5Ø:FORQ=7TO1STEP-1:VO
       LQ:FORU=1TO5Ø:NEXTU,Q
BG 770 A=INT((X-1)/15):B=X-A*1
       5-1
PB 780 D=B AND 1:B=INT(B/2)
HR 790 A=45+16Ø*A+D*42+B*4
FQ 800 HD=INT(X/1Ø):LD=X-HD*1Ø
       +48:IF LD=48 THEN LD=15
GQ 810 HD=HD+48:IF HD=48 THEN
       {SPACE}HD=32
XG 820 POKE S+A,HD:POKE S+A+1,
       LD
QM 830 CT=CT+1:PRINT TAB(2Ø) C
       T:PRINT CHR$(145);CHR$(
       145)
SK 840 FOR L=Ø TO DL:B=L/2Ø AN
       D 1
MK 850 POKE C+A,B+16*6:POKE C+
       A+1,B+16*6
AR 860 NEXT L
FP 870 POKE C+A,9:POKE C+A+1,9
FD 880 GET I$:IF I$=CHR$(136)
       {SPACE}GOTO93Ø
JC 890 A=ASC(I$+CHR$(Ø))-48:IF
        A>Ø AND A<1Ø THEN DL=A
       *8Ø
DC 900 IF I$=CHR$(133) GOTO18Ø
PR 910 IF I$=CHR$(81) THEN PRI
       NT CHR$(147):END
DA 920 GOTO95Ø
GE 930 GET I$:IF I$="" GOTO93Ø
RS 940 GOTO9ØØ
GR 950 POKE NDX,Ø
EC 960 NEXT I
SJ 970 FORI=1TO2269Ø:NEXT:GOTO
       18Ø
XF 980 IF X>3Ø AND X<46 THEN F
       L=1
CE 990 RETURN
QD 1000 IF X<16 OR X>6Ø THEN F
        L=1
DS 1010 RETURN
GA 1020 IF (X>15 AND X<31) OR
        {SPACE}(X>45 AND X<61)
         THEN FL=1
SB 1030 RETURN
GH 1040 IF X>6Ø THEN FL=1
AD 1050 RETURN
CR 1060 IF X>15 AND X<61 THEN
        {SPACE}FL=1
MC 1070 RETURN
AJ 1080 PRINT CHR$(147):PRINT:
        PRINT TAB(2);"PRINT TO
         SCREEN OR PRINTER (S/
        P) P"
BF 1090 GET I$:IF I$="S" THEN1
        12Ø
PD 1100 IF I$<>"P" AND I$<>CHR
        $(13) GOTO1Ø9Ø
BM 1110 DV=4:TB$="{27 SPACES}"
        :PRINTCHR$(147):PRINT:
        TB=27:GOTO115Ø
DB 1120 DV=3:TB=7:PRINT CHR$(1
        47);CP$:PRINT:PRINT:PR
        INT
AA 1130 PRINT CHR$(5)" "A$"RET
        URN"B$"TO MENU : ";
SA 1140 PRINT "ANY KEY FOR NEW
         CARD"CHR$(149) CHR$(1
        9);:GOTO122Ø
FF 1150 CC$="":INPUT"
        {4 SPACES}HOW MANY CAR
        DS DO YOU WANT";CC$
CG 1160 IF CC$="" GOTO151Ø
MX 1170 E=Ø:FOR I=1 TO LEN(CC$
        )
MR 1180 A=ASC(MID$(CC$,I,1)):I
        F A<48 OR A>57 THEN E=
        I:I=LEN(CC$)
SR 1190 NEXT
JC 1200 IF E THEN PRINT:PRINT
        {SPACE}TAB(12+E);"INVA
        LID CHARACTER
        {2 SPACES}↑":PRINT:GOT
        O115Ø
HR 1210 CC=VAL(CC$):IF CC=Ø GO
        TO151Ø
XH 1220 FOR I=1 TO 75:A(I)=I:N
        EXT
SE 1230 E$=CHR$(14)+CHR$(32):F
        $=CHR$(15)+CHR$(32):RE
        M DOUBLE WIDE, NORMAL
        {SPACE}TEXT
QE 1240 IF DV=3 THEN E$="
        {2 SPACES}":F$=E$
JH 1250 C$="*****************
        ********"
BA 1260 D$="*{4 SPACES}*
        {4 SPACES}*{4 SPACES}*
        {4 SPACES}*{4 SPACES}*
        "
RC 1270 OPEN 4,DV:CMD4
MJ 1280 FOR I=6Ø TO Ø STEP-15:
        FOR J=15 TO 1 STEP-1
FR 1290 B=INT(RND(1)*J+1)+I:A=
        A(I+J):A(I+J)=A(B):A(B
        )=A:NEXT J,I
GC 1300 PRINT#4,LEFT$(TB$,TB);
        E$;"B";F$;E$;"I";F$;E$
        ;"N";F$;E$;"G";F$;E$;"
        O";F$
DM 1310 FOR I=Ø TO 4
JQ 1320 PRINT#4,LEFT$(TB$,TB);
        C$
AP 1330 PRINT#4,LEFT$(TB$,TB);
        D$
EK 1340 PRINT#4,LEFT$(TB$,TB);
RR 1350 FOR J=1 TO 61 STEP 15
QQ 1360 N$=RIGHT$(STR$(A(I+J))
        ,2)
CQ 1370 IF I=2 AND J=31 THEN P
        RINT#4,"*FREE";:GOTO13
        9Ø
XX 1380 PRINT#4,"* ";N$;" ";
EC 1390 NEXT J
DX 1400 PRINT#4,"*"
RH 1410 PRINT#4,LEFT$(TB$,TB);
        D$
MC 1420 NEXT I
SH 1430 PRINT#4,LEFT$(TB$,TB);
        C$
```

```
JH 1440 IF DV=4 THEN1480
RG 1450 GET I$:IF I$="" GOTO1450
SR 1460 IF I$=CHR$(13) THEN1500
SM 1470 PRINT CHR$(19):GOTO1280
JR 1480 FOR I=0 TO 10:PRINT#4:NEXT
KR 1490 CC=CC-1:IF CC GOTO1280
AA 1500 CLOSE 4
PX 1510 RETURN
GM 1520 DATA 4,10,17,10,4,4,4,31,4,4,17,14,10,14,17,31,17,17,17,31,31,0,31,0,31
FA 1530 DATA 21,10,21,10,21,4,14,31,10,14,31,31,31,31,31,14,31,4,4,4,21,10,0,21,10
PX 1540 DATA 10,10,10,31,14,4,10,14,10,17,31,4,4,4,4,17,10,4,4,4,3,3,0,24,24,17
JG 1550 DATA 10,4,10,17,17,17,31,17,17,17,25,21,19,17,3,3,4,8,16,14,10,14,8,8,14
HG 1560 DATA 10,14,10,14,14,8,14,2,14,21,0,21,0,21,18,20,24,20,18,17,17,17,17,17
```

BEFORE TYPING . . .

Before typing in programs, please refer to "How To Type In COMPUTE!'s GAZETTE Programs," which appears before the Program Listings.

Going Up?

See instructions in article on page 30 before typing in.

```
0801:0D 08 00 00 9E 28 32 30 C3
0809:36 33 29 00 00 00 4C C0 7F
0811:0B 00 00 00 00 00 00 00 A6
0819:00 00 00 00 00 00 00 00 29
0821:00 00 00 00 00 00 00 00 31
0829:00 00 00 00 00 00 00 00 39
0831:00 00 00 00 00 00 00 00 41
0839:00 00 00 00 00 00 00 00 49
0841:3C 00 00 14 00 00 14 00 D8
0849:00 10 00 00 28 00 00 28 C6
0851:00 00 28 00 00 28 80 00 08
0859:2A 80 00 2A 00 00 28 00 91
0861:00 3C 00 00 3C 00 00 3C 9E
0869:00 00 3C 00 00 3C 00 00 F1
0871:3C 00 00 3C 00 00 3F 00 E1
0879:00 30 00 00 3C 00 00 00 77
0881:3C 00 00 14 00 00 14 00 19
0889:00 10 00 00 28 00 00 28 07
0891:00 00 A8 00 00 A8 80 00 5A
0899:AA 80 00 AA 00 00 28 00 1A
08A1:00 3C 00 00 3C 00 00 3F E1
08A9:00 00 3F 00 00 33 00 00 6E
08B1:33 00 03 F3 00 03 00 F0 F7
08B9:03 00 C0 00 00 00 00 00 63
08C1:3C 00 00 14 00 00 14 00 59
08C9:00 10 00 00 28 00 00 28 47
08D1:00 00 28 00 00 28 00 00 87
08D9:28 00 00 2A 00 00 2A 00 F4
08E1:00 3C 00 00 3C 00 00 3F 22
08E9:00 00 0F C0 00 0C C0 00 99
08F1:FF C0 00 CC 00 00 CC 00 98
08F9:00 0C 00 00 0F 00 00 00 85
0901:3C 00 00 14 00 00 14 00 9A
0909:00 10 00 00 28 00 00 28 88
0911:00 00 28 00 00 28 00 00 C8
0919:2A 00 00 2A 00 00 28 00 33
0921:00 3C 00 00 3F 00 00 3F 7B
0929:C0 00 33 C0 00 F0 C0 00 53
0931:F3 C0 00 C3 00 00 C0 C0 EB
0939:00 C0 00 00 30 00 00 00 FC
0941:3C 00 00 14 00 00 14 00 DA
0949:00 10 00 00 28 00 00 28 C8
0951:00 00 A8 00 00 A8 80 00 1C
0959:AA 80 00 AA 00 00 28 00 DB
0961:00 3C 00 00 3F 00 00 FF 7C
0969:C0 00 F3 C0 03 C0 C0 03 06
0971:C0 C0 0F 00 F0 0C 00 00 AD
0979:0C 00 00 00 00 00 00 00 91
0981:3C 00 00 14 00 00 14 00 1B
0989:00 10 00 00 28 00 00 28 09
0991:80 00 AA 80 02 AA 00 02 FD
0999:28 00 02 28 00 00 28 00 D2
09A1:00 3F 00 00 3F C0 0F 3C DA
09A9:C0 03 F0 C0 00 F0 F0 00 AC
09B1:00 00 00 00 00 00 00 00 C3
09B9:00 00 00 00 00 00 00 00 CB
09C1:3C 00 00 14 00 00 14 00 5B
09C9:00 04 00 00 28 00 00 28 46
09D1:00 02 28 00 02 A8 00 00 1C
09D9:A8 00 00 A8 00 00 28 00 1B
09E1:00 3C 00 00 3C 00 00 3C 21
09E9:00 00 3C 00 00 3C 00 00 74
09F1:3C 00 00 3C 00 00 FC 00 DF
09F9:00 0C 00 00 3C 00 00 00 F0
0A01:3C 00 00 14 00 00 14 00 9C
0A09:00 04 00 00 28 00 00 28 87
0A11:00 00 2A 00 02 2A 00 02 25
0A19:AA 00 00 AA 00 00 28 00 7D
0A21:00 3C 00 00 3C 00 00 FC 23
0A29:00 00 FC 00 00 CC 00 00 10
0A31:CF C0 00 C0 C0 0F 00 C0 6C
0A39:03 00 00 00 00 00 00 00 CE
0A41:3C 00 00 14 00 00 14 00 DC
0A49:00 04 00 00 28 00 00 28 C7
0A51:00 00 28 00 00 28 00 00 0B
0A59:28 00 00 A8 00 00 A8 00 5D
0A61:00 3C 00 00 3C 00 00 FC 63
0A69:00 03 F0 00 03 30 00 03 38
0A71:FF 00 00 33 00 00 33 00 1F
0A79:00 30 00 00 F0 00 00 00 21
0A81:3C 00 00 14 00 00 14 00 1D
0A89:00 04 00 00 28 00 00 28 08
0A91:00 00 28 00 00 28 00 00 4B
0A99:A8 00 00 A8 00 00 28 00 DC
0AA1:00 3C 00 00 FC 00 03 FC AF
0AA9:00 03 CC 00 03 0F 00 03 6F
0AB1:CF 00 00 C3 00 03 03 00 FB
0AB9:00 03 00 00 0C 00 00 00 EE
0AC1:3C 00 00 14 00 00 14 00 5D
0AC9:00 04 00 00 28 00 00 28 48
0AD1:00 00 2A 00 02 2A 00 02 E5
0AD9:AA 00 00 AA 00 00 28 00 3E
0AE1:00 3C 00 00 FC 00 03 FF F2
0AE9:00 03 CF 00 03 03 C0 03 61
0AF1:03 C0 0F 00 F0 00 00 30 51
0AF9:00 00 30 00 00 00 00 00 14
0B01:3C 00 00 14 00 00 14 00 9E
0B09:00 04 00 00 28 00 02 28 8D
0B11:00 02 AA 00 00 AA 80 00 A8
0B19:28 80 00 28 80 00 28 00 3A
0B21:00 FC 00 03 FC 00 03 3C D0
0B29:F0 03 0F C0 0F 0F 00 00 1B
0B31:00 00 00 00 00 00 00 00 47
0B39:00 00 00 00 00 00 00 07 56
0B41:FF F0 07 FF F0 07 FF F0 09
0B49:07 FF F0 07 FF F0 07 FF 43
0B51:F0 07 FF F0 07 FF F0 07 D1
0B59:FF F0 07 FF F0 07 FF F0 21
0B61:07 FF F0 07 FF F0 07 FF 5B
0B69:F0 07 FF F0 07 FF F0 07 E9
0B71:FF F0 07 FF F0 07 FF F0 39
0B79:07 FF F0 07 FF F0 00 00 65
0B81:00 00 00 00 00 00 00 00 97
0B89:00 00 00 00 00 00 00 00 9F
0B91:00 00 00 00 00 00 00 00 A7
0B99:00 00 00 00 00 00 00 00 AF
0BA1:00 00 00 00 00 00 00 00 B7
0BA9:00 00 00 00 00 20 03 00 46
0BB1:20 03 D2 AB FF D6 AB FF 60
0BB9:D6 AB FF D6 AB FF 00 A0 91
0BC1:00 A9 00 99 00 D4 C8 C0 81
0BC9:19 90 F8 A9 0F 8D 18 D4 FD
0BD1:A9 00 8D 05 D4 8D 00 D4 70
0BD9:8D 0C D4 8D 07 D4 8D 13 E6
0BE1:D4 8D 0E D4 8D 15 D4 8D CC
0BE9:06 D4 A9 F0 8D 0D D4 8D 54
0BF1:14 D4 A9 80 8D 04 D4 A9 54
0BF9:10 8D 0B D4 A9 20 8D 12 25
0C01:D4 A9 07 8D 01 D4 A9 04 5A
0C09:8D 0F D4 A9 00 8D 15 D0 12
0C11:8D 01 D0 8D 00 D0 A9 00 B9
0C19:8D F8 BF 8D 03 C0 8D 04 41
0C21:C0 A9 01 8D 30 C0 A9 80 55
0C29:8D 8A 02 A9 93 20 D2 FF 48
0C31:A9 00 8D 20 D0 8D 21 D0 A1
0C39:A9 0E 8D 27 D0 AD 1C D0 14
0C41:09 01 8D 1C D0 A9 07 8D 5A
0C49:25 D0 A9 06 8D 26 D0 A9 0E
0C51:08 8D 28 D0 A9 05 8D 29 88
0C59:D0 A9 06 8D 2A D0 A9 07 CC
0C61:8D 2B D0 A9 04 8D 2C D0 3F
0C69:A9 02 8D 2D D0 A9 03 8D 1C
0C71:2E D0 A9 27 8D F8 07 A9 84
0C79:2D 8D F9 07 8D FA 07 8D 2F
0C81:FB 07 8D FC 07 8D FD 07 4C
0C89:8D FE 07 8D FF 07 A9 38 89
0C91:8D 02 D0 A9 55 8D 04 D0 5F
0C99:A9 72 8D 06 D0 A9 8F 8D 0F
0CA1:08 D0 A9 AC 8D 0A D0 A9 D1
0CA9:C9 8D 0C D0 A9 E6 8D 0E AA
0CB1:D0 A9 FF 8D 03 D0 8D 05 F0
0CB9:D0 8D 07 D0 8D 09 D0 8D 4B
0CC1:0B D0 8D 0D D0 8D 0F D0 C1
0CC9:A9 C3 8D 04 80 A9 C2 8D 57
0CD1:05 80 A9 CD 8D 06 80 A9 CD
0CD9:38 8D 07 80 A9 30 8D 08 8B
0CE1:80 A9 F2 8D 00 80 8D 02 FA
0CE9:80 A9 0C 8D 01 80 8D 03 2F
0CF1:80 A9 00 8D 15 D0 A9 80 4D
0CF9:8D 04 D4 A9 20 8D 0B D4 31
0D01:A9 10 8D 12 D4 A9 96 A0 E1
0D09:14 20 1E AB AD 00 DC C9 A4
0D11:6F D0 F9 A9 93 20 D2 FF B3
0D19:A2 00 8E 01 C0 A2 00 8E 85
0D21:00 C0 A9 52 A0 13 20 1E 75
0D29:AB AE 00 C0 E8 8E 00 C0 13
0D31:E0 05 90 EE A9 9D A0 13 16
0D39:20 1E AB AE 01 C0 E8 8E B6
0D41:01 C0 E0 04 90 D7 A9 78 18
0D49:A0 13 20 1E AB A9 C7 A0 92
0D51:13 20 1E AB 20 CD 12 A9 81
0D59:F4 A0 13 20 1E AB 20 CD 28
0D61:12 A9 FE A0 13 20 1E AB D9
0D69:20 CD 12 A9 07 A0 14 20 E6
0D71:1E AB 20 CD 12 A9 10 A0 5E
0D79:14 20 1E AB 20 CD 12 A9 2A
0D81:1A A0 14 20 1E AB 20 CD 03
0D89:12 A9 24 A0 14 20 1E AB AE
0D91:20 CD 12 A9 2D A0 14 20 40
0D99:1E AB 20 CD 12 A9 36 A0 D2
0DA1:14 20 1E AB 20 CD 12 A9 52
0DA9:40 A0 14 20 1E AB 20 CD 3E
0DB1:12 A9 4A A0 14 20 1E AB 9B
0DB9:20 CD 12 A9 53 A0 14 20 99
0DC1:1E AB 20 CD 12 A9 5C A0 47
0DC9:14 20 1E AB 20 CD 12 A9 7A
0DD1:66 A0 14 20 1E AB 20 CD 79
0DD9:12 A9 70 A0 14 20 1E AB 88
0DE1:20 CD 12 A9 79 A0 14 20 F2
0DE9:1E AB 20 CD 12 A9 82 A0 BB
0DF1:14 20 1E AB 20 CD 12 A9 A2
0DF9:8C A0 14 20 1E AB A9 FE F8
0E01:8D 00 D0 20 B2 10 20 87 9D
0E09:12 AD F8 07 C9 23 F0 09 EE
```

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0E11:C9 29 F0 05 A9 80 8D 04 39
0E19:D4 AD 8D 02 C9 01 F0 F9 0B
0E21:AD 1E D0 29 01 C9 01 F0 6A
0E29:03 4C 11 11 A9 E8 8D 53 6C
0E31:16 A9 03 8D 54 16 AD 00 52
0E39:D0 C9 FD B0 EC C9 22 90 5E
0E41:E8 A9 2E 8D F8 07 A0 00 FF
0E49:8C C0 C1 20 2D 12 20 74 7C
0E51:12 EE C0 C1 AC C0 C1 C0 13
0E59:82 D0 F0 CE F2 06 AD F2 F3
0E61:06 C9 30 D0 03 4C F3 10 47
0E69:A9 FE 8D 15 D0 AD 30 C0 7B
0E71:C9 01 F0 0F C9 03 F0 0B 09
0E79:A9 21 8D F8 07 8D 00 D0 33
0E81:4C 8E 0E A9 27 8D F8 07 2C
0E89:A9 FE 8D 00 D0 A9 FF 8D A6
0E91:15 D0 4C 0A 0E AD 30 C0 DE
0E99:C9 01 F0 12 C9 03 F0 0E 64
0EA1:AD 00 D0 C9 FF F0 21 C9 1B
0EA9:20 F0 17 4C 51 0F AD 00 DB
0EB1:D0 C9 20 F0 1B C9 FF F0 AC
0EB9:03 4C 51 0F CE 00 D0 4C E9
0EC1:51 0F EE 00 D0 4C 51 0F 91
0EC9:A9 27 8D F8 07 4C D6 0E EA
0ED1:A9 21 8D F8 07 AD 51 16 F3
0ED9:18 69 64 8D 51 16 90 03 C8
0EE1:EE 52 16 A9 51 A0 15 20 BE
0EE9:1E AB AE 51 16 AD 52 16 0D
0EF1:20 CD BD AD 30 C0 C9 01 3D
0EF9:F0 0B C9 02 F0 17 C9 03 25
0F01:F0 23 4C 74 11 CE 01 D0 C7
0F09:20 2D 12 AD 01 D0 C9 A5 24
0F11:F0 23 4C 06 0F CE 01 D0 B0
0F19:20 2D 12 AD 01 D0 C9 75 04
0F21:F0 13 4C 16 0F CE 01 D0 ED
0F29:20 2D 12 AD 01 D0 C9 45 E3
0F31:F0 03 4C 26 0F A9 10 8D 41
0F39:0B D4 EE 30 C0 AD 00 D0 80
0F41:C9 FF F0 06 EE 00 D0 4C 28
0F49:0A 0E CE 00 D0 4C 0A 0E A3
0F51:AD 00 DC C9 7F F0 18 C9 38
0F59:77 F0 42 C9 76 F0 3E C9 12
0F61:75 F0 3A C9 7B F0 52 C9 68
0F69:7A F0 4E C9 79 F0 4A AD 39
0F71:F8 07 C9 26 B0 17 C9 27 06
0F79:90 03 4C 0A 0E A9 21 8D B1
0F81:F8 07 A9 00 8D 02 C0 8D 96
0F89:03 C0 4C 0A 0E A9 27 8D 76
0F91:F8 07 A9 00 8D 02 C0 8D A6
0F99:03 C0 4C 0A 0E AD F8 07 B3
0FA1:C9 21 F0 51 C9 26 B0 4D B5
0FA9:AE 04 C0 E8 8E 04 C0 E0 AD
0FB1:30 F0 1E 20 D5 12 4C 0A 83
0FB9:0E AD F8 07 C9 28 90 3D 27
0FC1:AE 04 C0 E8 8E 04 C0 E0 C5
0FC9:2D F0 18 20 D5 12 4C 0A 59
0FD1:0E A9 00 8D 04 C0 AE 00 BA
0FD9:D0 E8 8E 00 D0 20 D5 12 31
0FE1:4C 0A 0E A9 00 8D 04 C0 04
0FE9:AE 00 D0 CA 8E 00 D0 20 5C
0FF1:D5 12 4C 0A 0E A9 22 8D 92
0FF9:F8 07 4C 9E 0F A9 28 8D C6
1001:F8 07 4C BA 0F EE 05 C0 93
1009:AE 05 C0 EC F8 C0 F0 54 A9
1011:EE 06 C0 AE 06 C0 EC F9 34
1019:C0 F0 54 EE 07 C0 AE 07 EE
1021:C0 EC FA C0 F0 54 EE 08 07
1029:C0 AE 08 C0 EC FB C0 F0 2C
1031:54 EE 09 C0 AE 09 C0 EC 6C
1039:FC C0 F0 54 EE 0A C0 AE 3B
1041:0A C0 EC FD C0 F0 54 EE 75
1049:0B C0 AE 0B C0 EC FE C0 1E
1051:F0 54 AD 38 C7 C9 01 D0 70
1059:08 A9 00 8D 38 C7 4C 52 8C
1061:12 4C 96 0E A9 00 8D 05 BE
1069:C0 EE 03 D0 4C 53 10 A9 8C
1071:00 8D 06 C0 CE 05 D0 4C 3A
1079:53 10 A9 00 8D 07 C0 EE 75
1081:07 D0 4C 53 10 A9 00 8D CC
1089:08 C0 CE 09 D0 4C 53 10 B6
1091:A9 00 8D 09 C0 EE 0B D0 71
1099:4C 53 10 A9 00 8D 0A C0 5C
10A1:CE 0D D0 4C 53 10 A9 00 79
10A9:8D 0B C0 EE 0F D0 4C 53 02
10B1:10 A9 28 8D F8 C0 A9 3C 7C
10B9:8D F9 C0 A9 37 8D FA C0 78
10C1:A9 32 8D FB C0 A9 2D 8D 49
10C9:FC C0 A9 41 8D FD C0 A9 71
10D1:46 8D FE C0 A9 01 8D 50 21
10D9:16 8D 30 C0 A9 00 8D 51 34
10E1:16 8D 52 16 8D 87 C2 A9 D5
10E9:E8 8D 53 16 A9 03 8D 54 76
10F1:16 60 A9 FF 8D 15 D0 A9 76
10F9:AD A0 15 20 1E AB 20 2D CA
1101:12 AD 00 DC C9 6F D0 F6 0A
1109:A9 00 8D 15 D0 4C 14 0D EF
1111:EE 3D C7 AD 3D C7 C9 E6 51
1119:F0 03 4C 06 10 A9 00 8D 13
1121:3D C7 38 AD 53 16 E9 01 7D
1129:8D 53 16 B0 03 CE 54 16 C6
1131:A9 7B A0 15 20 1E AB AE EB
1139:53 16 AD 54 16 20 CD BD 10
1141:A9 20 20 D2 FF AD 54 16 E6
1149:C9 00 D0 24 AD 53 16 C9 5D
1151:00 D0 1D A9 2E 8D F8 07 86
1159:A0 00 8C C0 C1 20 2D 12 64
1161:20 74 12 EE C0 C1 AC C0 09
1169:C1 C0 82 D0 F0 4C F3 10 AA
1171:4C 06 10 A9 01 8D 15 D0 11
1179:CE 01 D0 20 2D 12 AD 01 6D
1181:D0 C9 FF 90 F3 A9 00 8D 5B
1189:15 D0 A9 00 8D 15 D0 EE F0
1191:50 16 AD 50 16 C9 05 F0 EE
1199:0B C9 0A F0 07 C9 0F F0 72
11A1:03 4C A8 11 EE F2 06 AD 7B
11A9:51 16 18 6D 53 16 8D 51 33
11B1:16 AD 52 16 6D 54 16 8D 6C
11B9:52 16 A9 51 A0 15 20 1E 8C
11C1:AB AE 51 16 AD 52 16 20 F3
11C9:CD BD A9 FF 8D 03 D0 8D 1F
11D1:05 D0 8D 07 D0 8D 09 D0 6C
11D9:8D 0B D0 8D 0D D0 8D 0F 4E
11E1:D0 A2 00 A0 00 BD F8 C0 C8
11E9:C9 08 F0 08 DE F8 C0 C8 B6
11F1:C0 04 90 F1 E8 E0 07 90 10
11F9:EA A9 FE 8D 00 D0 A9 01 4C
1201:8D 30 C0 A9 FF 8D 15 D0 DB
1209:A9 1D A0 15 20 1E AB AE 2E
1211:50 16 A9 00 20 CD BD A9 75
1219:27 8D F8 07 A9 E8 8D 53 23
1221:16 A9 03 8D 54 16 20 87 B6
1229:12 4C 0A 0E A0 00 8C 3A E3
1231:C7 A2 00 8E 39 C7 AD 8D 9C
1239:02 C9 01 F0 F9 C9 23 F0 2E
1241:09 C9 29 F0 05 A9 80 8D ED
1249:04 D4 AD 39 C7 C9 2F 90 42
1251:1A EE 39 C7 AD 39 C7 C9 8D
1259:FF 90 DB A9 20 8D 12 D4 E7
1261:EE 3A C7 AD 3A C7 C9 01 E4
1269:90 C7 60 A9 01 8D 38 C7 E4
1271:4C 06 10 AD C0 C1 C9 08 C2
1279:B0 06 A9 21 8D 12 D4 60 7D
1281:A9 20 8D 12 D4 60 A9 FF D0
1289:8D 01 D0 A9 01 8D 15 D0 A2
1291:A9 27 8D F8 07 CE 01 D0 DB
1299:20 2D 12 A9 FF ED 01 D0 80
12A1:8D 08 D4 A9 11 8D 0B D4 6D
12A9:AD 01 D0 C9 D5 D0 E6 A9 05
12B1:10 8D 0B D4 A9 FF 8D 05 5D
12B9:D0 8D 07 D0 8D 09 D0 8D 57
12C1:0B D0 8D 0D D0 8D 0F D0 CD
12C9:8D 15 D0 60 A9 FB A0 14 AC
12D1:20 1E AB 60 AE 02 C0 E8 F0
12D9:8E 02 C0 4C 2A 13 AE 02 9F
12E1:C0 E0 1B F0 01 60 A2 00 DF
12E9:8E 02 C0 AE 03 C0 E8 8E 54
12F1:03 C0 E0 0C F0 01 60 A2 93
12F9:00 8E 03 C0 AD F8 07 C9 57
1301:21 F0 26 C9 27 F0 44 C9 A4
1309:2E F0 40 AE F8 07 E8 E0 0C
1311:27 F0 0A E0 2D F0 0C 8E 2A
1319:F8 07 4C 4C 13 A2 22 8E C1
1321:F8 07 60 A2 28 8E F8 07 30
1329:60 AD F8 07 C9 29 F0 0C 5B
1331:C9 23 F0 08 A9 80 8D 04 12
1339:D4 4C DF 12 AD 03 C0 C9 BE
1341:01 B0 F1 A9 81 8D 04 D4 0C
1349:4C DF 12 A9 80 8D 04 D4 81
1351:60 20 20 20 20 20 05 C2 04
1359:20 20 20 A5 20 20 D9 20 4B
1361:20 20 C7 20 20 20 A5 20 87
1369:20 C8 20 20 20 A5 20 20 CF
1371:20 20 1E A7 B4 0D 00 20 E7
1379:20 20 20 20 05 C2 20 20 51
1381:20 A5 20 20 D9 20 20 20 D6
1389:C7 20 20 20 A5 20 20 C8 58
1391:20 20 20 A5 20 20 20 20 10
1399:1E A7 B4 00 12 97 20 20 9E
13A1:20 AA 9B 20 20 20 20 20 D9
13A9:20 20 20 20 20 20 20 20 CF
13B1:20 20 20 20 20 20 20 20 D7
13B9:20 20 20 20 97 A5 20 20 B1
13C1:20 92 1E B4 0D 00 13 11 4B
13C9:1D 1D 1D 1D 1D 1D 1D 1D EF
13D1:1D 1D 1D 1D 1D 1D 1D 1D F7
13D9:1D 1D 1D 1D 1D 1D 1D 1D FF
13E1:1D 1D 1D 1D 1D 1D 1D 1D 08
13E9:1D 1E B4 99 47 4F 49 4E AE
13F1:47 20 00 1E B4 99 55 50 AC
13F9:3F 20 20 20 00 1E CC AF 8F
1401:AF AF AF AF AF 00 1E B4 4C
1409:20 20 20 20 20 20 00 1E EE
1411:B4 99 53 43 4F 52 45 20 07
1419:00 1E B4 05 30 20 20 20 12
1421:20 20 00 1E B4 20 20 20 C9
1429:20 20 20 00 1E CF B7 B7 C4
1431:B7 B7 B7 B7 00 1E B4 99 11
1439:4C 45 56 45 4C 20 00 1E F8
1441:B4 05 31 20 20 20 20 20 0F
1449:00 1E CC AF AF AF AF AF D8
1451:AF 00 1E B4 20 20 20 20 42
1459:20 20 00 1E B4 99 42 4F 5B
1461:4E 55 53 20 00 1E B4 05 59
1469:31 30 30 30 20 20 00 1E DE
1471:B4 20 20 20 20 20 20 00 C3
1479:1E CF B7 B7 B7 B7 B7 B7 DA
1481:00 1E B4 99 4D 45 4E 20 9D
1489:20 20 00 1E B4 05 35 20 EF
1491:20 20 20 20 00 93 11 11 59
1499:11 11 11 11 20 20 20 20 A3
14A1:20 20 20 20 20 20 20 20 C9
14A9:20 20 20 05 47 4F 49 4E 96
14B1:47 20 55 50 3F 0D 20 20 C3
14B9:20 20 20 20 20 20 20 20 E1
14C1:20 20 20 20 20 1C B8 B8 A3
14C9:B8 B8 B8 B8 B8 B8 B8 0D 46
14D1:11 11 11 11 11 11 11 11 F9
14D9:11 11 9F 20 20 20 20 20 A6
14E1:20 20 20 20 20 50 52 45 54
14E9:53 53 20 46 49 52 45 20 37
14F1:54 4F 20 53 54 41 52 54 F1
14F9:0D 00 1D 1D 1D 1D 1D 1D D2
1501:1D 1D 1D 1D 1D 1D 1D 1D 2B
1509:1D 1D 1D 1D 1D 1D 1D 1D 33
1511:1D 1D 1D 1D 1D 1D 1D 1D 3B
1519:1D 1D 1D 00 13 11 11 11 CC
1521:11 11 11 11 11 11 11 1D 57
1529:1D 1D 1D 1D 1D 1D 1D 1D 53
1531:1D 1D 1D 1D 1D 1D 1D 1D 5B
1539:1D 1D 1D 1D 1D 1D 1D 1D 63
1541:1D 1D 1D 1D 1D 1D 1D 1D 6B
1549:1D 20 20 20 9D 9D 9D 00 AE
1551:13 11 11 11 11 11 11 1D 88
1559:1D 1D 1D 1D 1D 1D 1D 1D 83
1561:1D 1D 1D 1D 1D 1D 1D 1D 8B
1569:1D 1D 1D 1D 1D 1D 1D 1D 93
1571:1D 1D 1D 1D 1D 1D 1D 1D 9B
1579:1D 00 13 11 11 11 11 11 A5
1581:11 11 11 11 11 11 11 11 AB
1589:11 1D 1D 1D 1D 1D 1D 1D AD
1591:1D 1D 1D 1D 1D 1D 1D 1D BB
1599:1D 1D 1D 1D 1D 1D 1D 1D C3
15A1:1D 1D 1D 1D 1D 1D 1D 1D CB
15A9:1D 1D 1D 00 13 11 11 11 5D
15B1:11 11 11 11 11 11 11 11 E7
15B9:1D 1D 1D 1D 1D 1D 1D 1D E3
```

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15C1:96 A6 A6 A6 A6 A6 A6 A6 E3
15C9:A6 A6 A6 A6 A6 A6 A6 A6 F3
15D1:11 9D 9D 9D 9D 9D 9D 9D B5
15D9:9D 9D 9D 9D 9D 9D 9D 9D Ø4
15E1:A6 20 20 20 20 20 20 20 4F
15E9:20 20 20 20 20 20 A6 11 12
15F1:9D 9D 9D 9D 9D 9D 9D 9D 1C
15F9:9D 9D 9D 9D 9D 9D 9D A6 2D
16Ø1:20 20 Ø5 47 41 4D 45 20 44
16Ø9:4F 56 45 52 20 20 96 A6 95
1611:11 9D 9D 9D 9D 9D 9D 9D F6
1619:9D 9D 9D 9D 9D 9D 9D 9D 45
1621:A6 20 20 20 20 20 20 20 9Ø
1629:20 20 20 20 20 20 A6 11 53
1631:9D 9D 9D 9D 9D 9D 9D 9D 5D
1639:9D 9D 9D 9D 9D 9D 9D A6 6E
1641:A6 A6 A6 A6 A6 A6 A6 A6 6D
1649:A6 A6 A6 A6 A6 A6 ØØ Ø1 82
1651:ØØ ØØ E8 Ø3 ØØ ØØ ØØ ØØ CA
```

BEFORE TYPING . . .

Before typing in programs, please refer to "How To Type In COMPUTE!'s GAZETTE Programs," which appears before the Program Listings.

Disk Vacuum

Article on page 68.

```
DX 1Ø POKE5328Ø,6:POKE53281,6:
      PRINT"{CLR}"CHR$(14):DIM
      F$(144),MT$(144)
GK 2Ø PRINTSPC(13)"{9 DOWN}{8}
      DISK VACUUM"
ME 3Ø PRINTSPC(5)"{8 DOWN}
      {RVS}INSERT DISK AND PRE
      SS ANY KEY"
KD 4Ø POKE198,Ø:WAIT198,1:GETA
      $
RA 5Ø PRINT"{CLR}{8 DOWN}"SPC(
      11)"READING DIRECTORY"
HR 6Ø FORI=83ØTO899:READD:POKE
      I,D
EE 7Ø CS=CS+D:NEXT:IFCS<>9588T
      HEN PRINT"{2 DOWN}{RVS}E
      RROR{OFF} IN DATA STATEM
      ENTS":END
DB 8Ø FORI=ØTO144:F$(I)=CHR$(3
      2)+"{18 SPACES}":NEXT
JF 9Ø OPEN1,8,Ø,"$":SYS83Ø:CLO
      SE1:C=PEEK(Ø)-1
SA 1ØØ PRINT"{CLR}{7 DOWN}"SPC
       (5)"FILE NAME"SPC(11)"F
       ILE TYPE{2 DOWN}":X=Ø:F
       ORI=1TOC
AF 11Ø PRINT"{UP}{5 SPACES}
       {RVS}"LEFT$(F$(I),18)"
       {OFF}{7 SPACES}";:W$=MI
       D$(F$(I),18,1)
SG 12Ø FT$="PRG":IFW$="S"THENF
       T$="SEQ"
GF 13Ø IFW$="R"THENFT$="REL"
SX 14Ø IFW$="D"THENFT$="DEL"
JB 15Ø PRINTFT$:INPUT"{2 DOWN}
       {5 SPACES}DELETE THIS F
       ILE (Y/N){2 SPACES}N
       {3 LEFT}";TM$:IFTM$="N"
       THEN2ØØ
PD 16Ø X=X+1:L=3
DJ 17Ø CK$=RIGHT$(F$(I),L):IFL
       EFT$(CK$,1)>" "THEN19Ø
DX 18Ø L=L+1:GOTO17Ø
RF 19Ø MT$(X)=MID$(F$(I),1,2Ø-
       L):MT$(X)=MID$(MT$(X),2
       ,19-L)
AM 2ØØ PRINT"{4 UP}{16 SPACES}
       ":NEXT:PRINT"{UP}"SPC(1
       6)"{17 SPACES}"
RS 21Ø IFX=ØTHENPRINT"{UP}"SPC
       (11)"{RVS}NO
       {SHIFT-SPACE}FILES DELE
       TED{OFF}{5 SPACES}
       {4 DOWN}":END
AA 22Ø PRINT"{UP}"SPC(13)"
       {RVS}SCRATCHING...":OPE
       N15,8,15,"SØ:"+MT$(1):G
       OSUB31Ø
JG 23Ø IFX=1THEN25Ø
MG 24Ø FORI=2TOX:PRINT#15,"SØ:
       "+MT$(I):NEXT
EE 25Ø CLOSE15:PRINT"{UP}"SPC(
       12)"{RVS}VALIDATING DIS
       K{5 DOWN}":OPEN1,8,15,"
       VØ":CLOSE1:END
FQ 26Ø DATA 169,255,133,Ø,165,
       55,133,71,165,56,133,72
       ,162,1,32,198,255
EM 27Ø DATA 166,Ø,232,134,Ø,21
       6,56,165,71,233,2Ø,133,
       71,176,5,166,72,2Ø2
XS 28Ø DATA 134,72,32,2Ø7,255,
       164,144,2Ø8,22,2Ø1,34,2
       Ø8,245,16Ø,Ø,32
AE 29Ø DATA 2Ø7,255,2Ø1,34,24Ø
       ,249,145,71,2ØØ,192,19,
       2Ø8,242,24Ø,2Ø7,32
KB 3ØØ DATA 2Ø4,255,96
FE 31Ø INPUT#15,A,B$,C$,D$:IFA
       <2THENRETURN
JC 32Ø PRINT"{CLR}DISK ERROR #
       "A,B$:PRINT"{3 DOWN}"SP
       C(7)"{RVS}PRESS ANY KEY
        TO START OVER"
PS 33Ø POKE198,Ø:WAIT198,1:GET
       A$:RUN
```

Power BASIC:
Impatient INPUTs

Article on page 78.

```
HR 1Ø PRINT"WAIT..."
GH 2Ø A=PEEK(55)+256*PEEK(56)
EC 3Ø A=A-16Ø:HB=INT(A/256)
HE 4Ø POKE55,A-256*HB:POKE56,H
      B
QH 5Ø POKE766,A-256*HB:POKE767
      ,HB
DE 6Ø RESTORE:I=Ø:T=Ø
BF 7Ø READV:T=T+V:I=I+1:IFI<15
      9THEN7Ø
ME 8Ø IFT<>19491THENPRINT"ERRO
      R IN DATA":END
FH 9Ø RESTORE:I=Ø
DE 1ØØ READV:POKEA+I,V:I=I+1:I
       FI<159THEN1ØØ
QA 11Ø A=A+1ØØ:HB=INT(A/256):P
       OKE1Ø2Ø,76
BE 12Ø POKE1Ø21,A-256*HB:POKE1
       Ø22,HB
BD 13Ø PRINT"IMPATIENT INPUTS
       {SPACE}IN MEMORY":NEW
RJ 14Ø DATA72,138,72,152,72,19
       8,25Ø,2Ø8,79,169,6Ø,133
BC 15Ø DATA25Ø,165,252,141,24,
       212,165,251,141,38,216,
       141
AB 16Ø DATA39,216,169,32,141,3
       8,4,141,39,4,165,253
KE 17Ø DATA72,74,74,74,74,9,48
       ,2Ø1,48,24Ø,3,141
PG 18Ø DATA38,4,1Ø4,41,15,9,48
       ,141,39,4,169,Ø
RM 19Ø DATA141,24,212,165,253,
       248,56,233,1,133,253,21
       6
GS 2ØØ DATA2Ø1,153,2Ø8,12,162,
       Ø,134,254,232,134,198,1
       69
HX 21Ø DATA13,141,119,2,1Ø4,16
       8,1Ø4,17Ø,1Ø4,76,158,2
HE 22Ø DATA234,234,234,234,234
       ,234,173,2Ø,3,141,159,2
KM 23Ø DATA173,21,3,141,16Ø,2,
       165,253,24Ø,11,17Ø,248
EA 24Ø DATA169,Ø,24,1Ø5,1,2Ø2,
       2Ø8,25Ø,216,133,253,169
HQ 25Ø DATA1,133,25Ø,133,254,1
       69,76,141,158,2,12Ø,173
DM 26Ø DATA254,2,141,2Ø,3,173,
       255,2,141,21,3,88
QF 27Ø DATA96,Ø,Ø
```

Hi-Res Graphics On The 128

Article on page 70.

Hi-Res Graphics—Demo 1

```
XR 1Ø GRAPHIC1,1:REM ***PUTS S
      CREEN IN STANDARD BIT-MA
      P MODE
GP 2Ø SCALE1,1ØØØ,1ØØØ:REM ***
      SCALE SCREEN FOR X=1ØØØ,
      Y=1ØØØ***
SH 3Ø COLORØ,1:COLOR4,1:REM **
      *SET COLORS***
QQ 4Ø COLOR1,2:CHAR1,1,1,"3D B
      AR GRAPH":REM ***DISPLAY
       TITLE***
PK 5Ø COLOR1,7:TRAP7Ø:REM ***S
      ET ERROR TRAP FOR LINE 7
      Ø***
QJ 6Ø READV(I):I=I+1:GOTO6Ø
PB 7Ø I=Ø:C=Ø:X=Ø:REM ***PROGR
      AM COMES HERE WITH TRAP
CQ 8Ø DO:REM ***START LOOP***
EP 9Ø H=1ØØØ-V(C):REM ***DEFIN
      ES FIRST Y COORDINATE
KB 1ØØ BOX1,I*1ØØ,H,I*1ØØ+75,1
       ØØØ,,1:REM ***DRAWS MAI
       N BAR
SB 11Ø DRAW1,I*1ØØ,HTOI*1ØØ+3Ø
       ,H-5ØTOI*1ØØ+95,H-5ØTOI
       *1ØØ+95,1ØØØ:DRAW1,I*1Ø
       Ø+95,H-5ØTOI*1ØØ+75,H
CE 12Ø V$=STR$(V(C)):COLOR1,2:
       CHAR1,X,24,V$:X=X+4:COL
       OR1,7
MM 13Ø REM ***ADDS 3D SECTION
       {SPACE}AND PRINTS VALUE
       S***
SH 14Ø I=I+1:C=C+1:IFI=1ØTHENG
       ETKEYA$:GRAPHICØ:END:EL
       SE:LOOP
KA 15Ø DATA 6ØØ,3Ø,5ØØ,3Ø2,654
       ,345,865,345,123,543
XJ 16Ø REM ***YOU MAY PUT YOUR
        OWN VALUES IN FOR THE
       {SPACE}DATA***
```

Hi-Res Graphics—Demo 2

```
XR 1Ø GRAPHIC1,1:REM ***PUTS S
      CREEN IN STANDARD BIT-MA
      P MODE
XB 2Ø COLORØ,1:COLOR4,1:COLOR1
      ,7:REM ***SET COLORS***
AC 3Ø FORT=75TO1STEP-1Ø:REM **
      *SETS UP LOOP THAT DESCE
```

```
       NDS IN INCREMENTS OF 10*
       **
KA 40  CIRCLE1,160,100,T,60:REM
         ***DRAWS A CIRCLE AND S
       LOWLY SQUASHES IT
KQ 50  NEXTT
DH 60  FORT=60TO0STEP-10
DQ 70  CIRCLE1,160,100,75,T:REM
         ***DRAWS CIRCLE AND SQU
       ASHES IT***
MS 80  NEXTT
FE 90  GETKEYA$:GRAPHIC0
```

BEFORE TYPING . . .

Before typing in programs, please refer to "How To Type In COMPUTE!'s GAZETTE Programs," which appears before the Program Listings.

ML Base

See instructions in article on page 62 before typing in.

```
C000:A9 FF 8D 8B C6 8D 92 C6 19
C008:8D 45 C6 8D 4B C6 A9 00 1C
C010:A8 AA 99 A3 00 C8 C0 04 A6
C018:D0 F8 A0 01 20 73 00 C9 FC
C020:53 F0 03 4C EE C0 20 73 DA
C028:00 C9 B0 D0 26 8D 50 C2 0A
C030:20 E4 C0 20 73 00 C9 41 85
C038:D0 09 8D 51 C2 20 E4 C0 4C
C040:4C 80 C0 C9 44 F0 03 4C F4
C048:EE C0 8D 51 C2 20 E4 C0 59
C050:4C 80 C0 C9 45 F0 03 4C 0D
C058:EE C0 8D 50 C2 20 E4 C0 59
C060:20 73 00 C9 48 D0 0E 8D 9A
C068:51 C2 A9 60 8D B8 C3 20 75
C070:E4 C0 4C 80 C0 C9 4C F0 DC
C078:EE C9 45 F0 EA 4C EE C0 C2
C080:20 73 00 F0 69 C9 24 F0 A9
C088:0A C9 28 F0 1A 95 A3 E8 EC
C090:4C 80 C0 C0 03 F0 05 A9 0C
C098:53 8D 52 C2 B9 A3 00 49 43
C0A0:80 99 A3 00 4C B0 C0 C0 A4
C0A8:03 F0 05 A9 4E 8D 52 C2 33
C0B0:20 73 00 C9 29 D0 F9 20 5C
C0B8:73 00 F0 32 C9 2E F0 07 25
C0C0:C9 2C F0 14 4C EE C0 E0 12
C0C8:02 B0 05 A9 00 8D 53 C2 52
C0D0:20 73 00 D0 19 4C F3 C0 EE
C0D8:A9 43 8D 53 C2 A2 02 A0 2C
C0E0:03 4C 80 C0 20 73 00 F0 D2
C0E8:05 C9 2C D0 F7 60 A2 0B 83
C0F0:6C 00 03 A9 CE A0 C4 20 46
C0F8:8D C5 AD EE C5 8D 56 C2 2B
C100:8D 43 C6 AD ED C5 8D 57 C7
C108:C2 8D 49 C6 A9 A3 8D 34 11
C110:C1 A5 2F 85 AA A5 30 85 ED
C118:AB A0 00 A5 AA C5 31 D0 93
C120:10 A5 AB C5 32 D0 0A A9 79
C128:88 A0 C1 20 1E AB 4C 65 EF
C130:A4 B1 AA D9 A3 00 D0 33 57
C138:C8 C0 02 D0 F4 AD 53 C2 65
C140:C9 43 F0 06 20 5A C1 4C 32
C148:57 C1 AD 34 C1 C9 A5 F0 52
C150:06 20 5A C1 4C 63 C1 4C 06
C158:99 C1 A5 AA 85 FB A5 AB 8B
C160:85 FC 60 A9 A5 8D 34 C1 1A
C168:4C 11 C1 A0 02 B1 AA 8D 52
C170:7C C1 C8 B1 AA 8D 82 C1 29
C178:18 A5 AA 69 63 85 AA A5 89
C180:AB 69 63 85 AB 4C 19 C1 7B
C188:41 52 52 41 59 20 4E 4F D6
C190:54 20 46 4F 55 4E 44 20 90
C198:00 A9 FB 20 D7 C1 A9 FB 1D
C1A0:20 EB C1 8D 54 C2 A9 FB 3D
C1A8:20 10 C2 AD 53 C2 C9 43 EF
C1B0:D0 22 AD 52 C2 48 AD 3C CE
C1B8:03 48 A9 AA 20 D7 C1 A9 3D
C1C0:AA 20 EB C1 8D 55 C2 A9 2C
C1C8:AA 20 10 C2 68 8D 3C 03 CC
C1D0:68 8D 52 C2 4C 58 C2 8D 39
C1D8:DD C1 A0 01 B1 FB 10 05 82
C1E0:A9 53 4C E7 C1 A9 4E 8D F4
C1E8:52 C2 60 8D F4 C1 8D FF F4
C1F0:C1 A0 04 B1 FB 8D 0E C2 0E
C1F8:C9 01 F0 07 A0 08 B1 FB B4
C200:8D 0E C2 AE 52 C2 E0 53 C5
C208:F0 01 0A 0A 18 69 63 60 B5
C210:8D 19 C2 8D 20 C2 A0 04 25
C218:B1 FB 0A 18 69 05 AA A0 8D
C220:FB 18 20 26 C2 60 A9 E9 E4
C228:B0 02 A9 69 8D 43 C2 8D DE
C230:4B C2 8C 42 C2 8C 46 C2 59
C238:8C 4A C2 8C 4E C2 8E 44 96
C240:C2 A5 63 69 00 85 63 A2 13
C248:01 B5 63 69 00 95 63 60 3C
C250:EA EA EA EA EA EA EA EA D5
C258:AD 50 C2 C9 B0 D0 03 4C D8
C260:65 C2 4C F8 C3 AD 52 C2 9E
C268:C9 53 D0 03 4C CD C2 20 31
C270:78 C3 AD 51 C2 C9 41 F0 9E
C278:05 A9 FF 4C 80 C2 A9 01 13
C280:8D B3 C2 A5 FB 85 A6 18 C7
C288:6D 3C 03 48 A5 FC 85 A7 8C
C290:69 00 A8 68 20 A2 BB A5 0F
C298:AA 85 50 A5 AB 85 51 4C 9B
C2A0:B6 C2 A5 FB 18 6D 3C 03 98
C2A8:48 A5 FC 69 00 A8 68 20 85
C2B0:5B BC C9 01 F0 11 20 34 9C
C2B8:C6 90 09 20 82 C6 90 01 3A
C2C0:60 4C 83 C2 4C A2 C2 20 B8
C2C8:DA C3 4C 83 C2 AD 51 C2 A0
C2D0:C9 41 F0 05 A9 B0 4C DB 7E
C2D8:C2 A9 90 8D 48 C3 8D 3C BD
C2E0:C3 20 78 C3 AC 3C 03 B1 A9
C2E8:FB D0 08 20 34 C6 90 F4 76
C2F0:4C 57 C3 A2 00 B1 FB 95 69
C2F8:A3 C8 E8 E0 03 D0 F6 A5 9C
C300:FB 85 A6 A5 FC 85 A7 A5 09
C308:AA 85 50 A5 AB 85 51 4C 0D
C310:4A C3 AC 3C 03 B1 FB F0 CE
C318:31 C5 A3 90 02 A5 A3 8D A2
C320:32 C3 C8 B1 FB 8D 42 C3 44
C328:C8 B1 FB 8D 43 C3 A0 FF 43
C330:C8 C0 63 D0 0C AC 3C 03 54
C338:B1 FB C5 A3 90 1D 4C 4A 66
C340:C3 B9 AA AA D1 A4 F0 E8 04
C348:90 11 20 34 C6 90 09 20 4E
C350:82 C6 B0 03 4C E4 C2 60 EC
C358:4C 12 C3 20 DA C3 AC 3C 80
C360:03 A2 00 B1 FB 95 A3 E8 93
C368:C8 E0 03 D0 F6 A5 FB 85 C5
C370:A6 A5 FC 85 A7 4C 4A C3 73
C378:AD 53 C2 C9 43 D0 0D A5 BD
C380:AA 85 9B A5 AB 85 9C A9 E2
C388:EA 4C 8E C3 A9 60 8D B8 49
C390:C3 8D C6 C3 8D DA C3 8D 5F
C398:E4 C3 A5 FB 85 FD A5 FC 64
C3A0:85 FE AD 3C 03 8D B3 C3 9D
C3A8:AE 52 C2 E0 53 F0 01 0A EC
C3B0:0A 18 69 63 8D 3C 03 60 6A
C3B8:EA 18 A5 AA 6D 55 C2 85 E6
C3C0:AA 90 02 E6 AB 60 EA 18 3D
C3C8:A5 9B 6D 55 C2 85 9B 85 F5
C3D0:AA A5 9C 69 00 85 9C 85 16
C3D8:AB 60 EA A5 AA 85 50 A5 B7
C3E0:AB 85 51 60 EA A0 00 B1 5B
C3E8:9B 48 B1 50 91 9B 68 91 E8
C3F0:50 C8 CC 55 C2 D0 F0 60 5D
C3F8:AD 52 C2 C9 53 F0 03 4C 91
C400:87 C4 AD 51 C2 C9 45 F0 02
C408:03 4C EE C0 A9 53 A0 D2 BE
C410:20 8D C5 A0 00 B9 ED C5 58
C418:D0 03 4C A7 C5 8D 70 C4 D8
C420:C8 B9 ED C5 8D 5F C4 C8 D2
C428:B9 ED C5 8D 60 C4 20 E5 D7
C430:C4 90 03 4C 55 C5 AC 3C BC
C438:03 B1 FB F0 39 CD ED C5 E0
C440:90 34 ED ED C5 8D 67 C4 B3
C448:EE 67 C4 C8 B1 FB 8D 5C 3D
C450:C4 C8 B1 FB 8D 5D C4 A0 70
C458:00 A2 00 BD AA AA D9 AA C4
C460:AA F0 0A A0 00 E8 E0 63 8F
C468:B0 0C 4C 5B C4 E8 C8 C0 A8
C470:63 90 E8 20 F2 C5 EE 10 8B
C478:C6 D0 03 EE 0B C6 20 34 D0
C480:C6 90 01 60 4C 36 C4 AD 2A
C488:51 C2 C9 45 D0 08 A9 00 F2
C490:8D CB C4 4C A4 C4 C9 48 45
C498:D0 05 A9 FF 4C 90 C4 A9 D8
C4A0:01 4C 90 C4 20 E5 C4 90 CE
C4A8:03 4C 5C C5 A9 53 A0 52 DC
C4B0:20 8D C5 A9 ED A0 C5 20 9E
C4B8:A2 BB A5 FB 18 6D 3C 03 E8
C4C0:48 A5 FC 69 00 A8 68 20 A1
C4C8:5B BC C9 00 F0 03 4C D4 69
C4D0:C4 20 F2 C5 EE 10 C6 D0 95
C4D8:03 EE 0B C6 20 34 C6 90 5D
C4E0:01 60 4C BA C4 A0 00 8C 6D
C4E8:02 C6 8C FD C5 8C 0B C6 D3
C4F0:8C 10 C6 20 1C C6 B1 2F 2E
C4F8:C9 D2 F0 03 4C 55 C5 C8 76
C500:B1 2F C9 D0 F0 03 4C 55 F7
C508:C5 A5 2F 85 92 A5 30 85 2F
C510:93 A0 02 B1 2F 18 65 92 20
C518:8D 48 C5 C8 B1 2F 65 93 6A
C520:8D 4E C5 A0 92 A2 07 18 0E
C528:20 26 C2 A5 92 8D FF C5 90
C530:A5 93 8D 00 C6 A9 00 A8 AA
C538:91 92 C8 91 92 A0 92 A2 42
C540:02 18 20 26 C2 A5 92 C9 D4
C548:63 D0 08 A5 93 C9 63 D0 70
C550:02 38 60 18 60 A9 66 A0 8F
C558:C5 4C 60 C5 A9 7A A0 C5 80
C560:20 1E AB 4C 65 A4 52 50 70
C568:25 20 41 52 52 41 59 20 46
C570:4E 4F 54 20 46 4F 55 4E EB
C578:44 00 52 50 25 20 41 52 F3
C580:52 41 59 20 4F 56 45 52 63
C588:46 4C 4F 57 00 8D B5 C5 11
C590:8C BC C5 A5 2D 85 AA A5 1F
C598:2E 85 AB A5 AA C5 2F D0 08
C5A0:0D A5 AB C5 30 D0 07 A9 6A
C5A8:DA A0 C5 4C 60 C5 A0 00 A2
C5B0:A2 FF B1 AA C9 53 D0 13 BE
C5B8:C8 B1 AA C9 D2 D0 0C C8 C1
C5C0:E8 B1 AA 9D ED C5 E0 04 A8
C5C8:D0 F5 60 18 A5 AA 69 07 79
C5D0:85 AA 90 02 E6 AB 4C 9B 16
C5D8:C5 60 56 41 52 49 41 42 BA
C5E0:4C 45 20 4E 4F 54 20 46 1F
C5E8:4F 55 4E 44 00 EA EA EA EB
C5F0:EA EA EE 02 C6 D0 03 EE 19
C5F8:FD C5 A2 00 A9 63 9D AA 0A
C600:AA A9 63 E8 E0 02 D0 F6 EF
C608:A0 00 A9 63 91 92 C8 A9 63
C610:63 91 92 20 3D C5 90 03 2D
C618:4C 5C C5 60 AD 3C 03 F0 F6
C620:12 8D 2F C6 AE 52 C2 E0 91
C628:53 F0 01 0A 0A 18 69 63 43
C630:8D 3C 03 60 AD 00 04 8D FC
C638:68 C6 EE 45 C6 D0 03 EE 4C
C640:4B C6 A9 63 C9 63 D0 26 34
C648:A9 63 C9 63 D0 20 A9 FF 4D
C650:8D 45 C6 8D 4B C6 38 AD 3B
C658:43 C6 E9 01 8D 43 C6 AD 3B
C660:49 C6 E9 00 8D 49 C6 A9 4A
C668:63 8D 00 04 38 60 18 A5 64
C670:FB 8D 00 04 6D 54 C2 85 67
C678:FB 90 02 E6 FC 20 B8 C3 74
C680:18 60 EE 8B C6 D0 03 EE 37
C688:92 C6 A9 63 CD 56 C2 D0 9A
C690:09 A9 63 CD 57 C2 D0 02 BF
C698:38 60 20 E4 C3 A0 00 B1 FE
C6A0:FD 48 B1 A6 91 FD 68 91 C6
C6A8:A6 C8 CC 54 C2 D0 F0 18 ED
C6B0:A5 FD 6D 54 C2 85 FD 85 31
C6B8:FB A5 FE 69 00 85 FE 85 BD
C6C0:FC 20 C6 C3 18 60 FF FF 2C
C6C8:FF FF 00 00 00 00 00 00 56
```

Program 2: ML Base—Demo 1

```
KB 10 POKE 53280,12:POKE 53281
      ,12:PRINT"{CLR}{DOWN}
      {RIGHT}"
BA 20 IF X=1 THEN GOTO40:REM F
      LAG X PREVENTS RELOADING
       IN LINE 30
XR 30 X=1:LOAD "0:ML/BASE.OBJ"
      ,8,1
HB 40 INPUT "{RED}HOW MANY ENT
      RIES";N:N=N-1:PRINT"
      {BLK}";
HB 50 ND%=N:DIM RP%(N+2),N$(1,
      N),D(N)
BK 60 FOR I=0 TO N:FOR K=0 TO
      {SPACE}1
FG 70 IF K=0 THEN PRINT "
      {DOWN}NAME?
QC 80 IF K=1 THEN PRINT "
      {DOWN}ADDRESS?"
KH 90 INPUT N$(K,I)
AQ 100 NEXT K
PF 110 INPUT "{DOWN}SALARY";D(
       I)
JR 120 NEXT I
ED 130 RP(0)=0:INPUT"{DOWN}
       {RED}SORT OR SEARCH";S$
QA 140 IF S$="SORT" THEN170
AD 150 IF S$="SEARCH" THEN330
FQ 160 GOTO130
BS 170 INPUT "{DOWN}SORT BY NA
       ME, ADDRESS, OR SALARY"
       ;Q$
EK 180 INPUT "{DOWN}A OR D";AD
       $
AK 190 IF Q$<>"NAME" THEN230
RE 200 IF AD$="A" THEN X=0:GOS
       UB490
JB 210 IF AD$="D" THEN X=0:GOS
       UB500
XX 220 GOTO300
CC 230 IF Q$<>"ADDRESS" THEN27
       0
MA 240 IF AD$="A" THEN X=1:GOS
       UB490
HM 250 IF AD$="D" THEN X=1:GOS
       UB500
QC 260 GOTO300
AB 270 IF Q$<>"SALARY" THEN170
GH 280 IF AD$="A" THEN GOSUB51
       0
CD 290 IF AD$="D" THEN GOSUB52
       0
CC 300 PRINT"{CLR}{BLK}":FORI=
       0 TO N: FORK=0 TO 1:PRI
       NTN$(K,I),:NEXT K:PRINT
       D(I)
QD 310 PRINT:NEXT I
BM 320 GOTO580
DF 330 INPUT "{DOWN}SEARCH NAM
       E, ADDRESS OR SALARY";N
       A$
AG 340 IF NA$<>"NAME" THEN370
HJ 350 INPUT "{DOWN}WHAT NAME"
       ;SR$:X=0:GOSUB540
CP 360 GOTO450
DP 370 IF NA$<>"ADDRESS" THEN4
       00
XD 380 INPUT "{DOWN}WHAT ADDRE
       SS";SR$:X=1:GOSUB540
SS 390 GOTO450
DD 400 INPUT "{DOWN}WHAT SALAR
       Y $";SR
FR 410 INPUT "{DOWN}H,L OR E";
       EQ$
JM 420 IF EQ$="E" THEN GOSUB57
       0
KM 430 IF EQ$="H" THEN GOSUB55
       0
RH 440 IF EQ$="L" THEN GOSUB56
       0
HM 450 A=RP%(0): IF A=0 THEN P
       RINT "{DOWN}NOT FOUND":
       GOTO580
QA 460 PRINT"{CLR}{BLK}":FORI=
       1TOA:B=RP%(I):FOR K=0 T
       O 1:PRINT N$(K,B),:NEXT
        K:PRINT D(B)
KD 470 PRINT:NEXT I:GOTO580
MP 480 REM ***SORTS***
QH 490 POKE 828,X:SYS 49152:SO
       RT,A,N$(),D().:RETURN
PQ 500 POKE 828,X:SYS 49152:SO
       RT,D,N$(),D().:RETURN
GG 510 POKE 828,0:SYS 49152:SO
       RT,A,D(),N$().:RETURN
GA 520 POKE 828,0:SYS 49152:SO
       RT,D,D(),N$().:RETURN
CC 530 REM ***SEARCHES***
JE 540 POKE 828,X:SYS 49152:SE
       ARCH,E,N$().:RETURN
FC 550 POKE 828,0:SYS 49152:SE
       ARCH,H,D().:RETURN
SM 560 POKE 828,0:SYS 49152:SE
       ARCH,L,D().:RETURN
HG 570 POKE 828,0:SYS 49152:SE
       ARCH,E,D().:RETURN
JK 580 INPUT "{RED}ANOTHER OPE
       RATION? Y/N";AN$: IF AN
       $="Y" THEN130
```

Program 3: ML Base—Demo 2

```
BR 10 POKE 53280,15:POKE 53281
      ,15
DD 20 IF X=1 THEN GOTO40:REM F
      LAG X PREVENTS RELOADING
       IN LINE 20
XR 30 X=1:LOAD "0:ML/BASE.OBJ"
      ,8,1
AH 40 INPUT "{CLR}{BLU}{DOWN}H
      OW MANY RANDOM STRINGS";
      X
XC 50 PRINT"{4}"
KK 60 DIM N$(X):ND%=X
BC 70 FORI=1TOX:LN=INT(RND(0)*
      8)+1
RG 80 FORK=1 TO LN
RD 90 N$(I)=N$(I)+CHR$(INT(RND
      (0)*26+65))
AQ 100 NEXT K
FG 110 PRINT N$(I)+" ";:NEXT I
       :PRINT
SP 120 PRINT"{BLU}SORTING IN A
       SCENDING ORDER..{4}":B=
       TI
HM 130 POKE 828,0:SYS49152:SOR
       T,A,N$().
EK 140 B=TI-B
JM 150 FORI=0TO X:PRINTN$(I):N
       EXT:PRINT
JQ 160 PRINT:PRINT"{BLU}SECOND
       S TO SORT";X;"STRINGS=
       {LEFT}";B/60
```

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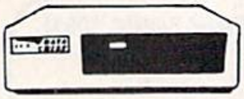

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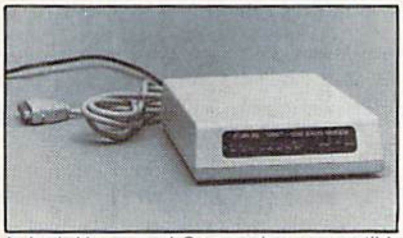

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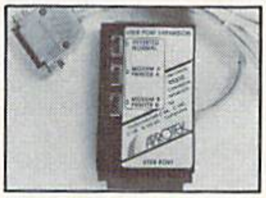

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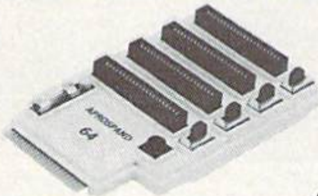

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How To Type In *COMPUTE!'s GAZETTE* Programs

Each month, COMPUTE!'s GAZETTE publishes programs for the Commodore 128, 64, Plus/4, 16, and VIC-20. Each program is clearly marked by title and version. Be sure to type in the correct version for your machine. All 64 programs run on the 128 in 64 mode. Be sure to read the instructions in the corresponding article. This can save time and eliminate any questions which might arise after you begin typing.

We frequently publish two programs designed to make typing easier: The Automatic Proofreader, and MLX, designed for entering machine language programs.

When entering a BASIC program, be especially careful with DATA statements as they are extremely sensitive to errors. A mistyped number in a DATA statement can cause your machine to "lock up" (you'll have no control over the computer). If this happens, the only recourse is to turn your computer off then back on, erasing whatever was in memory. So be sure to *save a copy of your program before you run it.* If your computer crashes, you can always reload the program and look for the error.

Special Characters

Most of the programs listed in each issue contain special control characters. To facilitate typing in any programs from the GAZETTE, use the following listing conventions.

The most common type of control characters in our listings appear as words within braces: {DOWN} means to press the cursor down key; {5 SPACES} means to press the space bar five times.

To indicate that a key should be *shifted* (hold down the SHIFT key while pressing another key), the character is underlined. For example, A means hold down the SHIFT key and press A. You may see strange characters on your screen, but that's to be expected. If you find a number followed by an underlined key enclosed in braces (for example, {8 A}), type the key as many times as indicated (in our example, enter eight SHIFTed A's).

If a key is enclosed in special brackets, Ɛ Ǝ, hold down the Commodore key (at the lower left corner of the keyboard) and press the indicated character.

Rarely, you'll see a single letter of the alphabet enclosed in braces. This can be entered on the Commodore 64 by pressing the CTRL key while typing the letter in braces. For example, {A} means to press CTRL-A.

The Quote Mode

Although you can move the cursor around the screen with the CRSR keys, often a programmer will want to move the cursor under program control. This is seen in examples such as {LEFT} and {HOME} in the program listings. The only way the computer can tell the difference between direct and programmed cursor control is *the quote mode.*

Once you press the quote key, you're in quote mode. This mode can be confusing if you mistype a character and cursor left to change it. You'll see a reverse video character (a graphics symbol for cursor left). In this case, you can use the DELete key to back up and edit the line. Type another quote and you're out of quote mode. If things really get confusing, you can exit quote mode simply by pressing RETURN. Then just cursor up to the mistyped line and fix it.

When You Read:	Press:	See:
{CLR}	SHIFT CLR/HOME	
{HOME}	CLR/HOME	
{UP}	SHIFT ↑ CRSR ↓	
{DOWN}	↑ CRSR ↓	
{LEFT}	SHIFT ← CRSR →	
{RIGHT}	← CRSR →	
{RVS}	CTRL 9	
{OFF}	CTRL 0	
{BLK}	CTRL 1	
{WHT}	CTRL 2	
{RED}	CTRL 3	
{CYN}	CTRL 4	

When You Read:	Press:	See:
{PUR}	CTRL 5	
{GRN}	CTRL 6	
{BLU}	CTRL 7	
{YEL}	CTRL 8	
{ F1 }	f1	
{ F2 }	SHIFT f1	
{ F3 }	f3	
{ F4 }	SHIFT f3	
{ F5 }	f5	
{ F6 }	SHIFT f5	
{ F7 }	f7	
{ F8 }	SHIFT f7	

When You Read:	Press:	See:
←	←	
↑	SHIFT ↑	

For Commodore 64 Only

When You Read:	Press:	See:
Ɛ 1 Ǝ	COMMODORE 1	
Ɛ 2 Ǝ	COMMODORE 2	
Ɛ 3 Ǝ	COMMODORE 3	
Ɛ 4 Ǝ	COMMODORE 4	
Ɛ 5 Ǝ	COMMODORE 5	
Ɛ 6 Ǝ	COMMODORE 6	
Ɛ 7 Ǝ	COMMODORE 7	
Ɛ 8 Ǝ	COMMODORE 8	

The Automatic Proofreader

Philip I. Nelson, Assistant Editor

"The Automatic Proofreader" helps you type in program listings for the 128, 64, Plus/4, 16, and VIC-20 and prevents nearly every kind of typing mistake.

Type in the Proofreader *exactly* as listed. Since the program can't check itself, type carefully to avoid mistakes. Don't omit any lines, even if they contain unfamiliar commands. After finishing, save a copy or two on disk or tape before running it. This is important because the Proofreader erases the BASIC portion of itself when you run it, leaving only the machine language portion in memory.

Next, type RUN and press RETURN. After announcing which computer it's running on, the Proofreader displays the message "Proofreader Active". Now you're ready to type in a BASIC program.

Every time you finish typing a line and press RETURN, the Proofreader displays a two-letter checksum in the upper-left corner of the screen. Compare this result with the two-letter checksum printed to the left of the line in the program listing. If the letters match, it's almost certain the line was typed correctly. If the letters don't match, check for your mistake and correct the line.

The Proofreader ignores spaces not enclosed in quotes, so you can omit or add spaces between keywords and still see a matching checksum. However, since spaces inside quotes are almost always significant, the Proofreader pays attention to them. For example, **10 PRINT"THIS IS BASIC"** will generate a different checksum than **10 PRINT"THIS ISBA SIC"**.

A common typing error is transposition—typing two successive characters in the wrong order, like PIRNT instead of PRINT or 64378 instead of 64738. The Proofreader is sensitive to the *position* of each character within the line and thus catches transposition errors.

The Proofreader does *not* accept keyword abbreviations (for example, ? instead of PRINT). If you prefer to use abbreviations, you can still check the line by LISTing it after typing it in, moving the cursor back to the line, and pressing RETURN. LISTing the line substitutes the full keyword for the abbreviation and allows the Proofreader to work properly. The same technique works for rechecking programs you've already typed in.

If you're using the Proofreader on the Commodore 128, Plus/4, or 16, *do not perform any GRAPHIC commands while the Proofreader is active.* When you perform a command like GRAPHIC 1, the computer moves everything at the start of BASIC program space—including the Proofreader—to another memory area, causing the Proofreader to crash. The same thing happens if you *run* any program with a GRAPHIC command while the Proofreader is in memory.

Though the Proofreader doesn't interfere with other BASIC operations, it's a good idea to disable it before running another program. However, the Proofreader is purposely difficult to dislodge: It's not affected by tape or disk operations, or by pressing RUN/STOP–RESTORE. The simplest way to disable it is to turn the computer off then on. A gentler method is to SYS to the computer's built-in reset routine (SYS 65341 for the 128, 64738 for the 64, 65526 for the Plus/4 and 16, and 64802 for the VIC). These reset routines erase any program in memory, so be sure to save the program you're typing in before entering the SYS command.

If you own a Commodore 64, you may already have wondered whether the Proofreader works with other programming utilities like "MetaBASIC." The answer is generally yes, *if you're using a 64 and activate the Proofreader after installing the other utility.* For example, first load and activate MetaBASIC, then load and run the Proofreader.

When using the Proofreader with another utility, you should disable *both* programs before running a BASIC program. While the Proofreader seems unaffected by most utilities, there's no way to promise that it will work with any and every combination of utilities you might want to use. The more utilities activated, the more fragile the system becomes.

The New Automatic Proofreader

```
10 VEC=PEEK(772)+256*PEEK(773):LO=43:HI=44
20 PRINT "AUTOMATIC PROOFREADER FOR ";:IF VEC=42364 THEN {SPACE}PRINT "C-64"
30 IF VEC=50556 THEN PRINT "VIC-20"
40 IF VEC=35158 THEN GRAPHIC CLR:PRINT "PLUS/4 & 16"
50 IF VEC=17165 THEN LO=45:HI=46:GRAPHIC CLR:PRINT"128"
60 SA=(PEEK(LO)+256*PEEK(HI))+6:ADR=SA
70 FOR J=0 TO 166:READ BYT:POKE ADR,BYT:ADR=ADR+1:CHK=CHK+BYT:NEXT
80 IF CHK<>20570 THEN PRINT "*ERROR* CHECK TYPING IN DATA STATEMENTS":END
90 FOR J=1 TO 5:READ RF,LF,HF:RS=SA+RF:HB=INT(RS/256):LB=RS-(256*HB)
100 CHK=CHK+RF+LF+HF:POKE SA+LF,LB:POKE SA+HF,HB:NEXT
110 IF CHK<>22054 THEN PRINT "*ERROR* RELOAD PROGRAM AND {SPACE}CHECK FINAL LINE":END
120 POKE SA+149,PEEK(772):POKE SA+150,PEEK(773)
130 IF VEC=17165 THEN POKE SA+14,22:POKE SA+18,23:POKESA+29,224:POKESA+139,224
140 PRINT CHR$(147);CHR$(17);"PROOFREADER ACTIVE":SYS SA
150 POKE HI,PEEK(HI)+1:POKE (PEEK(LO)+256*PEEK(HI))-1,0:NEW
160 DATA 120,169,73,141,4,3,169,3,141,5,3
170 DATA 88,96,165,20,133,167,165,21,133,168,169
180 DATA 0,141,0,255,162,31,181,199,157,227,3
190 DATA 202,16,248,169,19,32,210,255,169,18,32
200 DATA 210,255,160,0,132,180,132,176,136,230,180
210 DATA 200,185,0,2,240,46,201,34,208,8,72
220 DATA 165,176,73,255,133,176,104,72,201,32,208
230 DATA 7,165,176,208,3,104,208,226,104,166,180
240 DATA 24,165,167,121,0,2,133,167,165,168,105
250 DATA 0,133,168,202,208,239,240,202,165,167,69
260 DATA 168,72,41,15,168,185,211,3,32,210,255
270 DATA 104,74,74,74,74,168,185,211,3,32,210
280 DATA 255,162,31,189,227,3,149,199,202,16,248
290 DATA 169,146,32,210,255,76,86,137,65,66,67
300 DATA 68,69,70,71,72,74,75,77,80,81,82,83,88
310 DATA 13,2,7,167,31,32,151,116,117,151,128,129,167,136,137
```

MLX Machine Language Entry Program For Commodore 64

Ottis Cowper, Technical Editor

"MLX" is a labor-saving utility that allows almost fail-safe entry of Commodore 64 machine language programs.

Type in and save some copies of MLX—you'll want to use it to enter future ML programs from COMPUTE!'s GAZETTE. When you're ready to enter an ML program, load and run MLX. It asks you for a starting address and an ending address. These addresses appear in the article accompanying the MLX-format program listing you're typing.

If you're unfamiliar with machine language, the addresses (and all other values you enter in MLX) may appear strange. Instead of the usual decimal numbers you're accustomed to, these numbers are in *hexadecimal*—a base 16 numbering system commonly used by ML programmers. Hexadecimal—hex for short—includes the numerals 0–9 and the letters A–F. But don't worry—even if you know nothing about ML or hex, you should have no trouble using MLX.

After you enter the starting and ending addresses, you'll be offered the option of clearing the workspace. Choose this option if you're starting to enter a new listing. If you're continuing a listing that's partially typed from a previous session, don't choose this option.

A functions menu will appear. The first option in the menu is ENTER DATA. If you're just starting to type in a program, pick this. Press the E key, and type the first number in the first line of the program listing. If you've already typed in part of a program, type the line number where you left off typing at the end of the previous session (be sure to load the partially completed program before you resume entry). In any case, make sure the address you enter corresponds to the address of a line in the listing you are entering. Otherwise, you'll be unable to enter the data correctly. If you pressed E by mistake, you can return to the command menu by pressing RETURN alone when asked for the address. (You can get back to the menu from most options by pressing RETURN with no other input.)

Entering A Listing

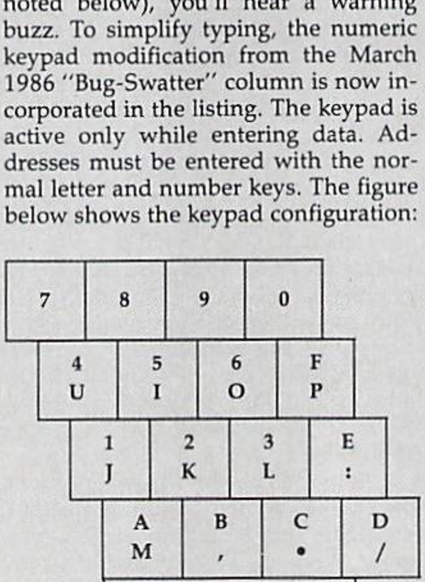
Once you're in Enter mode, MLX prints the address for each program line for you. You then type in all nine numbers on that line, beginning with the first two-digit number after the colon (:). Each line represents eight data bytes and a checksum. Although an MLX-format listing appears similar to the "hex dump" listings from a machine language monitor program, the extra checksum number on the end allows MLX to check your typing.

When you enter a line, MLX recalculates the checksum from the eight bytes and the address and compares this value to the number from the ninth column. If the values match, you'll hear a bell tone, the data will be added to the workspace area, and the prompt for the next line of data will appear. But if MLX detects a typing error, you'll hear a low buzz and see an error message. The line will then be redisplayed for editing.

Invalid Characters Banned

Only a few keys are active while you're entering data, so you may have to unlearn some habits. You *do not* type spaces between the columns; MLX automatically inserts these for you. You *do not* press RETURN after typing the last number in a line; MLX automatically enters and checks the line after you type the last digit.

Only the numerals 0–9 and the letters A–F can be typed in. If you press any other key (with some exceptions noted below), you'll hear a warning buzz. To simplify typing, the numeric keypad modification from the March 1986 "Bug-Swatter" column is now incorporated in the listing. The keypad is active only while entering data. Addresses must be entered with the normal letter and number keys. The figure below shows the keypad configuration:



MLX checks for transposed characters. If you're supposed to type in A0 and instead enter 0A, MLX will catch your mistake. There is one error that can slip past MLX: Because of the checksum formula used, MLX won't notice if you accidentally type FF in place of 00, and vice versa. And there's a very slim chance that you could garble a line and still end up with a combination of characters that adds up to the proper checksum. However, these mistakes should not occur if you take reasonable care while entering data.

Editing Features

To correct typing mistakes before finishing a line, use the INST/DEL key to delete the character to the left of the cursor. (The cursor-left key also deletes.) If you mess up a line really badly, press CLR/HOME to start the line over. The RETURN key is also active, but only before any data is typed on a line. Pressing RETURN at this point returns you to the command menu. After you type a character of data, MLX disables RETURN until the cursor returns to the start of a line. Remember, you can press CLR/HOME to quickly get to a line number prompt.

More editing features are available when correcting lines in which MLX has detected an error. To make corrections in a line that MLX has redisplayed for editing, compare the line on the screen with the one printed in the listing, then move the cursor to the mistake and type the correct key. The cursor left and right keys provide the normal cursor controls. (The INST/DEL key now works as an alternative cursor-left key.) You cannot move left beyond the first character in the line. If you try to move beyond the rightmost character, you'll reenter the line. During editing, RETURN is active; pressing it tells MLX to recheck the line. You can press the CLR/HOME key to clear the entire line if you want to start from scratch, or if you want to get to a line number prompt to use RETURN to get back to the menu.

Display Data

The second menu choice, DISPLAY DATA, examines memory and shows the contents in the same format as the program listing (including the checksum). When you press D, MLX asks you for a starting address. Be sure that the starting address you give corresponds to a line number in the listing. Otherwise, the checksum display will be meaningless. MLX displays program lines until it reaches the end of the program, at which point the menu is redisplayed. You can pause the display by pressing the space bar. (MLX finishes printing the current line before halting.) Press space again to restart the display. To break out of the display and get back to the menu before the ending address is reached, press RETURN.

Other Menu Options

Two more menu selections let you save programs and load them back into the computer. These are SAVE FILE and LOAD FILE; their operation is quite straightforward. When you press S or L, MLX asks you for the filename. You'll then be asked to press either D or T to select disk or tape.

You'll notice the disk drive starting and stopping several times during a load or save. Don't panic; this is normal behavior. MLX opens and reads from or writes to the file instead of using the usual LOAD and SAVE commands. Disk users should also note that the drive prefix 0: is automatically added to the filename (line 750), so this should *not* be included when entering the name. This also precludes the use of @ for Save-with-Replace, so remember to give each version you save a different name.

Remember that MLX saves the entire workspace area from the starting address to the ending address, so the save or load may take longer than you might expect if you've entered only a small amount of data from a long listing. When saving a partially completed listing, make sure to note the address where you stopped typing so you'll know where to resume entry when you reload.

MLX reports the standard disk or tape error messages if any problems are detected during the save or load. (Tape users should bear in mind that Commodore computers are never able to detect errors during a save to tape.) MLX also has three special load error messages: INCORRECT STARTING ADDRESS, which means the file you're trying to load does not have the starting address you specified when you ran MLX; LOAD ENDED AT *address*, which means the file you're trying to load ends before the ending address you specified when you started MLX; and TRUNCATED AT ENDING ADDRESS, which means the file you're trying to load extends beyond the ending address you specified when you started MLX. If you see one of these messages and feel certain that you've loaded the right file, exit and rerun MLX, being careful to enter the correct starting and ending addresses.

The QUIT menu option has the obvious effect—it stops MLX and enters BASIC. The RUN/STOP key is disabled, so the Q option lets you exit the program without turning off the computer. (Of course, RUN/STOP–RESTORE also gets you out.) You'll be asked for verification; press Y to exit to BASIC, or any other key to return to the menu. After quitting, you can type RUN again and reenter MLX without losing your data, as long as you don't use the clear workspace option.

The Finished Product

When you've finished typing all the data for an ML program and saved your work, you're ready to see the results. The instructions for loading and using the finished product vary from program to program. Some ML programs are designed to be loaded and run like BASIC programs, so all you need to type is LOAD *"filename"*,8 for disk or LOAD *"filename"* for tape, and then RUN. Such programs will usually have a starting address of 0801 for the 64. Other programs must be reloaded to specific addresses with a command such as LOAD *"filename"*,8,1 for disk or LOAD *"filename"*,1,1 for tape, then started with a SYS to a particular memory address. On the Commodore 64, the most common starting address for such programs is 49152, which corresponds to MLX address C000. In either case, you should always refer to the article which accompanies the ML listing for information on loading and running the program.

An Ounce Of Prevention

By the time you finish typing in the data for a long ML program, you may have several hours invested in the project. Don't take chances—use our "Automatic Proofreader" to type the new MLX, and then test your copy *thoroughly* before first using it to enter any significant amount of data. Make sure all the menu options work as they should. Enter fragments of the program starting at several different addresses, then use the Display option to verify that the data has been entered correctly. And be sure to test the Save and Load options several times to insure that you can recall your work from disk or tape. Don't let a simple typing error in the new MLX cost you several nights of hard work.

MLX For Commodore 64

```
SS 10 REM VERSION 1.1: LINES 8
      30,950 MODIFIED, LINES 4
      85-487 ADDED
EK 100 POKE 56,50:CLR:DIM IN$,
       I,J,A,B,A$,B$,A(7),N$
DM 110 C4=48:C6=16:C7=7:Z2=2:Z
       4=254:Z5=255:Z6=256:Z7=
       127
CJ 120 FA=PEEK(45)+Z6*PEEK(46)
       :BS=PEEK(55)+Z6*PEEK(56
       ):H$="0123456789ABCDEF"
SB 130 R$=CHR$(13):L$="{LEFT}"
       :S$=" ":D$=CHR$(20):Z$=
       CHR$(0):T$="{13 RIGHT}"
CQ 140 SD=54272:FOR I=SD TO SD
       +23:POKE I,0:NEXT:POKE
       {SPACE}SD+24,15:POKE 78
       8,52
FC 150 PRINT"{CLR}"CHR$(142)CH
       R$(8):POKE 53280,15:POK
       E 53281,15
EJ 160 PRINT T$" {RED}{RVS}
       {2 SPACES}{8 @}
       {2 SPACES}"SPC(28)"
       {2 SPACES}{OFF}{BLU} ML
       X II {RED}{RVS}
       {2 SPACES}"SPC(28)"
       {12 SPACES}{BLU}"
FR 170 PRINT"{3 DOWN}
       {3 SPACES}COMPUTE!'S MA
       CHINE LANGUAGE EDITOR
       {3 DOWN}"
JB 180 PRINT"{BLK}STARTING ADD
       RESS{4}";:GOSUB300:SA=A
       D:GOSUB1040:IF F THEN18
       0
GF 190 PRINT"{BLK}{2 SPACES}EN
       DING ADDRESS{4}";:GOSUB
       300:EA=AD:GOSUB1030:IF
       {SPACE}F THEN190
KR 200 INPUT"{3 DOWN}{BLK}CLEA
       R WORKSPACE [Y/N]{4}";A
       $:IF LEFT$(A$,1)<>"Y"TH
       EN220
PG 210 PRINT"{2 DOWN}{BLU}WORK
       ING...";:FORI=BS TO BS+
       EA-SA+7:POKE I,0:NEXT:P
       RINT"DONE"
DR 220 PRINTTAB(10)"{2 DOWN}
       {BLK}{RVS} MLX COMMAND
       {SPACE}MENU {DOWN}{4}":
       PRINT T$"{RVS}E{OFF}NTE
       R DATA"
BD 230 PRINT T$"{RVS}D{OFF}ISP
       LAY DATA":PRINT T$"
       {RVS}L{OFF}OAD FILE"
JS 240 PRINT T$"{RVS}S{OFF}AVE
        FILE":PRINT T$"{RVS}Q
       {OFF}UIT{2 DOWN}{BLK}"
JH 250 GET A$:IF A$=N$ THEN250
HK 260 A=0:FOR I=1 TO 5:IF A$=
       MID$("EDLSQ",I,1)THEN A
       =I:I=5
FD 270 NEXT:ON A GOTO420,610,6
       90,700,280:GOSUB1060:GO
       TO250
EJ 280 PRINT"{RVS} QUIT ":INPU
       T"{DOWN}{4}ARE YOU SURE
        [Y/N]";A$:IF LEFT$(A$,
       1)<>"Y"THEN220
EM 290 POKE SD+24,0:END
JX 300 IN$=N$:AD=0:INPUTIN$:IF
       LEN(IN$)<>4THENRETURN
KF 310 B$=IN$:GOSUB320:AD=A:B$
       =MID$(IN$,3):GOSUB320:A
       D=AD*256+A:RETURN
PP 320 A=0:FOR J=1 TO 2:A$=MID
       $(B$,J,1):B=ASC(A$)-C4+
       (A$>"@")*C7:A=A*C6+B
JA 330 IF B<0 OR B>15 THEN AD=
       0:A=-1:J=2
GX 340 NEXT:RETURN
CH 350 B=INT(A/C6):PRINT MID$(
       H$,B+1,1);:B=A-B*C6:PRI
       NT MID$(H$,B+1,1);:RETU
       RN
RR 360 A=INT(AD/Z6):GOSUB350:A
       =AD-A*Z6:GOSUB350:PRINT
       ":";
BE 370 CK=INT(AD/Z6):CK=AD-Z4*
       CK+Z5*(CK>Z7):GOTO390
PX 380 CK=CK*Z2+Z5*(CK>Z7)+A
```

```
JC 390 CK=CK+Z5*(CK>Z5):RETURN
QS 400 PRINT"{DOWN}STARTING AT
       E4}";:GOSUB300:IF IN$<>
       N$ THEN GOSUB1030:IF F
       {SPACE}THEN400
EX 410 RETURN
HD 420 PRINT"{RVS} ENTER DATA
       {SPACE}":GOSUB400:IF IN
       $=N$ THEN220
JK 430 OPEN3,3:PRINT
SK 440 POKE198,0:GOSUB360:IF F
        THEN PRINT IN$:PRINT"
       {UP}{5 RIGHT}";
GC 450 FOR I=0 TO 24 STEP 3:B$
       =S$:FOR J=1 TO 2:IF F T
       HEN B$=MID$(IN$,I+J,1)
HA 460 PRINT"{RVS}"B$L$;:IF I<
       24THEN PRINT"{OFF}";
HD 470 GET A$:IF A$=N$ THEN470
FK 480 IF(A$>"/"ANDA$<":")OR(A
       $>"@"ANDA$<"G")THEN540
GS 485 A=-(A$="M")-2*(A$=",")-
       3*(A$=".")-4*(A$="/")-5
       *(A$="J")-6*(A$="K")
FX 486 A=A-7*(A$="L")-8*(A$=":
       ")-9*(A$="U")-10*(A$="I
       ")-11*(A$="O")-12*(A$="
       P")
CM 487 A=A-13*(A$=S$):IF A THE
       N A$=MID$("ABCD123E456F
       0",A,1):GOTO 540
MP 490 IF A$=R$ AND((I=0)AND(J
       =1)OR F)THEN PRINT B$;:
       J=2:NEXT:I=24:GOTO550
KC 500 IF A$="{HOME}" THEN PRI
       NT B$:J=2:NEXT:I=24:NEX
       T:F=0:GOTO440
MX 510 IF(A$="{RIGHT}")ANDF TH
       ENPRINT B$L$;:GOTO540
GK 520 IF A$<>L$ AND A$<>D$ OR
       ((I=0)AND(J=1))THEN GOS
       UB1060:GOTO470
HG 530 A$=L$+S$+L$:PRINT B$L$;
       :J=2-J:IF J THEN PRINT
       {SPACE}L$;:I=I-3
QS 540 PRINT A$;:NEXT J:PRINT
       {SPACE}S$;
PM 550 NEXT I:PRINT:PRINT"{UP}
       {5 RIGHT}";:INPUT#3,IN$
       :IF IN$=N$ THEN CLOSE3:
       GOTO220
QC 560 FOR I=1 TO 25 STEP3:B$=
       MID$(IN$,I):GOSUB320:IF
        I<25 THEN GOSUB380:A(I
       /3)=A
PK 570 NEXT:IF A<>CK THEN GOSU
       B1060:PRINT"{BLK}{RVS}
       {SPACE}ERROR: REENTER L
       INE E4}":F=1:GOTO440
HJ 580 GOSUB1080:B=BS+AD-SA:FO
       R I=0 TO 7:POKE B+I,A(I
       ):NEXT
QQ 590 AD=AD+8:IF AD>EA THEN C
       LOSE3:PRINT"{DOWN}{BLU}
       ** END OF ENTRY **{BLK}
       {2 DOWN}":GOTO700
GQ 600 F=0:GOTO440
QA 610 PRINT"{CLR}{DOWN}{RVS}
       {SPACE}DISPLAY DATA ":G
       OSUB400:IF IN$=N$ THEN2
       20
RJ 620 PRINT"{DOWN}{BLU}PRESS:
        {RVS}SPACE{OFF} TO PAU
       SE, {RVS}RETURN{OFF} TO
        BREAKE4}{DOWN}"
KS 630 GOSUB360:B=BS+AD-SA:FOR
       I=BTO B+7:A=PEEK(I):GOS
       UB350:GOSUB380:PRINT S$
       ;
CC 640 NEXT:PRINT"{RVS}";:A=CK
       :GOSUB350:PRINT
KH 650 F=1:AD=AD+8:IF AD>EA TH
       ENPRINT"{DOWN}{BLU}** E
       ND OF DATA **":GOTO220
KC 660 GET A$:IF A$=R$ THEN GO
       SUB1080:GOTO220
EQ 670 IF A$=S$ THEN F=F+1:GOS
       UB1080
AD 680 ONFGOTO630,660,630
CM 690 PRINT"{DOWN}{RVS} LOAD
       {SPACE}DATA ":OP=1:GOTO
       710
PC 700 PRINT"{DOWN}{RVS} SAVE
       {SPACE}FILE ":OP=0
RX 710 IN$=N$:INPUT"{DOWN}FILE
       NAMEE4}";IN$:IF IN$=N$
       {SPACE}THEN220
PR 720 F=0:PRINT"{DOWN}{BLK}
       {RVS}T{OFF}APE OR {RVS}
       D{OFF}ISK: E4}";
FP 730 GET A$:IF A$="T"THEN PR
       INT"T{DOWN}":GOTO880
HQ 740 IF A$<>"D"THEN730
HH 750 PRINT"D{DOWN}":OPEN15,8
       ,15,"I0:":B=EA-SA:IN$="
       0:"+IN$:IF OP THEN810
SQ 760 OPEN 1,8,8,IN$+",P,W":G
       OSUB860:IF A THEN220
FJ 770 AH=INT(SA/256):AL=SA-(A
       H*256):PRINT#1,CHR$(AL)
       ;CHR$(AH);
PE 780 FOR I=0 TO B:PRINT#1,CH
       R$(PEEK(BS+I));:IF ST T
       HEN800
FC 790 NEXT:CLOSE1:CLOSE15:GOT
       O940
GS 800 GOSUB1060:PRINT"{DOWN}
       {BLK}ERROR DURING SAVE:
       E4}":GOSUB860:GOTO220
MA 810 OPEN 1,8,8,IN$+",P,R":G
       OSUB860:IF A THEN220
GE 820 GET#1,A$,B$:AD=ASC(A$+Z
       $)+256*ASC(B$+Z$):IF AD
       <>SA THEN F=1:GOTO850
RX 830 FOR I=0 TO B:GET#1,A$:P
       OKE BS+I,ASC(A$+Z$):IF(
       I<>B)AND ST THEN F=2:AD
       =I:I=B
FA 840 NEXT:IF ST<>64 THEN F=3
FQ 850 CLOSE1:CLOSE15:ON ABS(F
       >0)+1 GOTO960,970
SA 860 INPUT#15,A,A$:IF A THEN
        CLOSE1:CLOSE15:GOSUB10
       60:PRINT"{RVS}ERROR: "A
       $
GQ 870 RETURN
EJ 880 POKE183,PEEK(FA+2):POKE
       187,PEEK(FA+3):POKE188,
       PEEK(FA+4):IFOP=0THEN92
       0
HJ 890 SYS 63466:IF(PEEK(783)A
       ND1)THEN GOSUB1060:PRIN
       T"{DOWN}{RVS} FILE NOT
       {SPACE}FOUND ":GOTO690
CS 900 AD=PEEK(829)+256*PEEK(8
       30):IF AD<>SA THEN F=1:
       GOTO970
SC 910 A=PEEK(831)+256*PEEK(83
       2)-1:F=F-2*(A<EA)-3*(A>
       EA):AD=A-AD:GOTO930
KM 920 A=SA:B=EA+1:GOSUB1010:P
       OKE780,3:SYS 63338
JF 930 A=BS:B=BS+(EA-SA)+1:GOS
       UB1010:ON OP GOTO950:SY
       S 63591
AE 940 GOSUB1080:PRINT"{BLU}**
        SAVE COMPLETED **":GOT
       O220
XP 950 POKE147,0:SYS 63562:IF
       {SPACE}ST>0 THEN970
FR 960 GOSUB1080:PRINT"{BLU}**
        LOAD COMPLETED **":GOT
       O220
DP 970 GOSUB1060:PRINT"{BLK}
       {RVS}ERROR DURING LOAD:
       {DOWN}E4}":ON F GOSUB98
       0,990,1000:GOTO220
PP 980 PRINT"INCORRECT STARTIN
       G ADDRESS (";:GOSUB360:
       PRINT")":RETURN
GR 990 PRINT"LOAD ENDED AT ";:
       AD=SA+AD:GOSUB360:PRINT
       D$:RETURN
FD 1000 PRINT"TRUNCATED AT END
        ING ADDRESS":RETURN
RX 1010 AH=INT(A/256):AL=A-(AH
        *256):POKE193,AL:POKE1
        94,AH
FF 1020 AH=INT(B/256):AL=B-(AH
        *256):POKE174,AL:POKE1
        75,AH:RETURN
FX 1030 IF AD<SA OR AD>EA THEN
        1050
HA 1040 IF(AD>511 AND AD<40960
        )OR(AD>49151 AND AD<53
        248)THEN GOSUB1080:F=0
        :RETURN
HC 1050 GOSUB1060:PRINT"{RVS}
        {SPACE}INVALID ADDRESS
         {DOWN}{BLK}":F=1:RETU
        RN
AR 1060 POKE SD+5,31:POKE SD+6
        ,208:POKE SD,240:POKE
        {SPACE}SD+1,4:POKE SD+
        4,33
DX 1070 FOR S=1 TO 100:NEXT:GO
        TO1090
PF 1080 POKE SD+5,8:POKE SD+6,
        240:POKE SD,0:POKE SD+
        1,90:POKE SD+4,17
AC 1090 FOR S=1 TO 100:NEXT:PO
        KE SD+4,0:POKE SD,0:PO
        KE SD+1,0:RETURN
```

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