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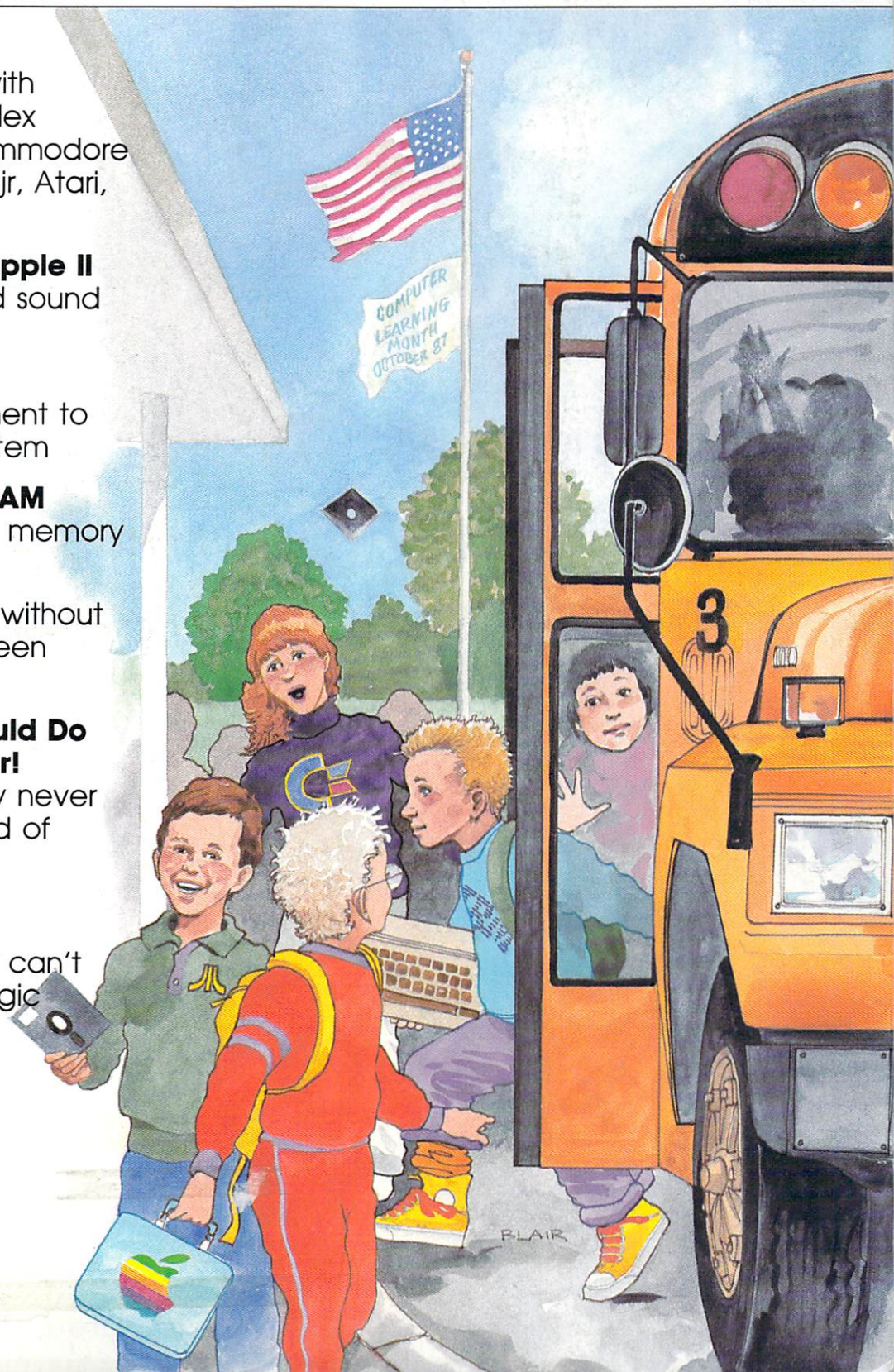

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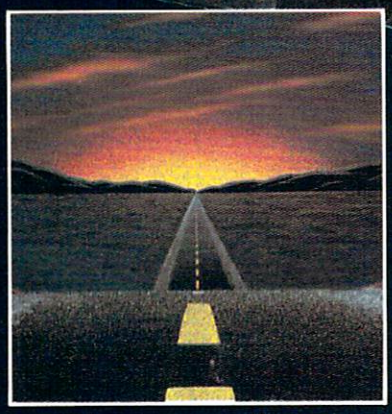

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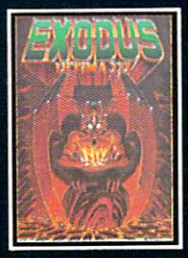

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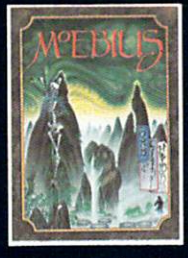

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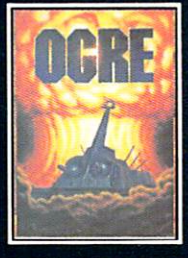

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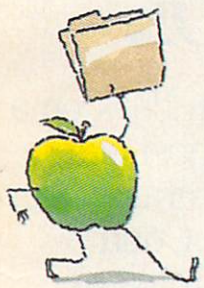

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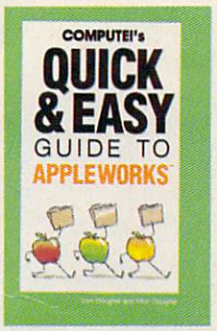

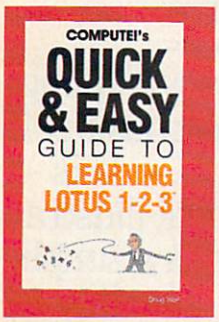

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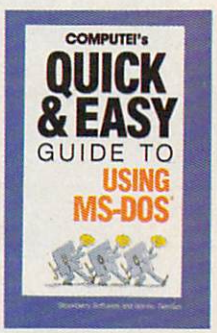

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COMPUTE!

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FEATURES

REVIEWS

COLUMNS AND DEPARTMENTS

THE JOURNAL

NOTE: See page 107 before typing in programs.

AP Apple, **GS** Apple IIGS **Mac** Macintosh, **AT** Atari, **ST** Atari ST, **AM** Amiga, **64** Commodore 64, **128** Commodore 128, **PC** IBM PC, **PCjr** IBM PCjr, • General interest.

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Editor's Notes

Programmers responding to a recent survey by the Boston Computing Society revealed an intriguing preference in languages—80 percent of them are programming in BASIC. One of the oldest computer languages, BASIC has been widely distributed. It comes either built into the computer's ROM chips (most eight-bit machines), or loaded from disk.

Next in popularity, used by 60 percent of the respondents, is Fortran, long favored by the scientific community. (The percentages add up to more than 100, since many programmers use more than one language.) Machine language, C, and Pascal were tied at 30 percent. LISP, a "list processing" language used in artificial intelligence work, received a 10-percent vote. Clustered at 5 percent each were Forth, Prolog, and COBOL. All other languages were at the low end of the spectrum, sharing 2 percent.

What's most intriguing about this survey is the overwhelming popularity of BASIC, a language rarely touted in the computer press. BASIC, it seems, has far more advocates than is generally assumed. Schools teach Pascal almost exclusively; it has many rules, so programs written in Pascal tend to converge into one *correct* version. If nothing else, this makes it easy to grade. Lately, professional programming teams are said to favor C. With its modular "black box" structure, with C it is relatively easy to divide a project into subtasks and then expect that they'll all work harmoniously when each programmer finishes his or her part of the larger program.

Prolog and LISP are often called "next generation" languages, ways to make computers understand context and infer relationships, ways to enrich the computer's thought processes.

Machine language is to programming what lasers are to communication. Machine language programs are the most focused and most efficient, and they operate at the ultimate speed—the speed of light.

But exciting and valuable as many of these languages are, good old reliable, understandable BASIC still gets used for most programming by most programmers. And the reason is simple: BASIC is the most natural language. It's not as easy as English, but it's essentially intuitive. It's also very forgiving (loose and messy, its critics say). Unlike Pascal or C, you can create new variables of any kind, anywhere you want, in a BASIC program. Unlike Forth, you can do math as you've always done it: 1 + 1 = (versus Forth's 1 1 + =). Unlike many of the more "advanced" languages, everything is available, so you don't need to invoke outside libraries of routines or spend time deciding what should be added to the core language. And, unlike machine language, you use words like RETURN and STOP, the meanings of which you have known since you were a child.

Ultimately, though, the easiest thing for all of us would be *natural language* programming. That would mean we could talk to the computer and create a program in the same way that we would describe any job to another human being. For example, we could say:

"After next week, I want to see all my electronic mail organized by date, newest message first. If any duplicate messages arrive, delete all but one. When I answer a letter, file the letter and my answer in a new database called "Email," and organize them by recipient. Also, show me how many downloads I've done, where they're from, and graph them by cost, time, and distance."

To us, these instructions are quite easy to understand; to computers they're filled with ambiguity. Nobody knows how long it will be before machines develop the capacity to understand human speech. A while back, it was thought that while computers would learn languages fairly easily, games like chess would be extremely difficult for computers to play. It turned out to be just the opposite.

It's hard to teach English to a machine because of the complex way we humans communicate—much is left unsaid, or is implied by context, or is just inherently vague. Feed the instructions above to a present-day computer, and you'll run into several serious problems. 1. The word *see* is used in an odd way. 2. I don't really want to read all the Email I've ever received, just the new, unread letters (but this is only implied, never stated directly). 3. Does *organize them* refer to the senders, my databases, the letters, answers, what? And who is the *recipient*? 4. *Done* is used in an odd way. 5. *Where they're from* is ambiguous. 6. If I'm speaking these instructions into a microphone, how will the computer know I'm not saying *therefrom*? 7. Do I want one graph or three?

Daunting as the difficulties are, there has been some progress in natural language communication. But until computers get significantly more clever, it looks as if BASIC—the closest thing we've got to a plain English computer language—will remain the most popular way to talk to machines.

Richard Mansfield
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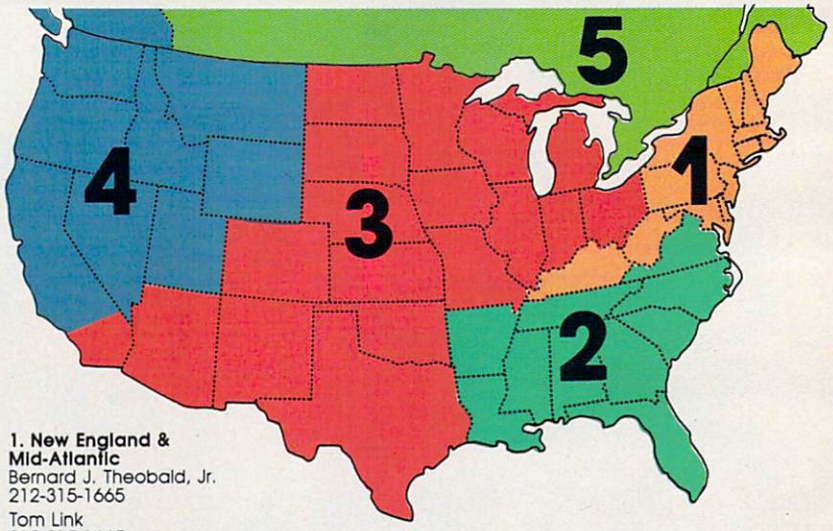

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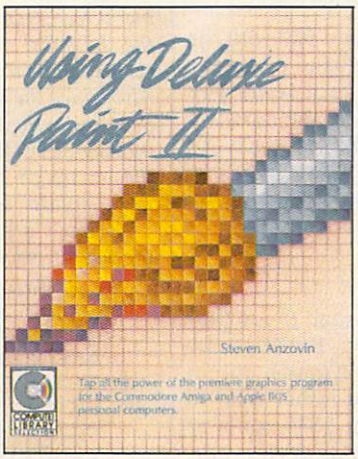

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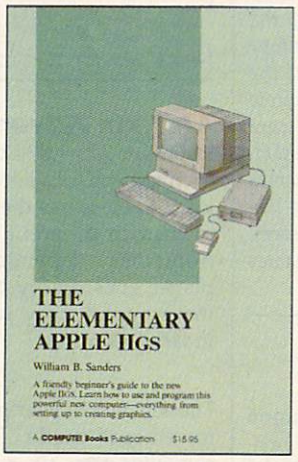

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Colorful Text

I own an IBM PC and have seen more than four colors in programs that are written in BASIC. Unfortunately, the machine language games that I purchase always use the same colors: powder pink, blue, white, and black. Why this arbitrary restriction?

Raymond A. Scruggs

When the PC was designed, colorful graphics were a low priority. The most common color adapter, the color/graphics adapter (CGA), can indeed display 16 colors simultaneously, but only in text mode. It would be difficult to draw a tank, airplane, or olympic athlete with the text-mode character set built into the CGA adapter, so programmers use the bitmapped screen, which allows each pixel on the screen to be addressed separately. Unfortunately, the CGA's bitmapped screen is limited to four colors. Newer IBM graphics cards like the EGA (Enhanced Graphics Adapter) allow more colors, but only now are software publishers beginning to support them. Some manufacturers are designing games that sense what kind of graphics card you have installed. If you upgrade your system, you may see an improvement in the games you play.

Serial Printing With *SpeedScript*

Although the Commodore 64 version of COMPUTE!'s *SpeedScript* word processor does not support output to the RS-232 interface (device 2), it is possible to print to an RS-232 printer by performing a few POKEs before you run the program. Here is the procedure to use:

1. Load *SpeedScript* into memory but *do not run it.*

2. Type the following lines in direct mode (without line numbers) and press RETURN:

```
POKE 5832,2
POKE 5837,0
```

3. POKE locations 659 and 660 with the correct values to set the baud rate, parity, and other RS-232 parameters you wish to use. For instance, the next two POKEs set the RS-232 interface for 1200 baud, eight-bit word size, one stop bit, full handshaking, and no parity.

```
POKE 659, 8
POKE 660, 3
```

4. Run *SpeedScript* as usual. If you perform the preparatory POKEs, the CTRL-P command now routes output to the RS-232 interface rather than to the serial bus. Location 5832 contains the number of the output device, normally 4 for a printer on the serial bus; and location 5837 contains the secondary address for output, normally 7 (the value for uppercase/lowercase printing on Commodore printers). By changing the device number to 2 and setting the necessary RS-232 parameters beforehand, *SpeedScript* prints to the RS-232 port rather than to the serial port.

Michel R. Vinette

Thank you for this information.

An Atari Adventure

I own an Atari 800XL, and I am trying to make an adventure game. What I want to do is use the ENTER command to load in different parts of the game from disk, depending on where the player goes. Every time I use ENTER, the program stops running. How can I make it continue?

Ken Wright

The solution to your problem is to use the forced-read mode. *This mode lets your computer press its own RETURN key. To turn forced-read mode on, execute a POKE 842,13. To turn it off, use POKE 842,12. The idea is to print all the necessary commands to the screen, home the cursor, perform the POKE, and stop the program. The last command on the screen should be POKE 842,12 to stop forced-read mode. In your case, you would want to expand the line to read*

```
POKE 842,12:CONT
```

This will cause your program to pick up where it left off.

When you're printing commands to the screen, remember to allow room for the READY *that BASIC puts on the screen after it executes each command. Also, since the display can be confusing to people playing the game, you may want to include SETCOLOR statements that make the letters on the screen invisible while the computer is in forced-read mode.*

Here's a program that demonstrates the use of forced-read mode.

```
5 REM DEMO OF FORCED READ
   MODE. NOTICE THAT THE
  VALUES OF ALL VARIABLES
   ARE PRESERVED.
10 A=5:B=10
20 PRINT "{CLEAR}{3 DOWN}
   PRINT";CHR$(34);"TEST"
   ;CHR$(34)
30 PRINT "{3 DOWN}POKE 84
   2,12:CONT"
40 POKE 842,13:POSITION 0
   ,0:STOP
50 PRINT "{CLEAR}";A,B
```

ST Reference Books

I am interested in learning to use C with my Atari ST, but have been unable to find any reference books on GEM programming, such as using windows, alert boxes, and menus. Are any reference books available?

George Nehme

Here are some reference books that are available from COMPUTE! Books.

COMPUTE!'s ST Applications Guide (Programming in C), *$16.95, by Simon Field, Kathleen Mandis, and Dave Myers, contains practical examples which demonstrate the use of many GEM features, such as dialog boxes, menus, and icons.*

Learning C (Programming Graphics on the Amiga and Atari ST), *$15.95, by Christopher D. Metcalf and Marc Sugiyama, provides an introduction to the C language, and includes many useful programming examples.*

COMPUTE!'s Technical Reference Guide, Atari ST, Volume One: The VDI, *$18.95, by Sheldon Leemon, is filled with program examples in C, machine language, and ST BASIC covering the VDI portion of GEM. It discusses everything*

you need to know to utilize the advanced graphic capabilities of the ST.

COMPUTE!'s Technical Reference Guide, Atari ST, Volume Two: GEM AES, *$18.95, by Sheldon Leemon, is an exploration of the AES (Application Environment Services) of GEM and provides programming examples and reference material on the AES portion of GEM.*

COMPUTE!'s ST Programmer's Guide, *$17.95, by the Editors of COMPUTE!, contains a reference section on useful VDI functions, as well as instruction on using GEM and TOS.*

Orders may be placed by calling COMPUTE! Books, *1-800-346-6767 (in NY, 1-212-887-8525) or by writing to:*

COMPUTE! Books
Customer Service
G.P.O. Lockbox 5044
New York, N.Y. 10087-5044

Other valuable reference books are available from Abacus Books:

Atari ST Internals *contains information on using BIOS, XBIOS, and GEMDOS.*

Atari ST GEM Programmer's Reference *provides detailed information on GEM, covering both VDI and AES.*

For more information on Abacus Books, call 1-616-241-5510.

Of course, the official GEM reference is the Atari ST Developers Kit, available from Atari for $300. In addition to a C compiler, assembler, and a resource construction set, you'll receive a huge stack of photocopied pages, much of which is more suitable to the PC version of GEM than the ST version. If you're willing to separate the wheat from the chaff, you'll find plenty here.

Transferring Files From Commodore To IBM PC

I would like to convert three years of files from the Commodore 64 and 128 to my IBM PC. These files were created with *SuperScript* and *Easyscript*. I also have some files from *Multiplan* and *Superbase*.

A.G. Farkas

I would like to convert some of my Commodore 64 programs to my IBM PC. How should I proceed?

H.W. Martens

Transferring text files is relatively easy, while program file transfers are somewhat more difficult.

Before a text file can be transferred, it must be converted into an ASCII file to remove any special formatting instructions that may be embedded in the file. Most word processors can do the conversion for you. Load the file into your word processor and then select the save option which creates an ASCII file. Of course, any special features, such as special fonts or underlining, will be lost.

Database and spreadsheet programs are more difficult to transfer. First, you must make certain that the fields are set up exactly the same on both programs that will use the data. This may require a bit of trial and error. Applications which use relative files may be especially difficult to transfer.

Program files must also be converted to ASCII before being sent. Load the program into your Commodore and then type

OPEN 1,8,2,"0:*filename*,S,W":CMD1:LIST

When the cursor reappears, type

PRINT#1:CLOSE 1

This creates an ASCII (nontokenized version) of your program file on your disk.

After transferring the file to another computer, you'll have to go through the program and convert Commodore-specific instructions into instructions acceptable to the new computer. This is trivial for the simplest BASIC programs, but becomes increasingly difficult as the programs become more specialized and optimized for a particular computer.

Most game programs, even those written in BASIC, are very difficult to convert from machine to machine. As a general rule, the more graphics commands

contained in the program, and the more PEEK, POKE, and SYS commands there are, the more difficult the translation. Programs written in machine language, or which contain machine language modules, are nearly impossible to transfer between dissimilar computers; 6502 machine language is quite different from 8088 machine language, and whole sections of machine code would need to be rewritten. Even if the two machines shared the same processor, the differing video and audio hardware would make translation difficult.

The easiest way to physically transfer files between computers is by attaching a modem to each computer, then connecting the two modems. You may use any telecommunications program (you'll need one for each computer) to transfer the data.

Usually a straight ASCII transfer is all that's necessary, but if the line connecting the computers is at all noisy, you may find that the XMODEM protocol is more reliable. Select a baud rate for the transfer which is supported by both communications programs, and be sure the parameters for both computers are set the same. Refer to the user's manuals for your modem and telecommunications programs for specific details.

Select the send file option for your telecommuncations program on your Commodore and the receive file option on your IBM PC, and the transfer of data will begin.

Another way of connecting the RS-232 ports of the computers is via a null modem cable. This method is usually the quickest way to transfer data, since it requires the least hardware. There's one potential problem, however. Commodore computers don't supply true RS-232 levels to the user port. Only TTL levels (0–+5 volts) are provided. An RS-232 level converter is required on the Commodore computer to supply the correct voltage levels to the RS-232 port of the IBM (and most other computers) when using a null modem connection.

The simplest null modem cable attaches the transmit data line of one computer to the receive data line of the other computer, and vice versa, while connecting the ground lines of both computers. The other pins are not used and need not be connected for a simple null modem cable. More sophisticated null modem cables cross-connect several of the RS-232 port's handshaking lines. If you are not skilled in making cables, buy a ready-made cable or have a professional make one for you. An improperly wired cable could cause damage to both computers.

Two Chores At Once

In the April 1986 issue of COMPUTE!, you printed a batch file for moving AmigaDOS commands to a ramdisk. In another issue, you told how to set the date using the DATE? command. Since it takes such a long time to move the commands to a ramdisk, couldn't you just take advantage of the multitasking environment of the Amiga to get the date while the commands are being moved to RAM?

Darcy Otto

Yes, there is a way to do this.

First, if you don't already have a backup of your Workbench disk, make a copy of it and store the original in a safe place. (Whenever you experiment, be sure to use a copy of the disk.)

Create a new file in the s subdirectory by typing (from a CLI window) ED S/SET-DATE. Type in the following two lines:

```
ECHO"Please enter the time and date in
  DD-MMM-YY HH:MM:SS format"
DATE <* ?
```

Then, exit the editor by typing ESC-e.

Now edit the startup-sequence file (also found in the s subdirectory of the Workbench disk) and insert the following line at the top:

```
RUN EXECUTE SYS:S/Set-Date
```

The next time you boot from this disk, your Amiga will ask for the date and time while the ramdisk fills with AmigaDOS commands.

Compiled Applesoft?

I have been experimenting with the machine language monitor built into my Apple IIc. Recently I typed in the following lines of BASIC:

```
10 HOME
20 PRINT
30 END
```

I then went into the monitor and used the pointer located at $67 to find my program. I was surprised to find that my BASIC program was not stored as ASCII text. Am I looking at compiled Applesoft or some form of assembly language? Is there a way of saving this area of memory as a binary file that will BRUN? I haven't had any luck yet, but if there is a way that I can use this area of memory to run my programs faster, please let me know.

David R. Bergman

When you use the monitor to look at a BASIC program in memory, the values you see reflect the way that Applesoft normally stores programs. What you are seeing is pure BASIC; saving it in a binary file won't improve the program's performance. If you are interested in speeding up your BASIC programs, several commercial compilers are available that really do convert BASIC to machine language.

Your three-line program looks like this in memory:

```
*0801  07  08  0A  00  97  00  0D
*0808  08  14  00  BA  00  13  08  1E
*0810  00  80  00  00  00
```

The first two bytes, 07 08, are the line link, the address of the next line of the program ($0807). The next two bytes, 0A 00, are the line number in hexadecimal form ($000A = 10).

The next byte, 97, is the token for HOME. All modern BASIC interpreters tokenize programs. When you type in a program line, BASIC scans it, looking for keywords such as PRINT or GOTO. It would waste quite a bit of memory if every letter in each command were saved in a separate byte, so BASIC replaces the keywords it knows with one-byte values called tokens. For example, the keyword HOME is replaced with the value $97. When you list your program, the tokens are converted back into full words. To perform this coding and decoding of tokens, BASIC has an internal table of all the keywords that are tokenized. By using your monitor, you can scan through the BASIC ROM area and find a list of all the tokens.

The sixth byte, 00, marks the end of the first line of the program. Every program line ends with a 00 byte.

Using this example, you should be able to decode the next program line: 0D 08 14 00 BA 00. The line link is $080D, the line number is $0014 (20), and $BA is the token for PRINT. If you had included any text in the PRINT statement—PRINT "HELLO", for example—the characters within quotes would have appeared as individual characters. Nothing within quotes in a PRINT statement or following the REM in a REM statement is tokenized.

Note that the line link for the third line, $0813, points to two 00 bytes. This indicates the end of the program. ©

Nobody's Perfect...

Game	Winner	Time to Move
1	SARGON III	5 seconds
2	SARGON III	5 seconds
3	SARGON III	15 seconds
4	SARGON III	15 seconds
5	SARGON III	30 seconds
6	Chessmaster	30 seconds
7	SARGON III	3 min
8	SARGON III	3 min

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(Note: The test was run on two Apple II computers. Each program played once as white and once as black at each level. Send us $5.00 for handling, along with a postage paid return envelope and we'll send you a copy of the moves each side played.)

Sargon III is available for: Apple II series, Apple Macintosh, IBM PC and Commodore 64/128 computers. You can find Sargon III at your local retailer or call 1-800-826-0706. Illinois residents call 1-800-826-1330.
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Computers In *Ten Years And Counting*

Keith Ferrell, Features Editor

Alexander the Great possessed many gifts, perhaps none greater than the teacher selected for him: Aristotle. A great teacher, however, can't do *everything*, and the story goes that Alexander had difficulty mastering the Calculus. Stumped, the young king finally invoked his sovereignty and *demanded* that his teacher simply give him the knowledge of the Calculus as his kingly right.

Aristotle's response to the youthful monarch was both patient and profound: "There is no royal road to learning."

Whether or not the story is true, the sentiment it expresses is as accurate today as 22 centuries ago. That accuracy extends to all forms and formats of the educational process, no less for software, hardware, and the computerized classroom than for Alexander, Aristotle, and the Calculus.

A decade ago, when the educational promise of the microcomputer was first being explored, many saw that promise as unlimited, projecting vast and dramatic changes in the nature of the educational process. That computers and classrooms go together is obvious now, but even before microcomputers became generally available, some educators and quite a few speculators had begun to extol the computer's virtues as a "teaching machine," a royal electronic road to learning.

Predictions ran rampant. Within a decade, printed media would become extinct. Children would begin programming at an early age, and as they progressed through school there would be increasing emphasis upon learning sophisticated programming languages. The computer would come to dominate the educational process, replacing traditional tools and curricula. With sufficient advances in technology, some felt, computers might even take the place of human teachers.

Now, though, after a decade's experience in computers and education, most of those speculators have come to see that, for all of the

The Classroom

The partnership between microcomputers and the classroom is ten years old. During this decade, hopes for the partnership first dwindled, then revived as new hardware and improved software became available. To what extent does the marketplace determine the nature of educational computing? And what lies ahead for computers, classrooms, and the educational system in which they are evolving?

contributions computers and software can and do make to every level of education, they remain *tools*, just as chalk and blackboard are tools.

After a relatively brief flirtation with establishing a national goal of "computer literacy"—usually interpreted to mean providing students with a foundation in computer programming—both the educational establishment and the computer industry shifted their focus toward the use of computers as applications machines designed to help students accomplish specific tasks.

The voice of big business entered the dialogue as well. Early on, Apple Computer recognized the size and importance of the educational market, specifically the K-12 market. Apple's huge and ongoing success in that market has attracted other computer manufacturers into the arena. Today, a duel is shaping up between Apple, which still holds the largest share of the educational hardware market, and Radio Shack and a variety of IBM compatible manufacturers who are aggressively promoting their MS-DOS machines to schools.

The evolution was even more dramatic in software. The initial flurry of unfocused excitement prompted the development of many dramatic programs which captured children's interest, but were of questionable educational value. Gradually, though, the software industry and the educational establishment moved toward a more thoughtful incorporation of computers into existing, proven curricula.

Now, ten years on, the introductory phase of the partnership between education and computers is ending. Newer, more dynamic educational technologies loom, promising new opportunities. Excited speculation once again fuels symposiums and debate. This time, however, the speculation is informed by a decade's worth of practice, successes and failures, experimentation and refinement. While many techniques remain to be discovered, the educational computing industry now has a solid sense of purpose and direction.

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Springboard Software, Inc. Weekly Reader Family Software

I. How It Was

Computers and educational software have had a great impact upon our educational system over the past ten years, but the educational system—especially the educational marketplace—has exerted influence of its own as well.

First, computers had to physically get into schools. That task was not easily accomplished. During the late 1970s, there were few school systems or districts with concrete plans for incorporating the emerging technology into their classrooms.

Charles Blaschke, president of Education Turnkey Systems, a market research and consultation firm specializing in educational hardware, recalls the late seventies as a time during which schools began seeking a rationale for incorporating computers into their curricula.

"There was increasing pressure from parents," Blaschke says, "who wanted their students to have the opportunities that computers could provide. Schools reacted by getting their first machines, although they didn't know exactly how to put them to work."

As recently as 1980, only seven states had official policies regarding the implementation of computers in public schools. Yet schools in virtually all of the states were acquiring machines, and various uncoordinated activities were creating a sort of computerized anarchy. At the same time, teachers began coming to terms with the physical reality of the computer, and learning how to take actual advantage of the machines' educational potential.

Teachers Take The Lead

Parents and school boards weren't the only ones who were interested in computers. Teachers themselves played a large part in putting the technology to work.

"Initially, the process of getting computers in the classroom was a scattered grassroots effort on the part of individual teachers," says Brian Dougherty president of Berkeley Softworks. He goes on to say that these teachers were often lonely in their enthusiasm in computers—not everyone perceived the benefits that computers could bring to education. That's changed now. "Today all schools recognize computers as an important part of the educational process," Dougherty says. "But even five years ago it was quite different."

He likens the situation in classrooms to that in the business environment. "Corporations did not initially embrace personal computers," he points out. "At many companies what happened was that an individual who perceived the computer's potential bought a PC and put it to work." The example set by those individuals fostered the implementation of other computers, and so on, leading to today's business environment where personal computers are ubiquitous.

"In the educational market," Dougherty continues, "you had an individual teacher getting a computer, then individual schools planning courses in computer use, followed by school districts putting together plans for computers. And finally the entire educational establishment sees how important computers are."

Obviously that sort of revolution in understanding does not take place over night, but the early 1980s witnessed a dramatic acceleration in attention and energy given to the incorporation of computers into schools. Charles Blaschke reports that those initial seven states with official computer education policies in 1980 were joined by nearly three dozen more within a year or so.

Washington Keeps Hands Off

One reason for the diversity of approaches to classroom computers may be the decentralization of our educational system. Educational decisions are pretty much left to individual school districts. With the exception of a brief debate over the goals of computer literacy, the federal education bureaucracy has left the details of their implementation to the schools themselves.

Chester Finn, Assistant Secretary for Research and Improvement at the U.S. Department of Education, says that the Federal government plays only a very small part in determining either curricula or resources for our schools. He says, "We don't in general get involved at all in the delivery of any instructional materials—and computer hardware is completely outside our ken."

Rather, the Department of Education sees its role as that of clearinghouse, providing toll-free educational bulletin boards for teachers. "Our largest undertaking," Finn states, "is E.R.I.C.—the Educational Resources Information Center, a database for gathering and disseminating educational research information."

Curing Computer Phobia

While some teachers eagerly embraced the arrival of the computer, others were less certain. Some even feared it. The attitudes of teachers have changed as well. Jan Davidson, founder and president of Davidson & Associates, an educational software publishing firm, recalls that many professional educators mistrusted computers.

"Teachers have naturally become much more sophisticated about computers than they were," says Davidson, a former teacher herself. "When we got started with computers there was some apprehension that computer technology might ultimately replace teachers themselves. There was therefore some real reluctance about embracing classroom computer technology."

Seth Levin, president of Gessler Educational Software, a developer and distributor of foreign language software and supplementary course materials, reveals that his company faced particular challenges in the early days of educational computing.

"Language teachers," Levin says, "unlike teachers in most other disciplines, already had a large investment in technology, represented by language labs with tapes and headphones. There was a real uncertainty about computers, a definite fear that this was another technological system that would cost a lot of money and end up not being used."

Hesitation and apprehension, Davidson says, have largely been replaced by enthusiasm. This shift in attitudes can be traced in part to simple proximity, Davidson feels. Teachers have used computers more and more, and as a result they are now relaxed about the technological and professional implica-

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tions; few feel threatened by computers today.

"But a lot of the change in attitude is a result of the higher quality of software available today," Davidson says. "This is true at all levels and in almost every discipline. We're able to see the advantages of teaching writing with word processing software, or organization with outlining software, and so on."

Software Goes To School

At first, no one seemed certain what qualities made for good educational software. For one thing, there was confusion about the value of the computer itself in our classrooms.

David Seuss, president of Spinnaker Software, recalls the early days of classroom computing. "Back in 1981, the educational applications the industry was coming up with were basically for boring and ineffective uses of the computer. The industry displayed a lack of imagination coupled with enormous expectations, real blue sky stuff about the computer's impact."

While the great potential of computers was being invoked by market analysts, software companies themselves were doing little more than adapting traditional educational materials such as flash cards for display on CRTs.

Kathleen Hurley, vice president for the educational division of Mindscape, remembers teachers' eagerness for worthwhile educational software being dampened by weak programs. "When computers first started being used in classrooms," Hurley says, "teachers were pretty much restricted to drill and practice software, although any type of educational software was rare enough that teachers were really using whatever kinds of programs they could get their hands on."

Dissatisfaction with the nature of educational software in the early 1980s led more than a few educators to enter the marketplace with products of their own. Jan Davidson was among those teachers-turned-entrepreneurs.

Davidson recalls her reactions to scholastic software in the early 1980s. "As a teacher I looked at the software from an educational point of view, and I saw a good amount of material that was labeled educational, but that displayed poor pedagogical approaches to its subject matter. It's important that the educational aspects of a product be primary—not the product's technical aspects."

The former teacher also says that there was a real misperception of the rewards that the educational marketplace offered. "When I first got into the industry," she observes, "there were a lot of people who saw educational software as glamorous, and its market as a good place to get rich quick." Davidson feels that the misperception has largely disappeared. "The industry, I think, now understands that it's a long-term business, as is any aspect of education, really. And, while it's certainly rewarding, it's not a field for anyone to choose who wants a fast route to getting rich."

Publishers are looking much more closely at the curriculum...making more of an effort to work with teachers, helping train them, showing them how software can fit into their whole educational program.

—Kathleen Hurley
Mindscape

Spinnaker's David Seuss notes that the period of boring, unimaginative (though educationally sound) products did not last long. "Within a couple of years we began to see several things happening to educational software all at once," he says. "Companies began generating products that did use the computer imaginatively, products that used graphics that were attractive and well-designed, programs that were able to hold children's interest."

At the time, there were few computers in the schools, and programs tended to use the hardware in alternative ways, unrelated to specific curriculum goals. "A program such as *Snooper Troops*," Seuss says of one of the earliest and largest educational software successes, "involved the whole class in solving a mystery. The package had arcade elements, offered the class a chance to play a fun game, involved the students in solving a mystery, while teaching skills that included gathering information and drawing conclusions."

Such programs, however engaging, did not address actual day-to-day curriculum needs.

Now we're experiencing a much closer integration of software with academic agenda. "Today," Hurley continues, "publishers are looking much more closely at the curriculum, seeking to tie their products in with textbooks and daily lesson plans. We're all making more of an effort to work with teachers, helping train them, showing them how software can fit into their whole educational program."

The Age Of The Computer Lab

For a time it looked as though computers might be restricted to specific rooms within schools. Computer labs came into being in many if not most schools, with computers centralized in a single room to which students came for instruction. Labs and workshops seemed at first to solve the problems caused by the fact that there were a lot more students than there were computers. But it was not a very effective solution.

"The computer lab is a mistake," says John Paulson, president of Springboard, a manufacturer of educational software. "A room filled with computers that students see only occasionally is not very satisfying to the students. The reason for the dissatisfaction is that the computer can't be used as a tool the way the student wants to use it."

Another teacher-turned-entrepreneur, Paulson sees the problems with computer labs as carrying an opportunity as well. "Obviously, if students see the potential of the computer, know what it can do for them, but don't get to use it often, there's a real feeling of frustration," he says. "But I think of it as a *wonderful* frustration, because it creates a demand for more computers, more computer time per student."

Paulson senses that the pace of getting more computers into schools is increasing. "It's speeding up as a result of that frustration," he says. "If you have only one computer in a school—as many schools

did just a few years ago—then nobody gets to use it much. But if you have 100 computers, then there's a lot more frustration, a lot more demand for even more computers. The more we allow students to have more access more regularly to their computers, the higher the rate of frustration during those times when access isn't available. And that wonderful frustration increases the time cycle for getting computers where they belong—in front of every student in every classroom in every school all the time."

In addition to questioning the wisdom of physically locating all computers in a central lab, many educators and software developers resisted the initial purpose of those labs—the teaching of something called "computer literacy."

Computer Literacy (Whatever That Was)

Charles Blaschke says, "Computer literacy attracted a great deal of attention around 1983." Various levels of government sought to establish a mandate for a consistent approach to making students computer literate.

Blaschke says that the problem is that there was never a consensus as to what computer literacy meant. Generally, the goal of computer literacy was to teach students how to operate computers. Many educators and legislators also felt that instruction in programming computers was another important objective.

That's changed now. The failure to arrive at a common definition and shared goal for computer literacy coincided with the topic itself being largely abandoned. There was a shift toward using the computer as a productivity and applications tool throughout the curriculum, rather than simply in computer labs and workshops. Instead of learning BASIC, students are learning word processing, desktop publishing, and the operation of spreadsheets and databases.

The increased focus on applications and productivity is another consequence of the growing but still limited number of computers available. Jan Davidson says, "I personally don't think it's necessary for a child to learn programming. As long as computers are a limited resource, students are better off using them as word processors than writing BASIC."

The abandonment of computer literacy as the single goal of computer education, however, does not mean that understanding of computers plays no part in education.

As Betsy Pace, K-12 education marketing manager for Apple Computer, points out, "We're seeing computer literacy—the ability to operate a computer—seen more and more as a means to an end rather than as an end in itself." Pace compares computers to telephones, saying, "I think that over time computers are going to be like the phone system. You don't have to know anything about the communications infrastructure in order to use a phone. With a computer, you don't have to know how a program is written in order to put that program to work."

We're seeing computer literacy...as a means to an end rather than as an end in itself...you don't have to know how a program is written in order to put that program to work.

—Betsy Pace
Apple Computer

Springboard's John Paulson notes that the act of learning how to run various applications also teaches, almost incidentally, a high level of computer literacy. "Students derive so much value from applications," he says, "that their ability to run them can almost be taken for granted."

This is not to say that programming is not finding an important place in education. "Students can learn a great deal about problem-solving from writing programs," Pace says. Jan Davidson suggests that programming can be used effectively with advanced and gifted students. Additionally, she says programming itself, rather than being restricted to computer rooms, is finding its way into mathematics and science curricula as an elective.

II. Current Trends

When there were only a few computers in schools, computer labs and concentration on computer literacy made sense: Few schools had computers. Those that had computers had few. In 1981 less than 20 percent of American schools were using computers. Last year there were computers in 96 percent of our schools. A few years ago, the educational hardware market absorbed roughly 50,000 computers a year. "Now," says Pace, "that market is taking more than 400,000 new machines every year."

Numbers that large, coupled with machines already in schools, have resulted in schools encountering the happy dilemma of having too many computers to put in one room or even several rooms.

The solution seems to be to put computers in *every* room.

The greater quantities of hardware is accompanied by increasing teacher expertise. Throughout the country, teachers are demonstrating greater facility both in operating the machines and in using them to aid instruction.

As a result of the dramatic increase in the number of machines, can we expect a consensus on the place of computers in education? Not necessarily, says Brian Dougherty. "We're starting to see some centralized guidelines, not only at the state and local levels, but also on the federal level, with increased computer funding being delivered.

"But, as far as a standardization of the purposes to which computers are put, no, I don't think so. Different states and different school districts mean that you're going to have different attitudes about computers. But among all the teachers and schools that I've talked with there is an understanding that the computer is a tool that students are going to be using for the rest of their lives."

David Seuss of Spinnaker suggests that it's a mistake to expect any sort of shared vision or agreement on the educational place of personal computers.

"The last few years have showed that teaching with comput-

ers is *hard*," Seuss states. "But so is teaching with textbooks. We have over 200 years experience with textbooks, and we *still* debate what the best approach to material is, how a curriculum should be assembled, which cognitive theories we believe. Nearly every state has its own, different approach to teaching the same topic to kids the same age."

Seuss says it's no different with computers and software. "We're at the very beginning of that 200-year period. Basically, we still don't have any real idea what we're doing. As far as computers go, we haven't explored and failed enough, we haven't tried enough strategies, alternative curricula, and so on. We're at the beginning of an enormous period of experimentation that's going to have its share of failures and partial successes. The result is going to be different from all of our initial hopes and dreams."

Integrated Programs

The disputes about the uses to which computers should be put is viewed by some as one of the real benefits that the technology provides. Computers, after all, are good at *many* things, not just a single thing.

Kathy Hurley of Mindscape takes note of the current, rapid diffusion of computers throughout curricula. "Computers are finding their way into every subject," she says. "We're seeing word processing used to prepare reports in virtually every subject; spreadsheets are being put to work in home economics and science classes; desktop publishing programs are turning up in several disciplines; databases are being used in social studies, and so on."

One result of this diffusion is a growing need for teacher-oriented materials aimed at effectively incorporating software into classrooms. Teachers themselves are requesting more than just software from developers. At the moment, many educational software developers are responding to requests for more supplementary materials to accompany the programs they use.

Cathy Carlston, vice president of educational market planning for Brøderbund, an educational software publisher, is excited about the opportunities these material present. "Brøderbund now works more closely in partnership with teachers. I think we're seeing a shift away from courseware alone. We're working to develop materials that really help teachers in the classroom, and this is a significant response on our part to market needs."

If teachers have come to see more clearly the ways in which computers can be used in class, it's also true that software developers are arriving at a better understanding of the teacher's needs. "Teachers face unique classroom challenges," Carlston says. "They have limited time that's also segmented. They face 30 or more students and have to deal with the managerial problems that accompany numbers that large. Our approach is to put together teacher-specific materials that address the entire classroom situation which includes the curriculum itself in the form of lesson plans, as well as addressing the students' skills, goals, and accomplishments. This sort of approach makes the computer a much more effective teaching tool."

Seth Levin points out that his company, Gessler, had 50 years' experience as a publisher of foreign language supplementary materials before entering the software field. Now Gessler is coordinating its software with other teacher materials. "Software struck us as a natural adjunct to our product line," Levin says. "We entered the market in 1982, fully expecting that most of the other major publishers would do so as well. While that didn't happen, we've found the response to the products we've developed and licensed to be gratifying."

Hardware manufacturers are involved in producing coordinated curriculum materials as well. IBM has achieved much success with its Write to Read literacy course. Apple Computer has long been actively involved in the generation and distribution of teacher-oriented materials.

Drill And Drill Again

These advances and shifts in emphasis do not mean that the use of computers for traditional purposes is being overlooked. Among the many advantages the computer offers is its inexhaustibility and infinite patience. For drill and exercise, computers can provide students with programs which, while essentially geared to rote learning, are interesting and also free the teacher to concentrate on more substantive matters.

Jan Davidson says that, "From the teacher's point of view, the computer can make captivating something that's hard for teachers to do. Few teachers really enjoy long sessions of drill and practice. By letting the computer deal with those aspects of education, the teacher has more time and energy to focus on the principles that underlie the exercises."

"Teachers enter the profession," says John Paulson, "because they understand the importance of their various subject areas, and they want to communicate that importance to their students. By shifting the routine aspects of education to the computer where possible, the teacher is better able to deliver that sense of importance to the class."

As computers have grown more sophisticated, so has their ability to provide tailored drills and exercises. Seth Levin of Gessler notes that in foreign languages drill and review remains essential to mastery. "Conjugations and vocabulary words," he says, "*have* to be learned by pure rote. A good computer program can provide a complete tutorial, analyzing the particular mistakes each individual student makes. Obviously this flexibility has advantages. The program can be used remedially for students who are having trouble. But it also gives the gifted and talented students the chance to move ahead of the class and learn new material on their own."

Market Challenges

The evolution of the purposes to which computers are put in classrooms places additional marketing challenges on software manufacturers and developers. Should programs be developed for the most common machines in schools, which means restricting the program to 128K or involving frequent disk-swaps? Or should developers push the limits of technology, taking advantage of increased memory to offer increasingly sophisticated features? Does it make better market-

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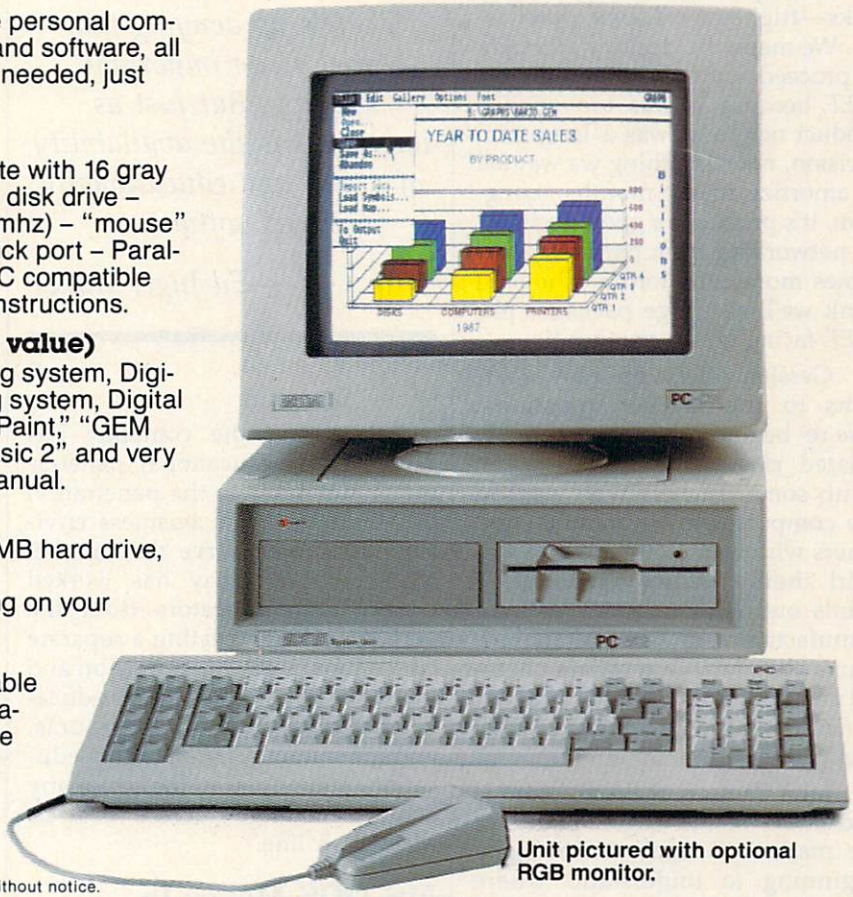

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sense to develop for the most experienced teachers, those who have a history of understanding computers? What's the best way to address the needs of teachers less comfortable with computers?

"There's no question," says Seth Levin, "that market pressures and questions like those play a large part in determining which products actually make their way into the classroom. Sometimes there's no immediate market—or at least no immediate payoff—for the most innovative or exciting packages." As an example, Levin cites Gessler's *CLEF*—Computer-assisted Learning Exercises for French, a Canadian-developed package that consists of dozens of disks. "In many ways this is the most sophisticated error-analysis program we've ever seen," he says. "But the size of the package—the number of disks—frightens off some purchasers. We made the decision, though, to proceed with the marketing of *CLEF* because it was too good a product not to. It was a long-term decision, not something we wanted to amortize in six months. Long-term, it's probably a good decision. As networking from hard disks becomes more common in schools, I think we'll see large packages like *CLEF* facing less resistance."

Gessler offers no easy solutions to the market questions. "We're beginning to see a really striated classroom," notes Levin, "with some teachers who want to use computers to their limits, and others who want software that will hold their hands." Gessler, he points out, is, like many software manufacturers, now marketing programs that let the teachers themselves establish the level of difficulty with which they are most comfortable.

John Paulson of Springboard is also aware of the fragmentation of the market. "I think we're finally beginning to understand where computers ought to be, how they ought to be used," he says. "But the field is still so new and young that while there are a lot of teachers who are putting computers to work in innovative ways, there are also quite a few teachers who will retire without ever having used a computer."

The Hardware Question

Whatever the advances in software, it is the computer itself—the actual hardware—that remains the focus of much of the attention given to the changing classroom. The machines themselves provide the momentum for their own integration into the academic environment.

The most successful hardware manufacturer in the educational marketplace is Apple Computer. Apple was among the first hardware manufacturers to perceive the importance of the education market, and to approach that market aggressively. As a result of its ongoing and intensive effort, there are more than one million Apple–II series computers in the nation's schools.

There's no denying that price is an important factor.... But just as important is the availability of useful and educationally sound software.

—Ed Juge, Tandy

Pace says the company has achieved an educational penetration comparable to the penetration of MS-DOS in the business environment. To preserve that market share, the company has worked closely with educators from the very beginning, creating a separate educational marketing division and maintaining a high profile at educational conferences, symposiums, and conventions. In the higher education marketplace, the company achieved a large success with its Macintosh line.

MS-DOS Moves In

Now, though, Apple's clearcut educational hegemony may be ending. The huge business success of IBM's PC family paved the way for the PC-clones and compatibles which offer large memory, mass storage, and access to huge libraries of MS-DOS programs. Clones deliver these features at a price far lower than IBM's, and often lower than Apple's as well.

Additionally, there is a sense on the part of some manufacturers and distributors of PC compatibles that the market is open to MS-DOS machines.

"The past six to eight months has seen a significant increase in educational market share for Radio Shack," says Charles Blaschke of Education Turnkey Systems. "There's also been a definite increase in the number of MS-DOS education packages over the past 12 months." Blaschke estimates that there are as many as 1600 educational packages available for MS-DOS machines, as opposed to 8000–9000 software packages for Apple machines.

The dominance of MS-DOS in business is being exploited by manufacturers eager to extend that dominance to the schools.

Wally Amstutz, vice president for marketing for Amstrad, views MS-DOS as a natural choice for schools, pointing out that the business environment into which students will graduate is overwhelmingly MS-DOS driven.

"It doesn't make any sense," says Amstutz, "for students to grow up on Apple and then have to cut their wisdom teeth, as it were, on MS-DOS in the office and professional environment." New to the American computing market, Amstrad hopes to achieve substantial penetration of the educational market in the months ahead.

One company that has been involved with educational computing from the early days of the industry is Tandy/Radio Shack. "We've been making a determined effort to get our machines into classrooms since 1979," says Ed Juge, Tandy's director of market planning. Since the introduction of PC-DOS and MS-DOS in the early 1980s, the company has seen an increasing number of schools select MS-DOS machines as their computer of choice.

"Our research shows Tandy holding down 25–28 percent of the K-12 education market," Juge notes. "In some states our share of education climbs as high as 45 percent."

While the company has achieved educational success in school districts of all sizes, Tandy has particularly high levels of market penetration in smaller communities, where the local Radio Shack store may be the only computer outlet. "Naturally, our retail presence plays a part in our success," Juge explains, "but we also make a concerted effort to work with educational software developers to insure that their programs are available for our machines."

Whatever the size of the particular school system, Juge does not view computer purchasing as solely price-driven. "There's no denying that price is an important factor, particularly for school systems with limited funding. But just as important is the availability of useful and educationally sound software. That plays an important part in buying decisions. Desktop publishing, for example, was for a long time available on Apple machines. Now, of course, desktop publishing programs are coming out for MS-DOS machines, which further strengthens our position in that market." Juge estimates that education accounts for approximately 20 percent of Tandy's computer sales.

Juge, too, sees decided advantages to increased educational dependence upon MS-DOS machines. "Using machines other than MS-DOS in the schools," he says, "is like teaching driving in a right-hand drive car. When the student gets out on the roads he discovers that it's a left-hand drive highway system. MS-DOS is the world's dominant operating system: It doesn't make sense for students to be learning on anything else."

Apple's Betsy Pace is confident about her company's strength in education, and is sanguine about the criticism, noting that Apple enjoys the competitive atmosphere. "Competition creates a healthy dialogue," she says, "and goes a long way toward making more people more interested in educational computing." She acknowledges that MS-DOS computers have demonstrated a lot of appeal in vocational education classes where students learn word processing and other skills.

To suggestions that Apple machines don't provide adequate preparation for "the IBM world," Pace suggests that critics might consider supplying students with Macintoshes, which are achieving substantial penetration of the business market and are on their way toward establishing a business standard of their own.

Selling To Students

Another growing educational target market for computer manufacturers is the individual student. The bulk of this market is made up of older students, and specifically college students who can afford personal computers. At the same time, more households are acquiring computers, with education listed by consumers as one of the primary motivations for the purchase.

The college market is particularly lucrative, as more and more colleges and universities require students to have computers. Again, it was Apple that first tapped the potential of this market with its Macintosh.

"The way Apple positioned the Mac in college bookstores tells you a lot about how to go after that market," says Wally Amstutz. "In many ways college students are the ultimate hard market. They don't have a lot of money; they buy for price, but they're very demanding of features. College students also tend to have a certain pragmatic sense of time. They want to go the fastest, most efficient route they can."

He says it was an understanding of all these market aspects that led to Apple's successful penetration of college bookstores—and through them to the students themselves—with the Macintosh. The time has come, he feels, for MS-DOS machines. "Certainly Amstrad is well-aware of the real success that the Macintosh found," Amstutz says. "But we also understand student concerns about compatibility with IBM. It's one of the reasons our computers are configured the way they are—with a mouse, GEM, and windows, graphics, all the features that are appreciated in K-12.

"But we're also bundling productivity software that should find real success with the older student, the student who understands computers and is ready to get to *work*."

III. The Next Ten Years

The coming decade promises educational and technological evolution on a scale likely to dwarf even the most dramatic recent innovations. So far, classroom computers have pretty much been used to deliver traditional educational materials in new ways.

Now, however, education and society are poised upon the brink of advances that may be as far ahead of the current generation of computers as those computers are of blackboard and chalk.

"We've barely scratched the surface when it comes to using computers in the classroom," says Betsy Pace of Apple. "I think we all have an increasing vision of how computers can be used, as well as a sense that the computers of the future won't even look like they do now and are going to be able to do many more things than we can now envision."

It's this aspect of the educational computer that most excites Pace. "We're approaching the point where computer technology will be conveying information in ways different from books or blackboards and chalk. That difference is going to make the technology sustainable in the classroom."

Pace emphasizes that computers deliver information differently from books rather than instead of them. "We don't see computers replacing teachers or books. Mankind has had an intimate friendship with books for hundreds and hundreds of years. Rather than replacing books and teachers, we have concentrated on the ways the computer can be used to help and reinforce them."

Ultimately, Pace feels, computers will alter the nature of classroom education itself. "I think we're going to be moving away from students learning facts," she says, "and toward higher learning skills. School will no longer focus solely on memorizing a set of information, but on helping the student in using, finding, sorting, applying, and writing about information."

John Paulson of Springboard sees this sort of advance as bearing

enormous educational advantages. "Education will start crossing a variety of subject matters," he says, "showing students the relationship among many bodies of information. And it won't be just facts. In simulations, for example, we'll be able to greatly elevate the level of discussions and understanding by putting students in charge of very intriguing and complex scenarios through which students can explore a variety of political circumstances. They'll be able to experiment, to make decisions and see the consequences of those decisions. For the first time, I think, students will really have a clear picture of consequences and variables and will learn that in some subjects there are no absolute judgments, that every path can be explored."

Friendlier And Friendlier

The software for these new types of learning will be increasingly easy to use, says Brøderbund's Cathy Carlston. "One of the things we're beginning to see is a real opportunity to take advantage of the available technology to make our educational programs more effective.

"Although it's tempting to work with bigger configurations, the challenge is to develop not just bigger programs, and more sophisticated programs, but programs that are even easier to use and to incorporate into the classroom. Of course, it takes a lot of memory to make programs more transparent, but we are seeing more memory in the newer computers." Carlston feels the arrival of these transparent programs will be accompanied over the next two to five years by the integration of many different technologies.

Mindscape's Kathy Hurley also sees a rapid convergence of several technologies. "Developers and educators will be taking advantage of videodisc, telecommunications, and other technologies to the point where I'm not certain of the future of stand-alone software. The opportunity that exists for developers is to take what's already there and tie it into these new and emerging technologies. The challenge, on the other hand, is to keep up with all of those technologies and make the right development decisions for what the market is going to buy."

Networking

One new area that's attracting a good bit of attention and excitement is networking, the linking of all the computers in a classroom or a school.

Tandy is providing classroom networking, whereby the students' computers are linked to the teacher's machine, which serves as both a file-server and a monitoring location from which the teacher can observe individual students at work.

"Our networks have evolved quite a bit over the years," Juge explains. "In our early networks the teacher was able to download files to the students. By the time we introduced Network 3, the individual student was able to use the computer to request a download." Network 4 is a Corvus network, with students able to access the teacher's hard disk storage.

As with any new technology...technology alone is not the answer. What's important is that developers take advantage of new capabilities in ways that increase educational effectiveness.

—Jan Davidson
Davidson & Associates

Other companies also see the increased importance of networking, not the least of them Berkeley, which has developed a program that permits teachers to network Commodore 64s with Apple and PC compatibles, all managed from the teacher's PC. The program, called *geoNet*, lets the teacher create a customized directory and then send it to each of the computers on the network. A 512K RAM expansion card for each student's computer turns that computer into a workstation.

Brian Dougherty of Berkeley envisions classroom networks as only a beginning. "With *geoNet*," he says, "each student workstation is linked to the teacher's PC, but the PC itself is not only a file-server. The teacher's PC can be ethernetted to other PCs in the school or elsewhere. This will let a student with, say, a Commodore 64, go through the teacher's PC by way of *geoNet*, then go out over ethernet to access other educational technology throughout the system."

Talking In Class

Farther down the road there is the promise of speech synthesis and voice recognition. "Right now this is of paramount concern to us," says Gessler's Seth Levin. "While at the moment speech synthesizers don't have the sophistication to generate accents, much less recognize pronunciation problems, we will have those capabilities someday soon, and a whole new generation of instructional possibilities will be made available to us."

Speech synthesis excites developers outside the foreign languages disciplines as well. "The ability to include speech in our packages will add an entirely new dimension to a child's educational experience at the computer," says Jan Davidson. "As with any new technology, though, the technology alone is not the answer. What's important is that developers take advantage of new capabilities in ways that increase educational effectiveness while addressing student motivational factors and attention."

Another area that Davidson finds exciting is the increased memory that new computers offer. "The one thing my developers fight for," she says, "is more memory to do what they need to do. Some things are hard to accomplish in 128K. You only have so much memory to spend when you're developing a program. I'd love to see 256K become standard."

At the same time, Davidson feels it's important to maintain a sense of perspective and purpose. "We have to be sure that the advances in computers are used to help achieve educational results. We must not only take advantage of new technology but do it in ways that increase the educational effectiveness of our materials."

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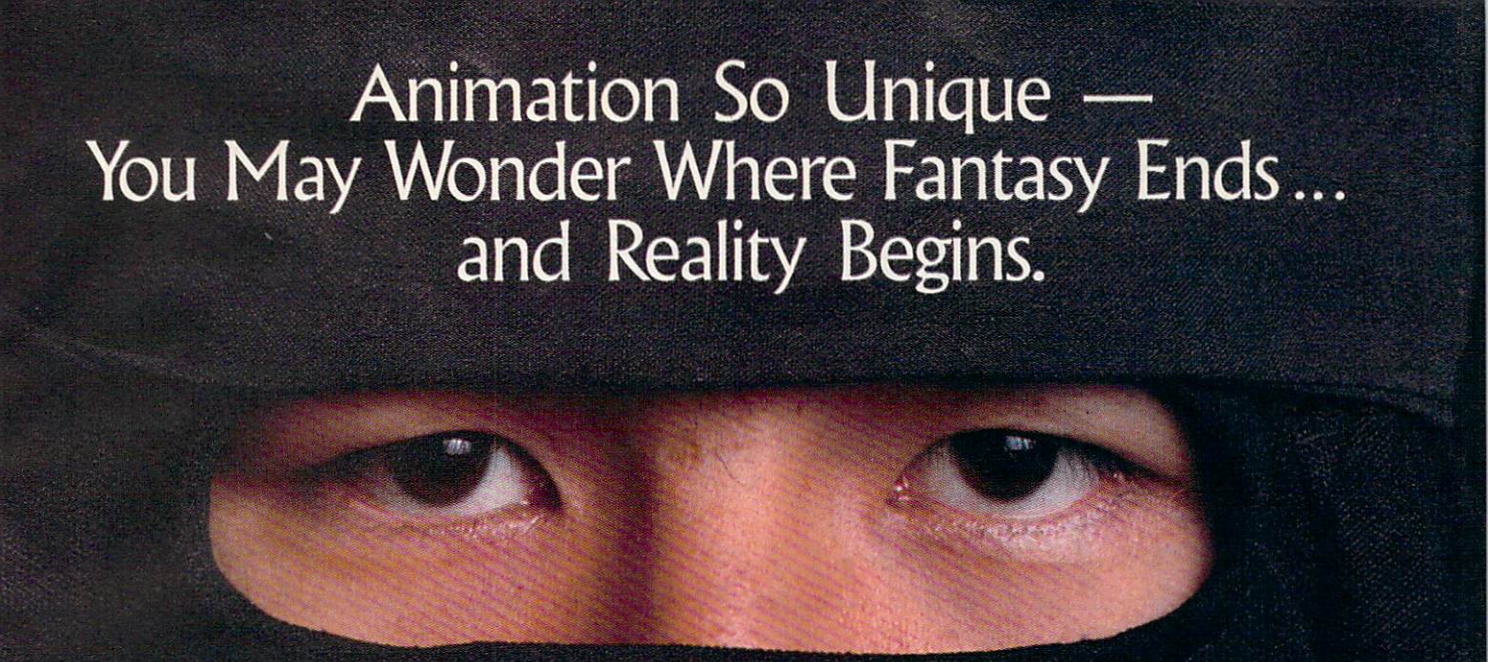

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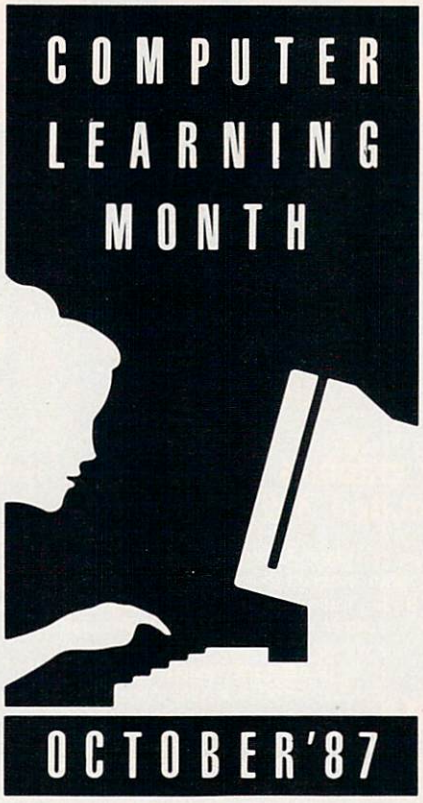
Computer Learning Month: *An Enthusiastic Start*

Selby Bateman, Associate Publisher

The first national Computer Learning Month, scheduled for October, will be the focal point for a variety of contests, meetings, back-to-school nights, and other events highlighting the impact that personal computers are having in classrooms across the country. Here's an overview of the events and activities in which teachers, parents, and students can take part.



Scarcely ten years after the advent of the personal computer, the nation's first Computer Learning Month is to be held this October. It's officially sanctioned by both houses of Congress and is supported by a wide cross-section of computer software and hardware companies, publishing houses, teachers, and state and national educational organizations.

So great has been the impact of personal computers in education—and so exciting the potential—that the reactions to this first national Computer Learning Month have far surpassed the expectations of its sponsors, says Katherine Borsecnik, Computer Learning Month project director for the Software Publishers' Association (SPA), the primary association of microcomputer software publishers, with more than 200 member firms.

"The level of enthusiasm has surprised me," says Borsecnik. "I'm not only surprised at the response by Computer Learning Month sponsors, but I'm getting these incredibly enthusiastic calls from teachers as well."

The event is sponsored by more than 25 hardware and software companies, computer publications (COMPUTE! Publications is a principal sponsor), and the SPA. Apple Computer, IBM, and Tandy Corporation are the three computer hardware sponsors who are also donating computers as prizes in several contests.

"It's an opportunity for all of us, as parents or educators, to take a close look at how our kids are using computers and to acknowledge the strides in education made possible by teachers who effectively use the technology," says Ken Wasch, executive director of the SPA.

"What's important about computer learning isn't the mastery of technology by whiz kids and hackers, but how millions of ordinary kids are using computers to develop critical-thinking abilities, academic skills, and creativity. That's what Computer Learning Month is all about," he adds.

The national, nonprofit campaign is aimed at promoting the creative and productive use of computers in the classroom as well as sharing information and ideas on how computers are already being used across the nation. Educational technology coordinators in all 50 states have been

contacted, and a number of educational and computer magazines and related periodicals will be featuring information on Computer Learning Month.

Nationwide Contests

Among the activities now under way are five different Computer Learning Month contests for teachers and students in primary (grades K–5), middle (grades 6–9), and secondary (grades 10–12) levels. Entries for each of the contests noted below must be postmarked by October 20, 1987. Top prizes are computer systems and software for the student winners to keep and other systems and software for the schools from which the winners come.

Computer Learning Month, a celebration of the use of computers in education, will get under way in October with a variety of contests and special events.

The five contests include competition in the following categories:

- Computer-generated student artwork, in color or black-and-white, with no enhancements made using other artistic tools.
- Noncomputer-generated student artwork that integrates in its theme the use and promotion of computers.
- Student essays of 750 words or less on a computer topic that begins with one of several specific opening sentences supplied by SPA.
- Teacher lesson plans and related ideas for integrating computers into the classroom in unique and innovative ways.
- Group projects (four or more students and a teacher) in which the participants have used the computer in an innovative learning situation.

Specific details of each of the contests are available from the SPA by writing to Computer Learning Month, P.O. Box 19763, Washington, D.C. 20036-0763. The contest entries will be judged by selected educators at the joint conference, Making Schools More Productive, in Dallas, Texas, November 5–7.

The student artwork entries will become part of the nation's largest single exhibit of student computer work and will be available for a national tour.

Additional Activities

Many of the software companies that produce educational programs for the classroom and the home will be offering special discounts on their products as well as catalogs of educational materials. And computer dealers across the country will be hosting Computer Learning Month activities, such as fairs and other promotions.

For example, Davidson & Associates, an educational software firm, will award $25,000 in free software to 20 schools that celebrate Computer Learning Month with activities for parents, teachers, and students. For information on that contest, write to Computer Learning Month, Davidson & Associates, 3135 Kashiwa St., Torrance, CA 90505.

This fall, parents will be able to receive at many Walden Bookstores a free 16-page booklet entitled "What Every Parent Should Know About Educational Computing." The booklet contains not only information on how parents can help their children use computers at home, but also suggestions for ways to get involved through the schools. In addition, schools, libraries, and museums will receive special Computer Learning Month posters.

In November, a Computer Learning Month time capsule containing student work will be dedicated at the Institute for the Transfer of Technology of Education conference in Dallas. Included in the capsule will be predictions about computer learning, written by students, to be viewed when the capsule is opened in the year 2001.

Principal sponsors of Computer Learning Month are *A+* magazine, Advanced Ideas, Apple Computer, B. Dalton Software, Britannica Software, Brøderbund Software, COMPUTE! Publications, Davidson & Associates, DLM Teaching Resources, Education Systems Corporation, IBM, *inCider* magazine, The Learning Company, Learning Technologies, Mindscape, Peter Li, Random House Software, Scholastic, Soft-Kat, Software Publishers Association, Spinnaker Software, Springboard Software, Tandy, and Weekly Reader Software.

Reading & Writing & CD-ROM

Another area of information technology that will change the way students learn is CD-ROM, Compact-Disc Read Only Memory. This optical storage medium uses compact discs, whose ability to store enormous amounts of information digitally, allows a single disc to text, music, pictures—anything that can be digitized.

Already being used for databases and bibliographies, CD-ROM promises to provide students with access to larger bodies of information than even the greatest of libraries can contain. "Never before have students been able to use technology as a simulation of experience," Betsy Pace of Apple points out. "But, with the advent of disc technology, that's what we'll be seeing. *National Geographic*, for example, has an exceptional library of images. Imagine what it will be like for students to be able to draw upon collections like that."

While CD-ROM technology has been around for several years, its immediate descendent, CD-I, Compact Disc Interactive, is only just being developed. This medium uses the increased memory of newer computers to produce true multimedia gatherings of information. "CDI will let students marry text and pictures, full motion video, speech and music, with computer overlays," Betsy Pace says. "Interactive video is among the most exciting tools ever to come onto the horizon, so it greatly expands the potential for using computers in instruction that it's all but indescribable."

Gessler's Seth Levin sees tremendous potential for the marriage of disc technology and foreign language instruction. "We'll be able to design programs that place the student *in* the foreign country," he says, "letting them see the sights and hear the sounds, all the while making them use their language skills to survive the simulation. And it will be a simulation—a recreation of a trip overseas without leaving the classroom or the language lab."

Springboard's John Paulson foresees a time when students, assigned, say, a report on whales, will have an array of tools at their disposal. "Word processors will let them create their text," he says, "while through telecommunications they can call up full-motion video images of whales swimming and accompany those images with actual whale sounds—blending all of it together into a type of educational report that has never before been possible."

It was not by luck that the species created the computer. It's up to all of us to see that computers continue to fulfill their primary purpose, helping students learn by amplifying the things their intelligence is capable of.

—John Paulson
Springboard

This sort of report—these sorts of advances—will insure the permanent presence of computers in the classroom, says Betsy Pace. She points out that the initial novelty of personal computers—computers for their own sake because they are *new*—has worn off. "But the thing that makes the technology sustainable as an educational medium is the fact that we're now able to do things with it that have never been done before. The computer's effectiveness increases as we learn to use it to convey ideas in ways that are better than books, than chalk and blackboards. We're learning to use computers," she says. "And that learning process is going to be very exciting.

The Dawn Of A New Era

History shows us how to approach the future. Looking at history, John Paulson sees the advent of the computer as inevitable. "It was not by luck that the species created the computer," he says. "The computer is an amplifier of intelligence, and our intelligence is the species' greatest gift. It's up to all of us to see that computers continue to fulfill their primary purpose, helping students learn by amplifying the things their intelligence is capable of."

What lies ahead? The futurist Arthur C. Clarke once proposed that the future will be not only stranger than we imagine—it will be stranger than we *can* imagine. H. G. Wells felt that civilization was a race between education and catastrophe.

Whether or not the computer provides the energy needed to insure that the race is won remains to be seen. It does seem certain, though, that as computers continue to reach more and more students, and as software further increases students' abilities to learn, the nature of education itself may come full-circle. The traditional purpose of education, after all, is to prepare the student for a lifetime of learning, to teach the student to *think*.

Which brings us once more to ancient Greece, and to another, possibly apocryphal, story of a great educator. This time the teacher is Plato, who supposedly said that the ingredients for education were simple: All that education requires is a student, a teacher, and a log for them to sit upon.

Ten years ago the personal computer was widely misperceived as an electronic teacher. Now we know better. The teacher is the professional at the head of the class, the author creating the text, the scholar organizing the body of knowledge, the photographer whose images are translated to disc, the software developer pushing the limits of his skill to prepare a challenging educational program, the musician whose compositions are digitized, the archivist whose database is the raw material from which exciting learning experiences are made.

And the computer? The computer is Plato's log—where each student and, ultimately, all of the teachers and teaching materials through history can gather together and accelerate the process of learning. ©

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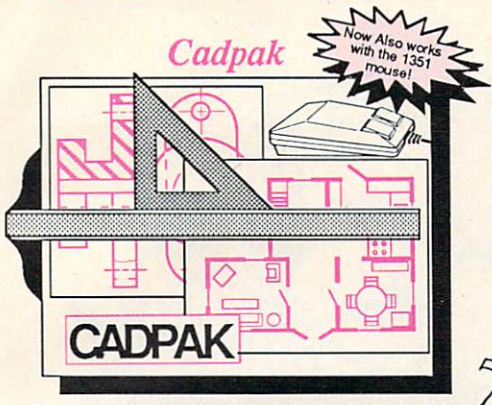

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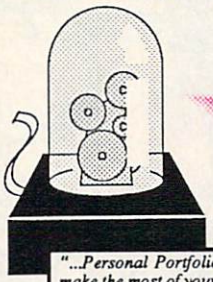

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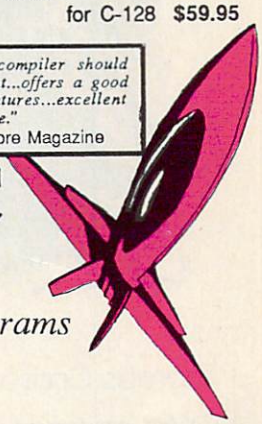

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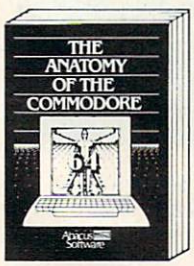

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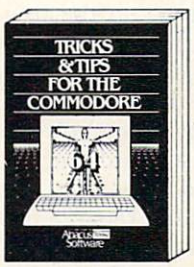

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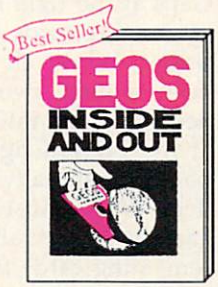

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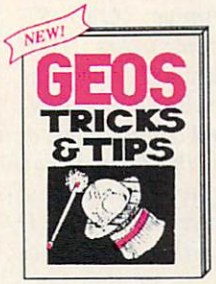

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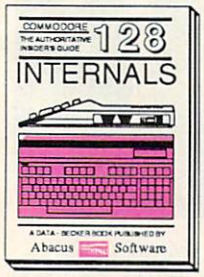

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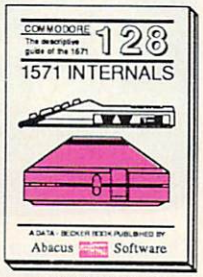

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Monte Carlo

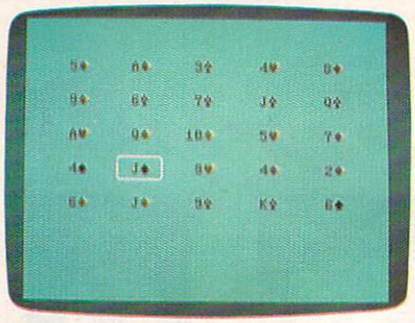
Thomas Carlson

Casino excitement at home can be yours when you type in this solitaire card game. Originally written for the Commodore 64, we've included new versions for the Amiga, Atari ST, Atari eight-bit computers, IBM PC/PCjr, and the Apple II series. The IBM version requires BASICA or GW-BASIC for the PC and compatibles, or Cartridge BASIC for the PCjr. It can be used with both monochrome and color/graphics adapters. The Apple II version runs under either ProDOS or DOS 3.3.

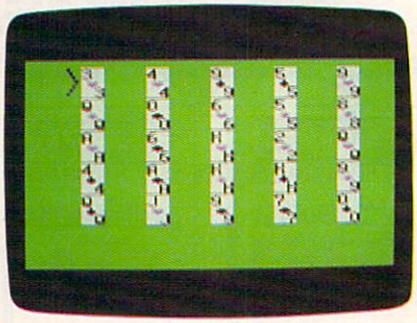
Monte Carlo is the name of a town in Monaco that is famous as a gambling resort. It also gave birth to the name of a card game with simple rules and complex strategies.

To play Monte Carlo, shuffle a deck of cards and deal 20 cards into a grid 5 cards across by 4 cards down. The goal of the game is to remove all the cards from the grid. Cards can be removed only in pairs. The cards must be of the same face value for you to remove them. In addition, they must be adjacent vertically, horizontally, or diagonally. The remaining cards are moved to fill in the gaps. Slide cards to the left to fill in the gaps. Gaps at the right edge are filled in by moving cards up from the row below. When all the cards have been moved, two cards from the deck are dealt into the empty slots at the bottom right corner of the board. Eventually, all cards in the deck are exhausted. You win the game if you are able to remove the remaining cards from the board.

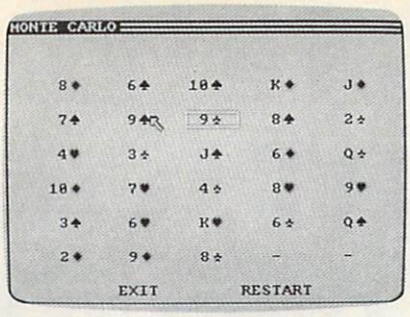
As you can imagine, all this moving about of cards can take quite a long time if you're playing with a real deck of cards. Letting the computer do the busywork makes the game more enjoyable. As you play, you'll develop strategies. Each pair you remove can destroy other pairs on the board and create new ones. But you might also have fun just removing the first pair of cards that you see. This game can be played by those who would rather leave their fate to the wind, those who analyze the consequences of each and every move, and all those players in be-



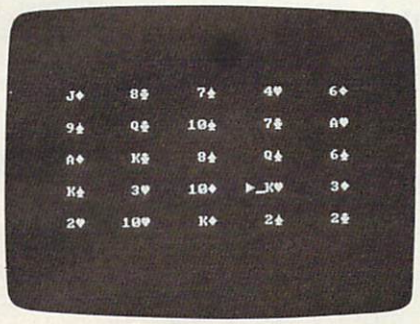
"Monte Carlo" for the 64 is a casino card game with three levels of difficulty.



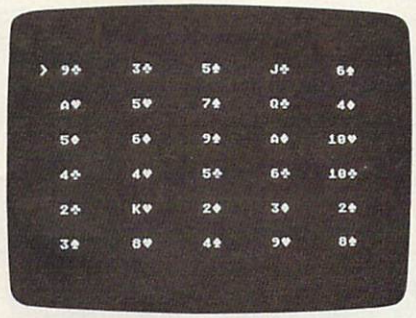
The Apple version of "Monte Carlo" features hi-res playing cards.



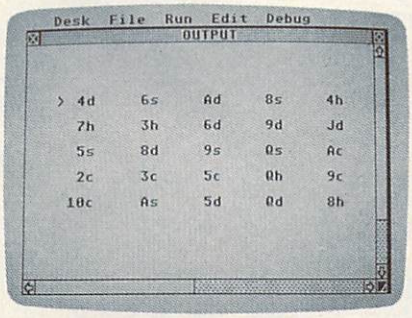
"Monte Carlo" for the Amiga lets you select cards with the mouse.



The IBM PC/PCjr version of the game works on both color and monochrome displays.



The Atari 400, 800, XL, and XE version of "Monte Carlo."



"Monte Carlo" for the Atari ST.

tween. Three difficulty levels are included. The level affects the number of rows on the the grid. *Easy* is six rows, *Medium* is five, and *Hard* is four. Choose the difficulty at the beginning of the game.

Typing It In

"Monte Carlo" is written in BASIC. Type in the correct version for your computer and save a copy.

Except for the Amiga version of the game, all versions use the cursor control keys to move a pointer on the screen. When the arrow is pointing to one of the cards you wish to remove, press the RETURN key (on some computers, this is known as the Enter key). The arrow changes shape to let you know that you have selected a card. If you change your mind after selecting one, go to the card and press RETURN again. The arrow will return to its normal shape.

When you've selected a card, move to the matching card (remember—the two cards you wish to remove must have either a corner or an edge in common) and press RETURN again. The computer will not let you make an illegal move. The Amiga version uses the mouse to select and match cards (see below for details).

Commodore 64 Version

This version of Monte Carlo (Program 1) sports excellent sound effects. Move the cursor with the cursor keys and press RETURN to select a card. Press Q to quit a game and start a new one.

Apple II Version

The Apple II version is in two parts. Program 2, in BASIC, is the main portion of the game. Program 3 contains graphics data for the card shapes, along with the machine language routine to draw cards in high resolution for an attractive display. Type in Program 2 and save a copy. Program 3 must be entered with the Apple version of the "MLX" machine language entry program, found elsewhere in this issue. When MLX asks for a starting and ending address, respond with these values:

```
STARTING ADDRESS?   8000
ENDING ADDRESS?     831F
```

Type in the data from Program 3. Before leaving MLX, save a copy of your work with the name CARDPLOT.OBJ0. The BASIC program expects a file of this name to be on the disk.

To play Monte Carlo, simply load and run Program 2. Use the cursor keys to move the arrow. Press Return to select a card. Since the Apple II+ does not have the up or down cursor keys, press Ctrl-J for up and Ctrl-K for down. The Apple IIc, IIe, and IIGS have all four cursor keys. To start a new game, press Q.

Amiga Version

The Amiga version of Monte Carlo (Program 4) uses the mouse to select cards. To choose a card, move the mouse pointer to the first card and click the left mouse button. Then move the pointer to the other card and click again. The cards are removed and the other cards slide into place. If you wish to deselect a card, point to the selected card and click on it again. Press Q at any time for a new game.

IBM PC/PCjr Version

The IBM version of Monte Carlo (Program 5) requires BASICA or GW-BASIC for the PC and compatibles. If you're using a PCjr, be sure to use Cartridge BASIC. The program will work with either a color/graphics or monochrome adapter. As with most other versions, use the cursor control keys and Enter to play the game. Press Q at any time if you wish to start a new game.

Monte Carlo For Atari 400, 800, XL, And XE

Program 6, for Atari eight-bit computers, uses the cursor keys (either alone or in combination with the CTRL key) to move the cursor. Press RETURN to select a card. Press Q at any time to start a new game.

ST Version

The Atari ST version (Program 7) works in any screen resolution. Use the cursor keys to move the arrow pointer. Press RETURN to select a card. Because of an oddity in ST BASIC, the game board will occasionally be displayed incorrectly. If the board looks strange to you, select a nonmatching pair of cards. The board will be displayed correctly. Press Q at any time for a new game.

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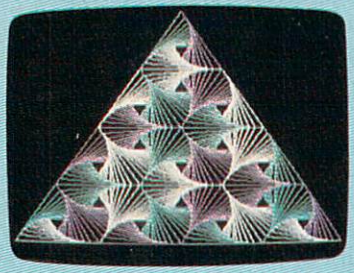

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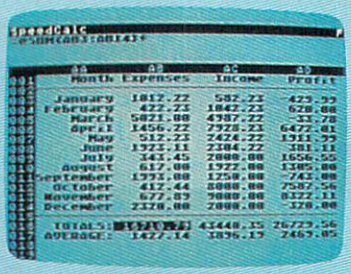

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January	1812.22	582.21	429.99
February	422.21	1042.21	620.00
March	5021.00	4787.22	-33.78
April	1456.22	7928.23	6472.01
May	512.23	7424.22	1911.99
June	1923.11	2304.22	381.11
July	343.45	2000.00	1656.55
August	617.00	1922.00	1305.00
September	1993.00	1250.00	-743.00
October	417.44	8000.00	7582.56
November	677.89	7800.00	8122.11
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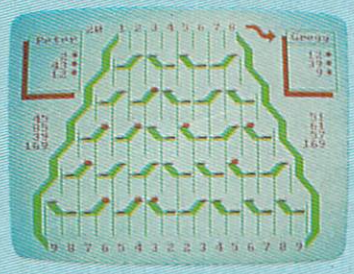
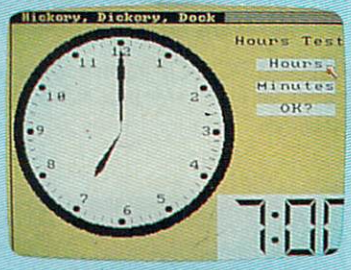
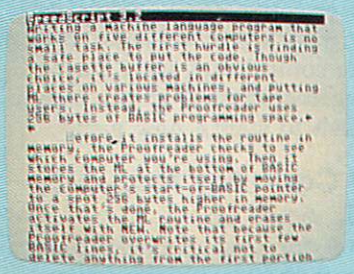
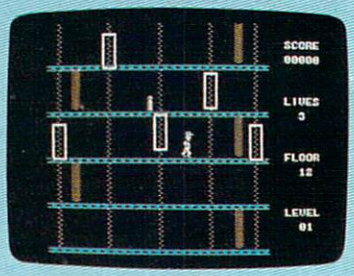
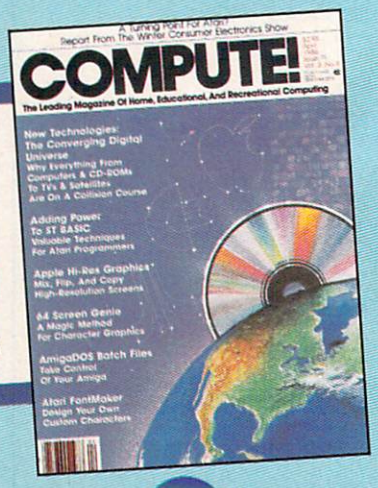








ACT NOW AND SAVE!



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For instructions on entering these programs, please refer to "COMPUTE!'s Guide to Typing In Programs" elsewhere in this issue.

Program 1: Commodore 64 Monte Carlo

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KQ 120 PRINT"{CLR}{DOWN} COPYR
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DG 125 PRINTTAB(10)"ALL RIGHTS
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CF 130 PRINT"{DOWN}";TAB(12);"
       MONTE{2 SPACES}CARLO
       {DOWN}"
BR 140 DIM C$(52),V$(13),T$(4)
       ,PS$(4,5)
SS 150 C$(52)=" --"
QA 160 FOR I=1TO4
RP 170 READ A$:T$(I)=A$:NEXT
DP 180 FORI=1TO13
CG 190 READA$:V$(I)=A$:NEXT
QR 200 DATA"{BLK}A{43}","{RED}S
       {43}","{RED}Z{43}","{BLK}
       X{43}"
JS 210 DATA" A"," 2"," 3"," 4"
       ," 5"," 6"," 7"," 8","
       {SPACE}9","10"," J"," Q
       "," K"
PB 220 FOR I=1TO13:FOR J=1TO4
QG 230 PRINT"{5 SPACES}";V$(I)
       ;T$(J);
PJ 240 NEXT:PRINT:NEXT
MC 250 GOSUB940
FB 260 PRINT TAB(5);"{43}{DOWN}
        SHUFFLING DECK - PLEASE
        WAIT"
DD 270 P=RND(-TI)
CJ 280 FOR I=1TO4:FOR J=1TO13
QB 290 P=INT(RND(1)*52)
AQ 300 IF C$(P)="" THEN C$(P)=
       V$(J)+T$(I):GOTO330
DE 310 P=P+1:IF P=52 THEN P=0
KF 320 GOTO300
AE 330 NEXT:NEXT
EQ 340 POKE781,1:SYS49152
PR 350 T$=CHR$(146):S$=CHR$(18
       )
FC 360 PRINT TAB(9)"CHOOSE: "
       {SPACE}S$ "H" T$ "ARD"
EF 370 PRINT TAB(17) S$ "M" T$
        "EDIUM"
AS 380 PRINT TAB(17) S$ "E" T$
        "ASY"
JX 390 GETA$:IF(A$<>"H")AND(A$
       <>"M")AND(A$<>"E")THEN3
       90
MS 400 C=4:IF A$="M" THEN C=5
FR 410 IF A$="E" THEN C=6
RD 420 CR$="{WHT}U****I{DOWN}
       {LEFT}-{6 LEFT}-{DOWN}
       {LEFT}J****K{43}"
HS 430 BL$="{WHT}{6 SPACES}
       {DOWN}{LEFT} {6 LEFT}
       {DOWN}{LEFT}{6 SPACES}
       {43}"
RJ 440 X$=CHR$(29):Y$=CHR$(17)
FQ 450 FOR I=1 TO 6:X$=X$+X$:Y
       $=Y$+Y$:NEXT
RQ 460 FOR X=0TO4:FOR Y=0TO5
QS 470 XX=X*7+3:YY=Y*3+3
KS 480 PS$(X,Y)="{HOME}"+LEFT$
       (Y$,YY)+LEFT$(X$,XX)
QB 490 NEXT:NEXT
AK 500 REM DISPLAY
DX 510 CT=0:PRINT"{CLR}
       {3 DOWN}"
GC 520 FOR I=1TOC
MJ 530 FOR J=1TO5
QA 540 PRINT"{4 SPACES}";C$(CT
       );
MF 550 CT=CT+1
DS 560 NEXT:PRINT:PRINT:PRINT:
       NEXT
ED 570 IF C$(0)=" --"THEN PRIN
       T TAB(11)"TABLEAU IS CL
       EARED":GOTO750
CJ 580 X=0:Y=0
QG 590 GOSUB830:POKE781,1:SYS
       {SPACE}49152:X1=X:Y1=Y:
       P1=Y*5+X
SB 600 POKE53280,15
MQ 610 GOSUB830:X2=X:Y2=Y:P2=Y
       *5+X
FQ 620 POKE 53280,11
PJ 630 IF P1=P2 THEN590
RK 640 IF(LEFT$(C$(P1),2))<>(L
       EFT$(C$(P2),2))THEN810
GF 650 IF ABS(X2-X1)>1 OR ABS(
       Y2-Y1)>1 THEN810
XH 660 POKE 781,2:SYS49152
QM 670 FOR I=P1 TO 51
XK 680 C$(I)=C$(I+1)
RR 690 NEXT
BX 700 IF P2>P1 THEN P2=P2-1
FQ 710 FOR I=P2 TO 51
CJ 720 C$(I)=C$(I+1)
SX 730 NEXT
DA 740 GOTO500
KA 750 FOR I=1TO11:GETA$
QB 760 NN=1-NN:POKE 781,NN+1:S
       YS 49152
XC 770 NEXT
CS 780 GETA$:IF A$<>"" THEN RU
       N
HP 790 GOTO780
HG 800 REM BAD MOVE SOUND
DK 810 POKE 781,0:SYS49152:GOT
       O590
AE 820 REM CURSOR INPUT ROUTIN
       E
BF 830 PRINTPS$(X,Y);CR$
HF 840 GETA$:IF A$="" GOTO840
CE 850 IF A$="Q" THEN RUN
BD 860 PRINT PS$(X,Y);BL$
MA 870 IF A$="{UP}" THEN Y=Y-1
       :IF Y<0 THENY=C-1
KJ 880 IF A$="{DOWN}" THEN Y=Y
       +1:IF (Y>(C-1)) THEN Y=
       0
JP 890 IF A$="{RIGHT}" THEN X=
       X+1:IF X>4 THEN X=0
QM 900 IF A$="{LEFT}" THEN X=X
       -1:IF X<0 THEN X=4
KP 910 IF A$<>CHR$(13) GOTO830
XS 920 RETURN
KQ 930 REM ML ROUTINE FOR SOUN
       DS
BH 940 T=49152
GJ 950 READ A:IF A=-1 THEN SYS
       49155:RETURN
HX 960 POKE T,A:T=T+1:GOTO950
AH 970 DATA 76,19,192,162,24,1
       69,0,157,0,212,202,16
RE 980 DATA 250,169,015,141,24
       ,212,96,189,48,192,141,
       5
DH 990 DATA 212,169,0,141,6,21
       2,189,51,192,141,1,212
EG 1000 DATA 189,54,192,141,4,
        212,73,1,141,4,212,96
BK 1010 DATA 152,104,104,6,88,
        66,32,16,32,-1
```

Program 2: Apple II Monte Carlo—BASIC Program

```
C0 90 HOME : PRINT CHR$ (4);"BLO
      AD CARDPLOT.OBJ0"
F6 100 REM COPYRIGHT 1987 COMPUT
       E! PUBLICATIONS, INC. ALL
        RIGHTS RESERVED
52 104 K = PEEK (49152): POKE 49
       168,0: IF KC > 0 AND (K =
        205 OR K = 197 OR K = 20
       0) THEN 104
C7 110 TEXT : HOME : PRINT " COP
       YRIGHT 1987 COMPUTE! PUBL
       ICATIONS": PRINT SPC( 9)"
       ALL RIGHTS RESERVED."
FB 122 HTAB 14: VTAB 3: PRINT "M
       ONTE CARLO": HTAB 12: VTA
       B 5: PRINT "CHOOSE H FOR
       HARD": HTAB 19: PRINT "M
       FOR MEDIUM": HTAB 19: PRI
       NT "E FOR EASY"
ED 124 K = PEEK (49152): IF K =
       200 THEN NC = 4: GOTO 130
38 125 IF K = 205 THEN NC = 5: G
       OTO 130
CA 126 IF K = 197 THEN NC = 6: G
       OTO 130
AA 128 K = RND (1): GOTO 124
77 130 HOME : POKE 230,32: POKE
       28,42: CALL 62454
46 150 POKE 49239,0: POKE 49235,
       0: POKE 49232,0:X = 0:Y =
        0
EE 160 VTAB 21: PRINT SPC( 6)"SH
       UFFLING DECK, PLEASE WAIT
       "
67 170 DIM C(52)
0A 175 FOR I = 0 TO 51:C(I) = I
       + 1: NEXT
27 180 FOR I = 0 TO 51
B3 190 T = INT ( RND (1) * 52)
EE 200 TC = C(I):C(I) = C(T):C(T
       ) = TC
FD 220 NEXT
4B 230 HOME
11 240 CT = 0: FOR I = 1 TO NC
73 244 Y = I * 24 - 18
48 250 FOR J = 1 TO 5
ED 260 X = J * 48 - 5:PP = C(CT)
09 262 REM IFPP=0THENCALL32768,0
       ,X-1,Y:GOTO274
91 270 CALL 32768,PP,X,Y
20 272 IF PP = 0 THEN CALL 32768
       ,0,X + 1,Y
82 274 CT = CT + 1
D0 280 NEXT : HCOLOR= 1: HPLOT 0
       ,Y + 23 TO 279,Y + 23: NE
       XT
96 290 IF C(0) = 0 THEN 440
EF 300 X = 0:Y = 0:CR = 0: GOSUB
        800
40 310 X1 = X:Y1 = Y:V1 = TV:P1
       = TP
5C 314 IF C(P1) = 0 THEN 780
16 320 CR = 2: GOSUB 800
A6 330 X2 = X:Y2 = Y:V2 = TV:P2
       = TP
61 334 IF C(P2) = 0 THEN 780
BD 340 IF P1 = P2 THEN 240
0F 350 IF V1 < > V2 THEN 780
AA 360 IF ABS (X2 - X1) > 1 OR A
       BS (Y2 - Y1) > 1 THEN ER
       = 1: GOTO 780
5E 380 FOR I = P1 TO 51
DF 390 C(I) = C(I + 1): NEXT
FD 400 IF P2 > P1 THEN P2 = P2 -
        1
53 410 FOR I = P2 TO 51
D2 420 C(I) = C(I + 1): NEXT
18 430 GOTO 240
70 440 VTAB 21: PRINT SPC( 11)"T
       ABLEAU IS CLEARED"
B3 450 PRINT SPC( 12)"PLAY AGAIN
        (Y/N)?";
AD 460 GET A$: IF A$ = "Y" THEN
       RUN
BE 470 IF A$ = "N" THEN TEXT : E
       ND
25 480 GOTO 460
91 780 FOR I = 0 TO 29:A = PEEK
       ( - 16336): NEXT
27 790 GOTO 240
2C 800 XX = X * 48 + 32:YY = Y *
```

```
      24 + 3
10 810 HCOLOR= CR: HPLOT XX,YY +
      2 TO XX + 7,YY + 13 TO X
      X,YY + 24
4E 820 GET A$: IF A$ = "" THEN 8
      20
2B 830 IF A$ = "Q" THEN RUN
E9 840 A = ASC (A$)
74 844 HCOLOR= 1: HPLOT XX,YY +
      2 TO XX + 7,YY + 13 TO XX
      ,YY + 24
BC 850 IF A = 11 THEN Y = Y - 1:
       IF Y < 0 THEN Y = NC - 1
EC 860 IF A = 10 THEN Y = Y + 1:
       IF Y > NC - 1 THEN Y = 0
F8 870 IF A = 8 THEN X = X - 1:
      IF X < 0 THEN X = 4
78 880 IF A = 21 THEN X = X + 1:
       IF X > 4 THEN X = 0
90 890 IF A < > 13 THEN 800
F7 900 TP = X + Y * 5:T = C(TP):
      TV = T - INT (T / 13) * 1
      3
A6 905 HOME : PRINT "{G}"
1B 910 RETURN
```

Program 3: Apple II Monte Carlo—Machine Language Program

```
8000: 20 EC 80 B0 72 20 00 82 FD
8008: B0 6D 20 5B 82 B0 68 AD CB
8010: 26 83 F0 0F A9 7F 8D 2C A6
8018: 83 8D 2D 83 A9 07 8D 2E CE
8020: 83 D0 0F A9 2A 8D 2C 83 F6
8028: A9 55 8D 2D 83 A9 02 8D 2C
8030: 2E 83 A9 03 8D 1A 83 A9 14
8038: 02 8D 22 83 20 09 81 A9 EB
8040: 18 8D 1B 83 20 98 81 20 D2
8048: 5C 81 EE 1E 83 CE 1B 83 A8
8050: D0 F2 AD 26 83 F0 20 A0 4F
8058: 00 AD 27 83 20 88 80 A0 A6
8060: 04 AD 27 83 20 88 80 A0 B0
8068: 08 AD 26 83 20 88 80 A0 9A
8070: 0C AD 26 83 20 88 80 60 64
8078: 72 82 03 08 92 82 0A 08 EE
8080: AA 82 01 01 AA 82 0A 0F 2A
8088: 0A 0A 0A 8D 2B 83 B9 78 7E
8090: 80 85 FC C8 B9 78 80 85 95
8098: FD C8 AD 28 83 8D 20 83 19
80A0: B9 78 80 C8 18 6D 29 83 85
80A8: C9 07 90 07 E9 07 EE 20 3C
80B0: 83 B0 F5 8D 21 83 B9 78 3A
80B8: 80 18 6D 2A 83 8D 1E 83 62
80C0: A9 01 8D 1A 83 A9 07 8D 88
80C8: 22 83 A9 08 8D 1B 83 AC FD
80D0: 2B 83 B1 FC 8D 2C 83 20 92
80D8: 09 81 20 98 81 20 5C 81 13
80E0: EE 1E 83 EE 2B 83 CE 1B 60
80E8: 83 D0 E4 60 20 67 82 C9 EF
80F0: 35 90 01 60 A2 00 8E 27 30
80F8: 83 C9 0E 90 07 E9 0D EE E1
8100: 27 83 B0 F5 8D 26 83 18 11
8108: 60 AD 1A 83 8D 1C 83 A8 AE
8110: A9 00 99 2C 83 AD 21 83 76
8118: 18 6D 22 83 C9 07 90 05 8F
8120: E9 07 EE 1C 83 8D 23 83 95
8128: AD 2C 83 09 7F 8D 1D 83 FD
8130: AC 21 83 F0 15 A2 00 0E 92
8138: 2C 83 BD 2C 83 0A 3E 2D 9A
8140: 83 E8 EC 1C 83 D0 F3 88 6E
8148: D0 EB AC 1C 83 B9 2C 83 E4
8150: 09 80 2D 1D 83 99 2C 83 CD
8158: 88 10 F2 60 AC 23 83 B9 BA
8160: 8A 81 AC 1C 83 88 31 FE FF
8168: 19 2C 83 91 FE 88 30 0A 11
8170: F0 08 B9 2C 83 91 FE 88 D0
8178: D0 F8 AC 21 83 B9 91 81 71
8180: A0 00 31 FE 0D 2C 83 91 9B
8188: FE 60 7F 7E 7C 78 70 60 02
8190: 40 00 01 03 07 0F 1F 3F F5
8198: AD 1E 83 29 3F A8 B9 C0 CD
81A0: 81 05 E6 85 FF AD 1E 83 51
81A8: 29 08 F0 02 A9 80 18 2C 2C
81B0: 1E 83 70 04 10 04 69 28 7D
81B8: 69 28 6D 20 83 85 FE 60 BA
81C0: 00 04 08 0C 10 14 18 1C A3
81C8: 00 04 08 0C 10 14 18 1C AB
81D0: 01 05 09 0D 11 15 19 1D B3
81D8: 01 05 09 0D 11 15 19 1D BB
81E0: 02 06 0A 0E 12 16 1A 1E C3
81E8: 02 06 0A 0E 12 16 1A 1E CB
81F0: 03 07 0B 0F 13 17 1B 1F D3
81F8: 03 07 0B 0F 13 17 1B 1F DB
8200: A9 00 8D 20 83 8D 21 83 A5
8208: 20 67 82 8D 1F 83 C0 01 A9
8210: 90 12 F0 01 60 C9 18 90 FA
8218: 01 60 A9 24 8D 20 83 A9 CA
8220: 04 8D 21 83 A9 00 8D 25 74
8228: 83 A9 E0 8D 24 83 AD 1F F7
8230: 83 CD 24 83 90 04 ED 24 BB
8238: 83 38 2E 25 83 4E 24 83 46
8240: 90 EF 18 6D 21 83 8D 21 B6
8248: 83 8D 29 83 18 AD 25 83 15
8250: 6D 20 83 8D 20 83 8D 28 AF
8258: 83 18 60 20 67 82 8D 1E B1
8260: 83 8D 2A 83 C9 C0 60 20 3A
8268: B1 00 20 05 E1 A5 A1 A4 28
8270: A0 60 7F 7F 5F 07 01 01 DF
8278: 0F 7F 7F 7F 77 55 55 57 DF
8280: 5F 7F 7F 7F 5F 57 55 57 57
8288: 5F 7F 7F 7F 47 47 01 01 5F
8290: 47 7F 7F 7F 7F 7E 78 78 60
8298: 7F 7F 7F 7F 7E 7A 7A 7E 76
82A0: 7F 7F 7F 7F 7F 7E 7A 7E 96
82A8: 7F 7F 7F 7F 7F 7F 7E 7E AA
82B0: 7F 7F 63 1C 1C 1C 00 1C F0
82B8: 1C 1C 63 1C 1F 1F 63 7C B9
82C0: 7C 00 63 1C 1F 63 1F 1F 16
82C8: 1C 63 4F 47 43 49 4C 00 EA
82D0: 4F 4F 00 7C 7C 60 1F 1F DB
82D8: 1C 63 43 79 7C 60 1C 1C 7E
82E0: 1C 63 00 1C 1F 4F 67 73 07
82E8: 73 73 63 1C 1C 63 1C 1C 75
82F0: 1C 63 63 1C 1C 1C 03 1F 81
82F8: 1C 63 63 1C 1C 1C 1C 1C B8
8300: 1C 63 1F 1F 1F 1F 1F 1F 96
8308: 1C 63 63 1C 1C 1C 1C 10 BD
8310: 44 13 1C 1C 1C 60 1C 1C F9
8318: 1C 1C 06 07 06 58 58 58 FF
```

Program 4: Monte Carlo For Amiga

```
  Copyright 1987 COMPUTE! Public
ations, Inc.  All rights reserve
d.
GOSUB DefinePLayFieLd
start:
DEFINT a-z
CLS:PRINT " Copyright 1987 COMPU
TE! Publications":PRINT TAB(10)"
All rights reserved."
LOCATE 4,14:PRINT "MONTE CARLO":
PRINT
DIM  c$(52),v$(13),t$(4),c2(52)
c$(52)=" -"
RESTORE:FOR i=1 TO 13
READ a$:v$(i)=a$:NEXT
DATA " A"," 2"," 3"," 4"," 5","
6"," 7"," 8"," 9","10"," J"," Q"
," K"
PRINT TAB(12);"Shuffling Deck"
RANDOMIZE TIMER
FOR i=1 TO 4:FOR j=1 TO 13
p=INT(RND(1)*52)
skip2: IF c$(p)="" THEN c$(p)=v$
(j):c2(p)=(i-1)*43:GOTO skip1
p=p+1:IF p=52 THEN p=0
GOTO skip2:
skip1: NEXT:NEXT
GOSUB suitshapes
SOUND 440,1.5
PRINT:PRINT
PRINT TAB(14)"Click on:":PRINT
PRINT TAB(16)"HARD"
PRINT TAB(16)"MEDIUM"
PRINT TAB(16)"EASY"
skip4: WHILE MOUSE(0)=0:WEND
x=MOUSE(1):y=MOUSE(2)
IF x<120 OR x>170 OR y<80 OR y>1
03 THEN skip4
IF y<104 THEN c=6
IF y<96 THEN c=5
IF y<88 THEN c=4
WHILE MOUSE(0)<>0:WEND
dispLay:
ct=0:CLS:LOCATE 5,1
FOR i=1 TO c:t=4
FOR j=1 TO 5
PRINT SPC(t);c$(ct);:t=5
IF c$(ct)<>" -" THEN PUT (j*56-6
,i*24+8),suit(c2(ct))
ct = ct+1
NEXT
PRINT:PRINT:PRINT
NEXT
PRINT TAB(12);"EXIT";SPC(8);"RES
TART";
IF c$(0)=" -" THEN LOCATE 2,12:P
RINT"Tableau is cleared":GOTO wi
nner
x=0:y=0
cr$=CHR$(62):GOSUB cursor:x1=x:y
1=y:p1=y*5+x:SOUND 440,1.5
cr$=CHR$(187):GOSUB cursor:x2=x:
y2=y:p2=y*5+x
IF p1=p2 THEN dispLay
IF (LEFT$(c$(p1),2))<>(LEFT$(c$(
p2),2)) THEN invaLid
IF ABS(x2-x1)>1 OR ABS(y2-y1)>1
THEN invaLid
SOUND 660,1.2
FOR i=p1 TO 51
c$(i)=c$(i+1):c2(i)=c2(i+1):NEXT
IF p2>p1 THEN p2=p2-1
FOR i=p2 TO 51
c$(i)=c$(i+1):c2(i)=c2(i+1):NEXT
GOTO dispLay
winner:
FOR i=1 TO 11
SOUND 440,1:SOUND 660,1:a$=INKEY
$
NEXT:game=1
GOSUB cursor
invaLid:
SOUND 150,3:GOTO dispLay
cursor:
WHILE MOUSE(0)=0:WEND
xx=(MOUSE(1)-12)/8:yy=(MOUSE(2)-
36)/12
x=(xx-6)/7:y=yy/2
IF y<>c OR (yy MOD 2)=1 THEN ski
p3
IF xx>9 AND xx<14 THEN CLS:END
IF xx>20 AND xx<29 THEN CLEAR ,,
25000:WHILE MOUSE(0)<>0:WEND:GOT
O start
SOUND 190,1.9:GOTO cursor
skip3:
IF game THEN SOUND 190,1.9:GOTO
cursor
IF (xx MOD 7)<3 OR (yy MOD 2)<>0
THEN SOUND 190,1.9:GOTO cursor
x=(xx-6)/7:y=yy/2
IF x>4 OR x<0 OR y<0 OR y>=c THE
N SOUND 190,1.9:GOTO cursor
tx=x*56+30:ty=y*24+30:LINE (tx,t
y)-(tx+40,ty+10),3,b
WHILE MOUSE(0)<>0:WEND
RETURN
DefinePLayFieLd:
SCREEN 1,320,200,2,1
WINDOW 1,"MONTE CARLO",,2,1
PALETTE  0,.5,.5,.9
PALETTE  1,0,0,0
PALETTE  2,1,0,0
PALETTE  3,.9,.9,0
RETURN
suitshapes:
DIM suit(299):RESTORE suitshapes
m= 42 :m2= 10 :GOSUB ReadCompres
sed
DATA  9, 7, 2, 6144, 15360, 3225
6,-256,-256
```

```
DATA  6144, 15360, 40033 ←
m= 42 :m2= 10 :GOSUB ReadCompres
sed←
DATA  8, 7, 2, 0, 6144, 6144, 32
256, 26112 ←
DATA  6144, 15360, 40033 ←
m= 42 :m2= 11 :GOSUB ReadCompres
sed←
DATA  8, 7, 2, 40007, 2048, 7168
, 15872, 32512 ←
DATA  15872, 7168, 2048, 40026 ←
m= 42 :m2= 11 :GOSUB ReadCompres
sed←
DATA  8, 7, 2, 40007, 27648,-512
,-512,-512 ←
DATA  31744, 14336, 4096, 40026
←
RETURN←
ReadCompressed:←
FOR j=0 TO m2←
READ t& ←
IF t&<40000& THEN suit(i2)=t&:i2
=i2+1 ELSE FOR i=0 TO t&-40000&:
suit(i+i2)=0:NEXT:i2=i2+t&-40000
&←
NEXT  ←
RETURN←
```

Program 5: IBM PC/PCjr Monte Carlo

```
BE 100 REM Copyright 1987 COMPUT
       E! Publications, Inc.  Al
       l rights reserved.
JE 110 DEF SEG = 0:KEY OFF:WIDTH
        40
AA 120 CLS:PRINT" Copyright 1987
        COMPUTE! Publications":P
       RINT TAB(10)"All rights r
       eserved."
NH 130 LOCATE 3,14:PRINT"MONTE C
       ARLO"
HN 140 DIM C$(52),V$(13),T$(4),P
       S$(4,5)
QO 150 C$(52)=" --"
GH 160 FOR I=1 TO 4
DN 170 READ A:T$(I) = CHR$(A):NE
       XT
HG 180 FOR I= 1 TO 13
MB 190 READ A$:V$(I)=A$:NEXT
GI 200 DATA 3,4,5,6
KD 210 DATA " A"," 2"," 3"," 4",
       " 5"," 6"," 7"," 8"," 9",
       "10"," J"," Q"," K"
KD 220 FOR I=1 TO 13:FOR J =1 TO
        4
CL 230 PRINT"      ";V$(I);T$(J);
MH 240 NEXT:PRINT:NEXT
BJ 250 REM junk
HO 260 PRINT TAB(5);"Shuffling d
       eck - please wait"
AA 270 RANDOMIZE TIMER
EE 280 FOR I = 1 TO 4:FOR J = 1
       TO 13
LH 290 P = INT(RND(1)*52)
LI 300 IF C$(P)="" THEN C$(P)=V$
       (J)+T$(I):GOTO 330
ON 310 P = P+1:IF P=52 THEN P=0
BG 320 GOTO 300
OP 330 NEXT :NEXT
FD 340 SOUND 440,1.5
GF 350 PRINT TAB(10)"Choose H fo
       r hard"
LG 360 PRINT TAB(17) "M for medi
       um"
CD 370 PRINT TAB(17) "E for easy
       "
PH 380 A$=INKEY$:IF (A$ <> "h")
       AND (A$ <> "m") AND (A$ <
       > "e") THEN 380
KJ 390 C=4:IF A$="m" THEN C=5
LN 400 IF A$="e" THEN C=6
LJ 410 REM display
DF 420 CT=0:CLS:LOCATE 5,1
BL 430 FOR I= 1 TO C
IP 440 FOR J=1 TO 5
IO 450 PRINT "     ";C$(CT);
KK 460 CT = CT+1
OD 470 NEXT
CP 480 PRINT:PRINT:PRINT
OC 490 NEXT
FP 500 IF C$(0)=" --" THEN PRINT
        TAB(12)"Tableau is clear
       ed":GOTO 660
IA 510 X=0:Y=0
AB 520 CR$=CHR$(16):GOSUB 740:X1
       =X:Y1=Y:P1=Y*5+X:SOUND 44
       0,1.5
BA 530 CR$=CHR$(175):GOSUB 740:X
       2=X:Y2=Y:P2=Y*5+X
PG 540 IF P1=P2 THEN 520
LH 550 IF (LEFT$(C$(P1),2))<>(LE
       FT$(C$(P2),2)) THEN 720
LH 560 IF ABS(X2-X1)>1 OR ABS(Y2
       -Y1)>1 THEN 720
FG 570 SOUND 660,1.2
LK 580 FOR I=P1 TO 51
PG 590 C$(I)=C$(I+1)
NC 600 NEXT
HJ 610 IF P2>P1 THEN P2=P2-1
LL 620 FOR I=P2 TO 51
PL 630 C$(I)=C$(I+1)
OK 640 NEXT
DE 650 GOTO 410
IN 660 FOR I=1 TO 11
EL 670 SOUND 440,1:SOUND 660,1:A
       $=INKEY$
OC 680 NEXT
PG 690 A$=INKEY$:IF A$<>"" THEN
       RUN
JH 700 GOTO 690
BO 710 REM bad move sound
CB 720 SOUND 150,3:GOTO 520:REM
JE 730 REM cursor input routine
HC 740 XX=X*7+4:YY=Y*3+5:LOCATE
       YY,XX:PRINT CR$;
NE 750 A$=INKEY$:IF A$="" THEN 7
       50
EB 760 IF LEN(A$)=2 THEN A$=RIGH
       T$(A$,1)
IC 770 IF A$="q" THEN RUN
HA 780 LOCATE YY,XX:PRINT " ";
HI 790 IF A$=CHR$(72) THEN Y=Y-1
       :IF Y<0 THEN Y=C-1
NE 800 IF A$=CHR$(80) THEN Y=Y+1
       :IF (Y>(C-1)) THEN Y=0
GP 810 IF A$=CHR$(77) THEN X=X+1
       :IF X>4 THEN X=0
FF 820 IF A$=CHR$(75) THEN X=X-1
       :IF X<0 THEN X=4
EM 830 IF A$<>CHR$(13) THEN 740
NK 840 RETURN
```

Program 6: Monte Carlo For Atari 400, 800, XL, And XE

```
DO 100 REM COPYRIGHT 1987 CO
       MPUTE! PUBLICATIONS,
       INC.  ALL RIGHTS RESE
       RVED.
ON 110 OPEN #1,4,0,"K:":POKE
        752,1:? CHR$(125):PO
       KE 710,0
HD 120 ? " COPYRIGHT 1987 CO
       MPUTE! PUBLICATIONS"
JA 130 POSITION 11,2:? "ALL
       RIGHTS RESERVED"
IA 140 POSITION 15,3:? "MONT
       E CARLO"
JD 150 DIM C$(53),C2$(53),C3
       $(53),V$(13),V2$(13),
       V3$(13),T$(4),CR$(1)
IA 160 C2$(53)="-":C$(53)="
       ":C3$(53)="  "
AN 170 FOR I=1 TO 4
NE 180 READ A:T$(I)=CHR$(A):
```

```
      NEXT I
MK 190 V2$="A23456789ØJQK"
LO 200 V$="{9 SPACES}1
       {4 SPACES}"
MN 210 DATA Ø,16,96,123
OJ 220 FOR I=1 TO 13:FOR J=1
       TO 4
NB 230 ? "{5 SPACES}";V$(I,I
       );V2$(I,I);T$(J,J);
FK 240 NEXT J:? :NEXT I
PD 250 ? "{5 SPACES}SHUFFLIN
       G DECK - PLEASE WAIT"
DK 260 C2$(1)=" ":C2$(52)="
       ":C2$(2)=C2$:C2$(53,5
       3)="-"
OO 270 FOR I=1 TO 4:FOR J=1
       TO 13
LG 280 P=INT(RND(1)*52+1)
ID 290 IF C2$(P,P)=" " THEN
       C$(P,P)=V$(J,J):C2$(P
       ,P)=V2$(J,J):C3$(P,P)
       =T$(I,I):GOTO 320
MH 300 P=P+1:IF P=53 THEN P=
       1
GI 310 GOTO 290
OA 320 NEXT J:NEXT I
OA 330 SOUND 2,75,10,12:FOR
       I=1 TO 22:NEXT I:SOUN
       D 2,Ø,10,Ø
EN 340 POSITION 9,18:PRINT "
       CHOOSE: H FOR HARD":P
       OSITION 17,19:? "M FO
       R MEDIUM":POSITION 17
       ,20:? "E FOR EASY"
DJ 350 GET #1,A
AM 360 IF A<>69 AND A<>72 AN
       D A<>77 THEN 350
OH 370 C=4:IF A=77 THEN C=5
PM 380 IF A=69 THEN C=6
EM 390 CR$=CHR$(62)
IO 400 REM DISPLAY
DO 410 CT=1:? CHR$(125):POSI
       TION 2,4
BK 420 FOR I=1 TO C
AO 430 FOR J=1 TO 5
KC 440 ? "{4 SPACES}";C$(CT,
       CT);C2$(CT,CT);C3$(CT
       ,CT);
BA 450 CT=CT+1
FA 460 NEXT J:? :? :? :NEXT
       I
FI 470 IF C2$(1,1)="-" THEN
       POSITION 12,1:PRINT "
        TABLEAU IS CLEARED":
       GOTO 660
GB 480 X=Ø:Y=Ø
PJ 490 GOSUB 740:X1=X:Y1=Y:P
       1=Y*5+X+1
MP 500 SOUND 2,75,10,12:FOR
       I=1 TO 22:NEXT I:SOUN
       D 2,Ø,10,Ø
CC 510 SETCOLOR 4,Ø,14
PG 520 GOSUB 740:X2=X:Y2=Y:P
       2=Y*5+X+1
PD 530 SETCOLOR 4,Ø,4
DE 540 IF P1=P2 THEN 490
IG 550 IF C$(P1,P1)<>C$(P2,P
       2) OR C2$(P1,P1)<>C2$
       (P2,P2) THEN 720
EB 560 IF ABS(X2-X1)>1 OR AB
       S(Y2-Y1)>1 THEN 720
OI 570 SOUND 2,55,10,12:FOR
       I=1 TO 26:NEXT I:SOUN
       D 2,Ø,10,Ø
EC 580 I=P1:J=P1+1
HL 590 C$(I)=C$(J):C2$(I)=C2
       $(J):C3$(I)=C3$(J):C2
       $(53,53)="-":C$(53,53
       )=" ":C3$(53,53)=" "
DN 600 I=P2:J=P2+1
CM 610 IF P2>P1 THEN I=I-1:J
       =J-1
HM 620 REM
HG 630 C$(I)=C$(J):C2$(I)=C2
       $(J):C3$(I)=C3$(J):C2
       $(53,53)="-":C$(53,53
       )=" ":C3$(53,53)=" "
HO 640 REM
GJ 650 GOTO 410
FD 660 REM WINNER
FA 670 FOR I=1 TO 99
CM 680 SOUND 2,I,10,12:SOUND
        2,120-I,10,12:NEXT I
       :SOUND 2,Ø,10,Ø
GP 690 GET #1,A:RUN
GP 700 GOTO 690
MG 710 SOUND 2,75,12,12:FOR
       I=1 TO 79:NEXT I:GOTO
        490
AC 720 SOUND 2,75,12,12:FOR
       I=1 TO 69:NEXT I:SOUN
       D 2,Ø,12,Ø:GOTO 490
BC 730 REM CURSOR INPUT ROUT
       INE
EO 740 XX=X*7+5:YY=Y*3+4:POS
       ITION XX,YY:? CR$
DN 750 GET #1,A
DH 760 IF A=81 THEN RUN
OH 770 POSITION XX,YY:PRINT
       " ";
AO 780 IF A=28 OR A=45 THEN
       Y=Y-1:IF Y<Ø THEN Y=C
       -1
AO 790 IF A=29 OR A=61 THEN
       Y=Y+1:IF Y>C-1 THEN Y
       =Ø
IN 800 IF A=30 OR A=43 THEN
       X=X-1:IF X<Ø THEN X=4
IO 810 IF A=31 OR A=42 THEN
       X=X+1:IF X>4 THEN X=Ø
EJ 820 IF A<>155 THEN 740
HL 830 RETURN
```

Program 7: Atari ST Monte Carlo

```
100   rem Copyright 1987 COMP
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      ights reserved."
110   fullw 2:clearw 2:resto
      re:randomize Ø
120   gotoxy Ø,1:?" Copyrigh
      t 1987 COMPUTE! Publicat
      ions"
130   gotoxy 13,3:?"MONTE CA
      RLO"
140   DIM C$(52),V$(13),T$(4
      )
150   C$(52)=" --"
160   FOR I=1 TO 4
170   READ A$:T$(I)=A$:NEXT
      I
180   FOR I=1 TO 13
190   READ A$:V$(I)=A$:NEXT
      I
200   DATA "h","d","s","c"
210   DATA " A"," 2"," 3","
      4"," 5"," 6"," 7"," 8","
       9","10"," J"," Q"," K"
220   for i=Ø to 51:c$(i)="-
      ":next i
230   gotoxy 5,5:?"Shuffling
       deck - please wait"
240   rem randomize timer
250   for i=1 to 4:for j=1 t
      o 13
260   p=int(rnd(1)*52)
270   if c$(p)="-" then c$(p
      )=v$(j)+t$(i):goto 300
280   t=p+1:if t=52 then t=Ø
290   p=t:goto 270
300   next j:next i
310   print tab(10);"Choose
      H for hard"
320   print tab(17) "M for m
      edium"
330   print tab(17) "E for e
      asy"
340   sound 1,8,5,4,20:sound
      1,Ø,Ø,Ø,Ø
350   a=inp(2):if a=69 or a=
      101 then c=6:goto 390
360   if a=72 or a=104 then
      c=4:goto 390
370   if a=77 or a=109 then
      c=5:goto 390
380   goto 350
390   ct=Ø:clearw 2:gotoxy Ø
      ,4
400   for i=1 to c
410   for j=1 to 5
420   xx=j*6-2:yy=i*2+2:goto
      xy xx,yy:?c$(ct)
430   ct=ct+1
440   next:?:?:next
450   if c$(Ø)=" --" then go
      toxy 9,1:?"Tableau is cl
      eared":goto 640
460   x=Ø:y=Ø:cr$=">"
470   gosub 720:x1=x:y1=y:p1
      =y*5+x
480   if q then clear:goto 1
      ØØ
490   sound 1,8,5,4,20:sound
       1,Ø,Ø,Ø,Ø:cr$=chr$(175)
500   gosub 720:x2=x:y2=y:p2
      =y*5+x
510   if q then clear:goto 1
      ØØ
520   if p1=p2 then 390
530   if (left$(c$(p1),2))<>
      (left$(c$(p2),2)) then 7
      ØØ
540   if abs(x2-x1)>1 or abs
      (y2-y1)>1 then 700
550   sound 1,8,7,4,20:sound
       1,Ø,Ø,Ø,Ø
560   for i=p1 to 51
570   c$(i)=c$(i+1)
580   next
590   if p2>p1 then p2=p2-1
600   for i=p2 to 51
610   c$(i)=c$(i+1)
620   next
630   goto 390
640   for i=1 to 10
650   sound 1,8,5,4,5:sound
      1,8,7,4,5
660   next:sound 1,Ø,Ø,Ø,Ø
670   a=inp(2)
680   clear:goto 100
690   rem bad move sound
700   sound 1,12,2,2,35:soun
      d 1,Ø,Ø,Ø,Ø:goto 390
710   rem cursor input routi
      ne
720   xx=x*6+3:yy=y*2+4:goto
      xy xx,yy:?cr$;
730   a=inp(2)
740   if a=101 then end
750   if a=113 then q=1:a=13
760   gotoxy xx,yy:?" ";
770   if a=200 then y=y-1:if
       y<Ø then y=c-1
780   if a=208 then y=y+1:if
       y>(c-1) then y=Ø
790   if a=205 then x=x+1:if
       x>4 then x=Ø
800   if a=203 then x=x-1:if
       x<Ø then x=4
810   if a<>13 then 720
820   return
```

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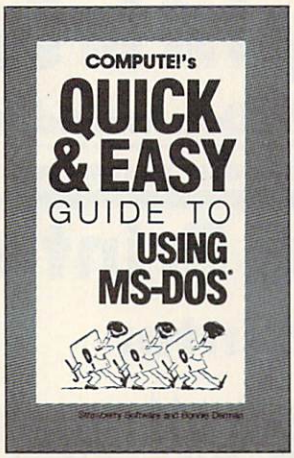

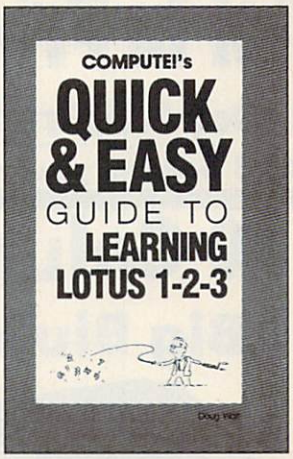

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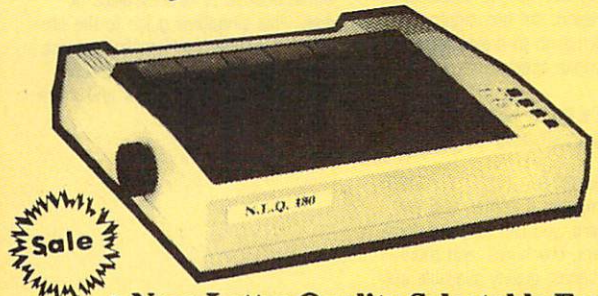

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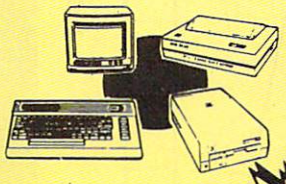

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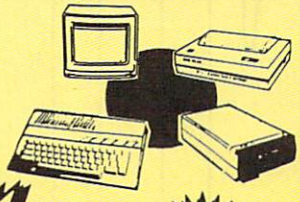

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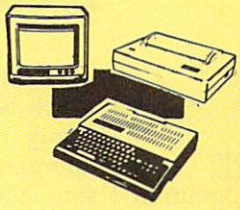

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Computers are unbeatable for word processing, spreadsheet work, and games. But if you think that's all they can do, think again. There are hundreds of unusual, specialized software packages out there—if you know where to look. From the purely practical to the imaginative to the utterly eccentric, most of these programs sell for under $30. Here's a sampling from Dan Gutman's I Didn't Know You Could Do That with a Computer!, *recently published by COMPUTE! Books.*

Your Home And Family

Trace Your Family Roots

There isn't a computer program in the world that will go to Europe or Africa for you and track down your long-lost ancestors. Maybe in a few years. But if you do the research, your computer is excellent at storing and organizing all the information. *Family Roots*, from Quinsept, is one of many genealogy programs on the market. There's even a program of pet genealogy called *Pet-I-Gree* (by Genealogy Software) for dog breeders.

But for now, let's stick with humans. *Family Roots* is broken into six interlinked programs, the first of which is "Edit." You type in each family member, including as much information as you have on the person. You can include the name, date of birth, place of birth, date of baptism, sex, number of marriages, cemetery where the person is buried, and occupation. Any of this data can easily be changed if you should find out more about the person. The computer assigns an identification number to each individual and keeps track of the relationships between members of a family.

The "Charts" section of *Family Roots* allows you to make printouts of charts in different forms. You can take your great-great-grandfather and print out all his descendants (up to seven generations), all his predecessors, or his immediate family. The "Sheets" section of the program lets you print single pages about an individual or a family, which are nice to send to the people involved. It's also possible to print out all the addresses of living relatives, which can be helpful around holiday time.

The "Search" section of the program helps you find people who fit into specific groups. As an example, the computer can quickly name all the members of your family who died between 1890 and 1920, if for some reason you need that information.

Family Roots was created by a genealogist and can be best used by people from large families with a serious interest in the subject. If you have a small family tree or if you don't know much about your ancestry, you'll be better off with a written record kept in a safety-deposit box.

Quinsept, for Apple II, Commodore 64/128, CP/M, IBM PC.

Other programs to look for: Pet-I-Gree *(Genealogy Software), for Apple II;* Patriarch I *(Cyclone Software), for Apple II;* Ancestors *(Autumn Color Software), for Radio Shack TRS-80 Color Computer;* Your Family Tree *(Acorn Software), for IBM PC/PCjr, TRS-80 Models III/4.*

Manage Your Career

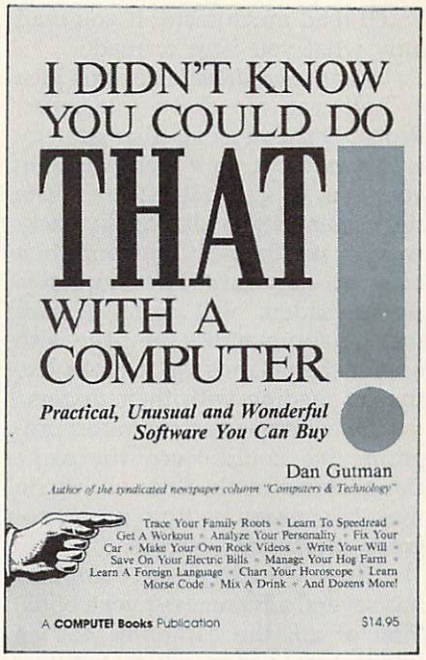
Construction worker? Farmer? Machine operator?

When you make your living as a writer, you don't expect to be told that you're best suited to occupations like the above. But I had honestly told CBS's *Career Planning* that I enjoy physical labor, and the computer honestly told me jobs which would provide this satisfaction. Despite that fluke, the program can really help a young adult starting out to pick the right career and manage it skillfully.

Career Planning is more than a computerized aptitude test. The four-disk program is designed for job hunters and job holders. Disk 1 (Assessing Your Skills and Attitudes) examines your likes, dislikes, talents, and feelings about work. Disk 2 (Writing a Career Plan) probes the importance of your working environment, co-workers, location, salary, and job responsibilities. Disk 3 (Strategies for Career Change) helps you decide if you should change the direction of your career and in what way. Disk 4 (The Art of the Interview) helps you write your cover letter and résumé, and provides tips for that all-important personal interview.

The computer is worthwhile only if it can perform a task differently from other media—like books. The bestseller *What Color Is Your Parachute?* can also help you plan your career, but it doesn't do it *interactively.* To teach you how to handle the interview situation, *Career Planning* puts you in that situation and requires that you make decisions. In this case, you are the interviewer, and you've got to decide which of four applicants should be hired for two positions. Your assessment indicates whether or not you'll know the right things to say when you're on the other side of the desk.

In evaluating you, the program asks questions about the satisfaction level of your current situation and then about your ideal situation. If the two are very different, you're encouraged to think about what you could do to bring them closer together.



No guidance counselor or computer program works miracles. All the program can do is force you to sit down and ask yourself, in logical order, questions that may be vague or disorganized in your mind. It forces you to examine yourself and nudges you toward making decisions you really need to make. By directing questions to you (using your name), the computer strips away any excuses or defense mechanisms you may have been hiding behind. It asks you questions you may have avoided asking yourself.

For people who are already quite introspective, *Career Planning* probably won't say much that you don't already know about yourself. But for people who haven't sat down and figured out in which direction they're heading, it can help organize those thoughts and provide valuable tips.

CBS Interactive Learning, for Apple II, IBM PC.

Other programs to look for: Jobfinder *(Compu-Job Software), for IBM PC. This program helps you write your résumé and cover letter, print a personal history report, and pick the best job offer.*

Design Your Own House

Anybody who's ever lugged a 500-pound couch from one room to another only to find out that it still looks lousy will appreciate Avant-Garde's *Design Your Own Home* series. Now, instead of carrying all that furniture up and down the stairs, you can just slide it around your computer screen.

Design Your Own Home is actually three programs: *Architectural Design, Interior Design,* and *Landscape Design.*

Architectural Design helps you design the house itself. The program contains 126 different detail shapes that can be used to make up a floor plan. These shapes can be rotated or arranged on the screen in any way you'd like. The computer automatically calculates distances, diagonals, and angles. Feet and inches can easily be converted into decimal or metric numbers. You can observe your design from a top view or a side view.

Nice floor plan. But what about that truckload of furniture that just pulled up outside?

Interior Design allows you to move your simulated furniture all over the house to decide where it fits best in your available space. Kitchens, living rooms, bedrooms, and bathrooms can all be laid out to your specifications. You can even experiment with different color schemes and put multicolored patterns on the walls to simulate wallpaper. If you don't like the way your wife or husband has arranged the furniture, rearrange it onscreen and then have the argument.

Your house is looking pretty good now. But a house isn't a home until you get the exterior looking the way you want it.

Landscape Design contains several outlines of "canned houses," or you can draw an original outline of your own home. Then you can position simulated plants, flowers, trees, and shrubs around the grounds. To help with your future

planning, you can even make the foliage larger to see how it will look in a few years.

Avant-Garde, for Apple II, IBM PC.

New home buyers who own a Macintosh aren't neglected. Hayden Software has turned the Mac into a computer-aided design tool. Their *Home Design* contains over 800 three-dimensional images of chairs, tables, fireplaces, hot tubs, and other home furnishings. And that includes 112 different kinds of chairs.

For more professional purposes, Hayden's *da Vinci* goes even further. It's a series of five packages consisting of predrawn and professionally rendered graphics. You can take a door, for instance, and change its size, stretch it, rotate it, and then insert it into your house design. The *da Vinci* programs can be used to design building exteriors, landscapes, interiors, offices, restaurants, even an entire city.

Moving furniture around with a computer is so effortless that it may be hard to tear you away from the screen to take your real furniture out of its boxes.

Hayden Software, for Macintosh.

Other programs to look for: Room Arranger *(Henry M. Hufnagel), for IBM PC.*

Teach Yourself

Learn To Read 1000 Words A Minute

Here's a depressing thought—there will be about 40,000 books published in the United States this year, but if you read at the average rate of 250 words per minute, you'll probably get through only 2500 in your *entire lifetime.* This can be good motivation to take a speed-reading course. Many of us have a pile of books, newspapers, and magazines all over the house that we never seem to have time to even *look* at.

There's nothing magical about doubling or even tripling your reading speed. The main idea is that most of us read . . . one . . . word . . . at . . . a . . . time. This is what slows us down. Research has shown that our brains are capable of taking in clusters of words or even incomplete words and assembling them into a coherent thought. As an example, read this passage:

> L-st ni—t I had a dre-m th-t I w-s an elder— man on my d—thbed. J-st as I was ab—t to die, Al—n Funt jump— out fr-m behi-d a wa-l a-d expl— n-d th-t my wh-le life w-s one l-ng episo-e of C-ndid Cam— a.

There were 32 letters missing from those two sentences, but you probably read them perfectly. Your brain automatically filled in any letters that were missing. You don't have to see every letter or every word in order to get the meaning. You'll read much faster if you read only what you *have* to read.

Micro SpeedRead uses this idea to help you zip down the pages. Probably the most familiar strategy is Z-patterning, in which you train your eyes to scan a line from left to right, then to scan diagonally backward down the next line, and then to scan the third line normally. Speed-readers will usually trace this Z-pattern across the page with one of their hands, so it looks like they're reading with their fingers.

So who needs a computer program? We could learn the same thing from a book. After all, we do most of our reading from paper, not green phosphor screens.

Speed-reading by computer has several advantages over a book. First of all, the computer has an internal stopwatch, which can time you and instantly calculate the number of words you're reading per minute. More importantly, the computer can scroll passages of text past your eyes at whatever speed you tell it. Of course, being able to work at your own pace and take the course in your own home are also advantages of speed-reading by computer. And computer programs cost less than most speed-reading courses.

Micro SpeedRead takes advantage of these capabilities to give you a complete speed-reading course. First, you'll estimate your present reading speed; then you'll learn about clustering words and ideas, various pacing patterns, and skimming and scanning; and finally you'll find out how much your reading speed has improved.

Your eyes and brain are approaching the end of this section now. You've probably been at it for a couple of minutes. While every writer hopes that readers are hanging on to every word, you could have actually skipped many of my words and knocked off this section in about 30 seconds. In fact, if you were a speed-reader, you'd probably have finished reading this book by now.

CBS Software, for Apple II, Commodore 64/128, IBM PC.

Other programs to look for: Evelyn Wood Dynamic Reader *(Timeworks), for Apple II, Commodore 64/128, IBM PC, Macintosh;* Speed Reader II *(Davidson & Associates), for Apple II, Commodore 64/128, IBM PC, Macintosh.*

Learn A Foreign Language

When President Carter visited Poland in 1977, he tried to express his wish to "learn your opinions and understand your desires for the future." Unfortunately, his words were translated as, "I desire the Poles carnally."

That's just one story of a bad translation. When General Motors introduced their Chevy Nova, it didn't occur to anyone at the company that *Nova* in Spanish means "it doesn't go." Not surprisingly, sales weren't so hot in Puerto Rico or Latin America. GM flubbed another one when their "Body by Fisher" slogan was translated "Corpse by Fisher" in Flemish.

And who can forget the famous Pepsi ad campaign in which confused Chinese soft-drink lovers thought "Come Alive with Pepsi" meant "Pepsi Brings Your Ancestors Back from the Grave"?

It all goes to show that Americans are terrible at languages other than English. (The English would probably say we don't shine at *that* language either.) High school classes don't seem to work. Books, audiotapes, and videotapes haven't worked. Maybe computers will work.

Fifty-five-year-old Gessler Publishing does nothing but sell foreign language software. At last count they had 250 titles covering just about every language spoken on the planet. Specialty software on grammar, vocabulary, and refresher courses is available. For adults, they've got *Gutenberg,* a word processor that can load language fonts

for French, Spanish, German, and ten other languages. For children, they've got the ever popular *La Guillotine* (Hangman, *à la française).* Foreign versions of Trivial Pursuit are in the works.

Real language buffs can say *au revoir* to boring drills and exercises. Gessler's programs try to make learning languages fun. Their latest is *French Micro Scrabble,* a clone of the 90-million-selling game we all know and love. The computer version has a built-in 20,000-word French vocabulary. You can play against the computer, or four players can compete against each other. No English words are allowed.

Gessler has also translated top-selling American programs into other languages. Spinnaker's *Snooper Troops* is available in German and French. Fans of Brøderbund's *The Print Shop* can now create their own greeting cards in French, Spanish, German, Italian, or Latin. Gessler recently completed a translation of Epyx's popular adventure game *Temple of Apshai* into French (*Le Temple d'Apshai*).

"It forces you to think in a language," says Gessler president Seth Levin. "If you're in a dungeon and you've got a troll coming after you, you don't have time to think of the correct word for *run* or *fight.* You've got to do it in your head immediately."

But what can a computer do that a human teacher can't? Levin believes that, "The beauty of the computer is that it's endlessly patient. If you have a problem with conjugating a verb, it will drill you forever."

Most Americans still have a "let the rest of the world learn English" attitude. But as the world gets smaller, we *need* to learn other languages. Our neighbors Canada and Mexico speak different languages. We can fly to Europe now in just three hours. "People are finally realizing that we can't survive in the world today without understanding another language," says Seth Levin.

Learning a nation's language is more than just a convenience. It also shows an appreciation for its culture. Sometimes we deceive ourselves into thinking the world revolves around the United States.

Gessler, most programs available for Apple II, Atari, Commodore 64/128, Commodore PET, IBM PC, Tandy 1000, TRS-80.

Other programs to look for: Linkworld Language Series *(Artworx), for Apple II, Atari, Commodore 64/128, IBM PC;* Russian for the VIC-20 *(Russian Software), for Commodore VIC-20;* Le Français par Ordinateur *(DHC Educational Software), for Apple II. DHC also makes programs that help students with the names of French foods, customs in French-speaking countries, conversation about sports, and getting around the Paris subway system.*

You might also want to check out Translator, *from Polygon Industries. It translates texts in French, German, Spanish, English, and Italian. The manufacturer claims 90 percent accuracy. The program is made for most computers.*

Sports And Recreation

Programs For Camera Buffs

Camera Simulator is one of the more clever computer programs you'll come across. As the name suggests, it simulates the action of taking a picture and teaches the fundamentals of photography at the same time.

As an example, the computer generates an animated image of a skier tumbling down a slope. Mountains, trees, and the sky are in the distance. First, you've got to focus the "camera." Alternately hitting the F and G keys causes the image to slide in and out of focus. You manipulate the keys until the image is sharp. Then you select a shutter speed with the arrow keys (from one second to 1/1000 second). Next, you pick one of several lens openings to adjust the exposure. When everything looks perfect, you hit the S key to snap the picture.

The computer "develops" the shot in a few seconds. The screen then becomes your finished photograph. If you have set everything correctly, it looks good. If you haven't focused properly, the skier is a blur on the screen. The same is true if you have selected a shutter speed that's too slow to freeze a moving object. If your lens opening is too wide, the image looks washed out.

Whichever mistake you make, the computer gently informs you that you have done something wrong and suggests how you should correct it—"YOU DIDN'T FOCUS PROPERLY. TRY AGAIN." By seeing your mistakes instantly, you can understand how shutter speed and f/stops interact in photography. The computer has acted as your teacher, camera, film, and processing lab.

Camera Simulator includes brief lessons on range finders, shutters, apertures, exposures, light meters, and trouble shooting, as well as a short history of photography. It was created by Armand Ensanian, a photography teacher for 18 years.

Brain Builders, for Apple II, Commodore 64/128, IBM PC.

Camera Simulator is strictly for beginners, but even serious hobbyists and professional photographers are starting to use computers in their work. The computer can be a secretary that sends out mailings to clients. It can keep track of thousands of slides, prints, and negatives. It can log on to Photonet, an online information network exclusively for photographers.

DarkStar Plus will even assist you in the darkroom. If you want to make an 8 × 10 print from a 35mm negative, for example, *DarkStar* will tell you exactly how many seconds the negative should be exposed under the enlarger. You don't have to waste time and expensive materials making test strips. The program also calculates processing times and lens openings, and tells you which filters you'll need for a color print.

F/22 Press, for Apple II, Atari, Commodore 64/128, IBM PC.

Photographers interested in computerizing should also consult *The Photographer's Computer Handbook,* written by B. Natine Orabona and published by Writer's Digest Books.

Build Your Own Robot

At Bell Labs in New Jersey, they're spending millions to teach robots how to catch Ping-Pong balls. Catching a Ping-Pong ball is easy with human hand/eye coordination, but a robot needs two television cameras, a vision microprocessor to calculate the trajectory of the ball, and motors to quickly

move the arm into position and catch the ball in a cup. Someday—*maybe*—we'll figure out how to teach the robots to throw the balls *back*.

If computing is an infant industry, robotics is in the fetal stage. A lot of people think that robotics now is where personal computers were ten years ago, when people like Steve Wozniak were building them in their garages. Robotics, say the experts, is "the next big thing."

Multibotics is a home robotic workshop that hooks up with your computer. It may turn out to be the erector set for kids of the eighties.

The heart of the system is the B100 Interface Module, which plugs into your computer. Cables are used to connect lights, motors, sensors, and other external devices. Instead of just crunching numbers, your computer can be turned into a variable-speed motor controller, voltmeter, oscilloscope, infrared detector, and audio digitizer. *Multibotics* connects your dumb terminal to mechanical and electrical devices in the real world.

The system is flexible. You can do one of the 50 projects and experiments described in the instructions, or design and build your own inventions. The first project is easy. You simply attach a small motor to the computer and program it to go forward, reverse, and at different speeds. Then you progress through Motors and Gears, Generators and Feedback, Digital Electronics, Moving Vehicles, and Electronic Speech. Not all the projects are robotic in nature, but you *can* build your own computer-controlled robots, cars, and cranes.

Adults will enjoy it, but the system has been designed so that even a ten-year-old child can perform the sample projects without help. No tools are necessary for assembly; the parts snap together. It's probably best not to tell your kids that *Multibotics* is an educational system that demonstrates the basic science and engineering principles they see every day.

Multibotics, for Apple II, Commodore 64/128, Amiga, Atari, Atari ST, IBM PC.

Other programs to look for: Robotic Computing Kit *(fischertechnik), for Apple II, Commodore 64/128.*

Create Your Own Crossword Puzzles

At some point in our lives, almost all of us have killed a few hours doing a crossword puzzle. But only a few of us ever *created* a crossword puzzle from scratch. Designing the grid and making all those words fit together perfectly just seems a pain in the neck, so why bother?

The computer may change all that. With *Crossword Magic*, you just provide the words and clues. The computer does the dirty work.

First, you're asked you if you want to use the "automatic puzzle sizing option." This means that you pick your words freely, and the computer makes the grid larger to accommodate them. If you prefer, you can pick the size of your puzzle in advance, anywhere from 3 to 20 boxes square.

Then you just type a word that you want in your puzzle. *Crossword Magic* automatically enters it into the grid. The first word always appears in the top row across. You can move it to a different location or delete it if you change your mind. When you enter your next word, the computer will show you all the spaces where it can fit. If the word doesn't connect with anything on the screen, you'll hear a buzz and see, "Word does not fit yet." The word will be stored in an "Unused Word File." When a spot opens up, the computer will reintroduce it. You can save as many as 500 words in the Unused Word File.

At the same time you're entering words, you're also writing clues for them. The computer organizes the clue list for you. When you print out the puzzle, it will also print out the clues and an answer code.

Crossword Magic not only makes it easier to write a puzzle, but it also makes it easier to *play* one. Unlike the first-come, first-served puzzles in your daily paper, computer crossword puzzles give each member of the family a chance to work the same puzzle. And you can store up to 20 puzzles on a single disk.

The only real disadvantage is that *Crossword Magic* doesn't allow you to create wild, imaginatively shaped puzzles. The program works only with square boxes. But you can create respectable-looking crossword puzzles simply for the fun of it or as a way to expand your vocabulary. The program can also make creative crossword greeting cards, announcements, or invitations. Whatever you do, you'll get your point across.

Or down.

Mindscape, for Apple II, Atari, Commodore 64/128, IBM PC.

Other programs to look for: *The New York Times Computer Crossword Puzzles (Simon & Schuster), for Apple II, Atari, Commodore 64/128, IBM PC;* MasterPieces *(Hayden Software), for Macintosh;* Puzzle Master *(Shenandoah Software), for TRS-80;* Crosscheck *(Datasoft), for Apple II, Atari, Commodore 64/128, IBM PC. You can solve any cryptogram with Crypto (Piedmont Specialty Software), for IBM PC.*

Health And Fitness

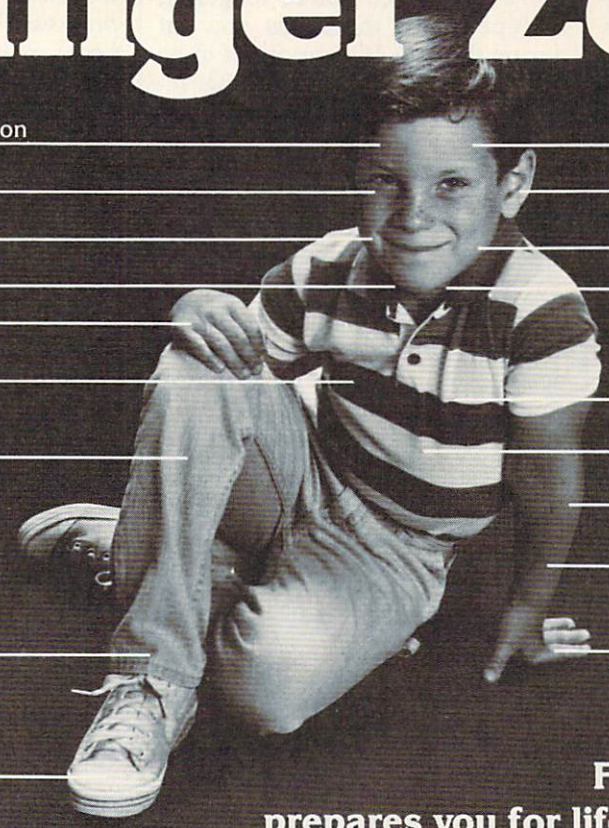
Get An Aerobic Workout

If there's one thing that's bad for your body, it's sitting at a computer keyboard all day. You can bet *The New England Journal of Medicine* is working up some fashionable new disease like "keyboard backache" or "disk drive elbow." Just like anything else carried to excess, computers can be hazardous to your health.

Computers can also be *good* for your health. *Aerobics* is the first computer program to give you a physical workout. It's also the first program you use standing ten feet away from the keyboard. As your onscreen computer-generated instructor performs her exercises, you follow her movements. She does 18 exercises, each consisting of a warm-up, aerobics, conditioning, and a cool-down. There's no voice to egg you on, but captions tell you what to do (like "Breathe!" in case you need to be told). Synthesized disco music helps you stay with the pace. Your instructor is quite lifelike and even sports a snappy headband. She seems to be in pretty good shape herself. In fact, it wouldn't hurt her to put on a few pounds, if you ask me.

Why would anybody want to work out with a hi-res Jane Fonda clone when they can just as easily buy a videotape and work out with

Danger Zone.



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Indicate Computer: ☐ Macintosh® ☐ IBM PC® and compatibles

a living, breathing, squatting human being. Or even with Richard Simmons. Well, videotapes are fine, but since everybody who buys them has a different body type, they have to be geared toward an "average" person. If you don't have that average body, too bad. You can't change the tape. You have to do the exercises at the same speed and in the same order that Jane Fonda does them. Even the most dedicated fitness fans get tired of working out in the exact same way, day in and day out.

But a computer is flexible. You can tap a few keys and slow the instructor down or speed her up. You can customize the exercise routine. You can concentrate on the leg exercises, upper body exercises, or any other part of your body that needs work. You can do as many repetitions as you want. You can create a workout that will take anywhere from half an hour to an hour and a half, and it will be personalized to your body.

To be frank, Jane Fonda sells a lot more videotapes than Spinnaker will ever sell copies of *Aerobics*. There's a reason—people would rather watch a human being than an animated character. But it's out there if you want it. Feel the burn.

Spinnaker, for Atari, Commodore 64/128.

Other programs to look for: Exercise/Aerobics *(CTRL Health Software), for Apple II, Commodore 64, IBM PC;* MacMuscle *(Tech 2000 Software), for Macintosh;* Fit and Trim *(Andent), for Apple II.*

Go On A Diet

Everyday we're bombarded with advice on what we should or shouldn't eat. Don't eat fat. Eat fiber. Don't eat sodium. Eat vegetables. Don't eat sweets. Take vitamins. This is all pretty obvious, but unless you go to a trained (and expensive) nutritionist, you never really find out whether the combinations of foods you eat add up to a balanced diet or not. This is one area where both books and computers can do the job, but computers—because they're interactive—do it better.

Nutri-Byte is better than a diet book because it can find out all about you and tailor a program based on *your* personal needs. The program starts by asking you questions about your age, sex, and frame size. Then you're requested to type in all the foods you eat during the day. It's important to be specific here. If you had a cheeseburger for lunch, you have to indicate whether it had Swiss cheese or American cheese on it. If you had orange juice, you're asked to estimate the number of ounces. Every little detail affects the analysis.

The program will then list all the foods you've admitted to eating and tell you their nutritional composition. A fried egg, for instance, contains 199 total calories—52 calories of protein, 146 calories of fat, and 1 calorie of carbohydrate. Did you know that an apple contains more calories than a glass of apple juice? The program has a database of 1200 foods, and you can add any of your favorites that might be missing.

After you go over these numbers, your current diet will be presented as a chart. You may find that your diet is made up of 10 percent protein, 42 percent fats, and 48 percent carbohydrates (it should be 12 percent, 30 percent, and 58 percent, according to the U.S. Senate Select Committee on Nutrition and Human Needs). All of this information can be printed out. That's just the first week of the five-week *Nutri-Byte* plan.

The designers of the program recognize that there are a number of factors that lead to overeating. Instead of eating when they're hungry, many people eat for other reasons—because they're depressed, because the clock says it's lunchtime, or simply because the refrigerator is a few feet away. During weeks 2–5, the program asks you questions and analyzes variables that might be relevant to your eating habits. How hungry were you before dinner? What mood were you in? Where did you eat? With whom? It may sound like the Spanish Inquisition, but you could find that you're eating more when you're in certain situations or with certain people. The program will act as an electronic conscience and tell you, "Overeating when fatigued or tired," or, "Too many snacks with Wanda." *Nutri-Byte* will also ask you about your physical activity and take that into account.

Behavior modification techniques are used to set goals, provide feedback, and comment on your progress. The program won't prevent you from stuffing that piece of cake into your mouth, but it *will* tell you what the consequences will be.

Nutri-Byte is very easy to use and is recommended for weight-conscious people between the ages of 20 and 69. The program is sensible; if you tell it you want to lose 80 pounds by Tuesday, it will refuse to run until you consult with a doctor or *claim* to have consulted with a doctor. Crash dieters will be better off with one of those "eat mangos till you drop" diets.

ISC Consultants, for Apple II, IBM PC.

Other programs to look for: The Complete Scarsdale Medical Diet *(Bantam), for Apple II, IBM PC;* The Original Boston Computer Diet *(Scarborough), for Apple II, Commodore 64/128, IBM PC;* The Model Diet *(Softsync), for Commodore 64/128;* Nutri-Calc *(Camde), for Macintosh.*

And when you go grocery shopping for your healthy foods, don't forget to consult The Coupon Organizer *(Andent), for Apple II.*

Mental Health And Fitness

Analyze Your Own Personality

Psychologist Carl Jung has been dead for 25 years, but his theories live on in, among other places, *Personality Analyzer.* This program attempts to assess Jung's four psychological functions of thinking, feeling, sensing, and intuiting, in conjunction with your own attitudes of judging, perceiving, and introversion/extroversion.

Personality Analyzer asks you questions—22, 44, or 88 (your choice). The questions require you to choose between two opposing responses. A few samples: Are social gatherings energizing or tiring? Do you prefer being separate or crowded? Do you prefer people who are sensible or imaginative? Do you prefer to travel or arrive?

Instead of requiring black or white answers, *Personality Analyzer* lets you respond according to how strongly you feel about a question. By moving the cursor left or right, you move a bar along a bar chart to

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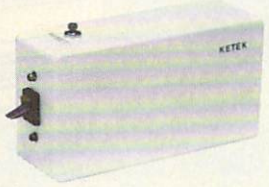

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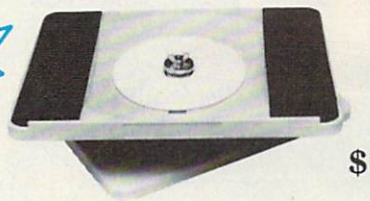

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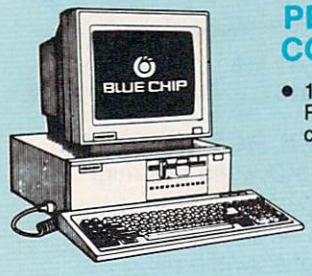

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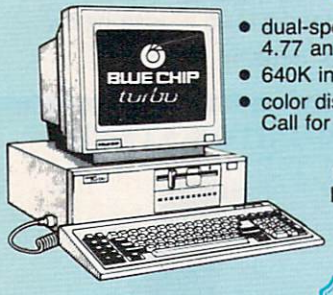

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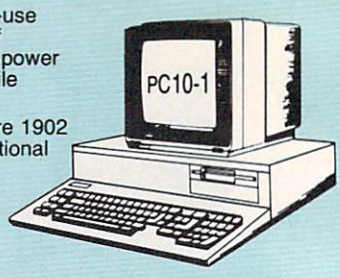

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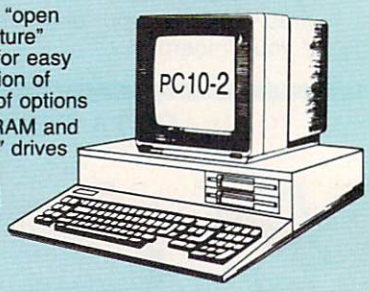

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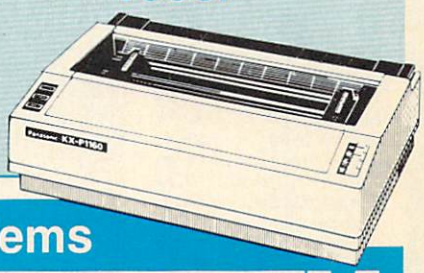

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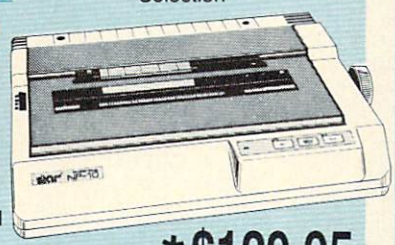

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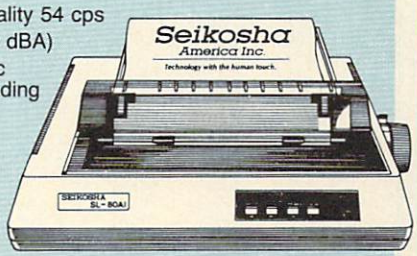

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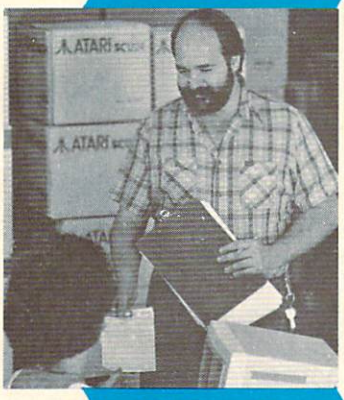

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Wld. Cl. Leader
Activision:
Aliens .....
Champion. Bask
Hacker .....
Hacker 2 .....
Labyrinth .....
Music Studio ....
Tass Times .....
Titanic .....
Leather Goddes
Stationfall .....
Lurking Horror
Top Fuel Elimin
Microprose:
F-15 Strike Eag
Gunship .....
Kennedy Appro
Silent Service .
Solo Flight .....
Top Gunner ....
Microleague:
Microleag. Base
General Manag
Stat Disk .....
'86 Team Disk

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register your degree of certainty. For instance, "Are social gatherings energizing or tiring?" If you simply hate parties, you'd move the bar all the way to 7 on the side of "tiring." If you slightly dislike parties, you'd just move it to 2 or 3. These subtle distinctions allow the computer to paint a more accurate picture of your personality.

After the last question, the computer "thinks" for a few seconds, cross-tabulates your replies, and delivers your personality profile. You receive numerical scores on Extrovertive/Introvertive, Intuition/Sensation, Thinking/Feeling, and Judging/Perceiving. Then you're told which of 16 personality types you fit into, along with a list of adjectives that describe you.

The computer then tells you which occupations might be best suited to your personality and what you might be like as a mate. It also describes a characteristic you value strongly (such as dependability, privacy, or independence) and your potential weaknesses ("fascination with irresponsible people").

Psycom Software, for Apple II, Commodore 64/128, IBM PC.

Bantam Software's *Know Your Own Personality* takes a different approach. The computer asks you 210 yes/no questions ("Are you careful to keep a supply of canned food in your house in case of an emergency food shortage?") to test for three personality traits—Extroversion/Introversion, Emotional Stability/Adjustment, and Tough-/Tender-Mindedness. At the end of the test, you're presented with charts comparing your various traits and a paragraph that describes your personality.

Taking this test can be fun, as long as your head is screwed on reasonably well. Bantam suggests inviting close friends over and throwing a "personality party." I wouldn't recommend it. Your close friend might not appreciate having everyone see such results as, "You have a low opinion of yourself. You believe you are an unattractive failure. You are characteristically pessimistic, gloomy, and depressed. You are disappointed with your existence and at odds with the world."

That could cool off a party *real* fast.

Bantam Software, for Apple II, Commodore 64/128. On the same disk is another program, Know Your Own I.Q.

Other programs to look for: Understand Yourself *(Dynacomp), for Apple II, Commodore 64/128.*

Improve Your Memory

Does this mean anything to you?

I saw a ton of wash floating in a dam. A chef and his son were there, and the chef was mad at his son.

That's a simple mnemonic device to learn the names of the first four presidents of the United States—Washington, Adams, Jefferson, and Madison. The suggestion comes from *Remember!*, a handy tool for high school and college students trying to memorize course material.

The program works by having you type questions and answers about the material you're trying to memorize. For instance, if you want to learn state capitals, you'd type CALIFORNIA as one question and SACRAMENTO as its answer. Later, the computer will present the word CALIFORNIA, and you'll have to type in the correct response. The computer organizes all the questions and answers, similar to the way teachers use flash cards.

Much of memorization involves forming associations between words, and the computer can help do this. The program contains a simple art and music program, so you can create a drawing or tune to go with each question. If you can't seem to remember that Little Rock is the capital of Arkansas, you might want to draw a picture of an ark sitting on top of a boulder—or whatever image you can dream up.

Learning comes easier if you can test yourself in many different ways. With *Remember!* you can respond to your original question or you can receive the answer first and provide the question (as on the game show "Jeopardy"). The computer is happy to construct multiple-choice questions on the material, or it can put the answers in a list format. At the end of the test, the computer will tell you how many questions you got right and which ones you missed. You can also print out the whole lesson on paper.

Remember! isn't really useful for *serious* memorization. A question can be only 79 characters long, exactly the length of this sentence. Answers must be even shorter—19 characters. That rules out essays and complicated questions. You can ask yourself only 20 questions per lesson. So if you were trying to memorize the names of the presidents, the program would top out before you hit Chester Arthur. That would be fine if we lived in 1887, but a student in 1987 needs to memorize 40 presidents.

Remember! can, however, be useful for memorizing vocabulary words, foreign languages, dates, phone numbers, chemical symbols, states and capitals, and short lists. Just typing the material into the computer, reviewing it, and taking a test on it makes it easier to learn the material. But this is one of those situations where the computer's solution to a problem isn't a vast improvement over the methods we already have. Homemade flash cards do just about the same thing as *Remember!*, and they're a lot cheaper.

Designware, for Apple II, Commodore 64/128, IBM PC.

Other programs to look for: Think Fast *(Brainpower), for Apple II, Macintosh;* The Einstein Memory Trainer *(Avant-Garde), for Apple II.*

Designware also makes a "French Vocabulary Disk" and a "Spanish Vocabulary Disk" to go with Remember!

Reduce Your Stress Level

In the sixties, drugs promised to bring us salvation, happiness, maybe bliss. It didn't happen. In the seventies, meditation was supposed to improve our lives and relax our minds if we'd only repeat a mantra for 20 minutes, twice a day. It didn't happen. Now it's the eighties, and we've finally found the one true answer to coping with the stress of everyday life—technology.

Relax is an offbeat device that you strap around your head and then plug the other end into your computer. Three small sensors on the headband record the tension in your forehead by measuring electrical activity in the muscles. They record your level of relaxation.

If biofeedback is Greek to you, here's the scoop—your body is constantly pumping out invisible signals. Your heart is beating, your

blood pressure is pulsing, your temperature is fluctuating, your muscles are firing, you're sweating. You're not even aware of it. Talk about body language. The body is a walking transmitter.

These signals are important. When you're under pressure, your heart beats faster, you sweat more and breathe faster. When you're relaxed, everything slows down. The idea of biofeedback is that if you can watch these invisible body signals on a computer screen as they're happening, you can actually manipulate them. This isn't voodoo; it's science. If you can see a blip on a screen representing your tension level, you can lower it—at will.

Basically, *Relax* transforms the signals from inside your body into data your computer understands (digital information), and your computer then transforms the digital information into data you can understand (graphics and sound). Some people can use biofeedback to change their heart rate or even their brain waves at will. With other people, it doesn't work at all.

As you stare at the screen, the headband sends the information it is registering about your tension level. It's a sensitive gauge—when you tighten your muscles on purpose, the simulated needle jumps up instantly.

Relax doesn't just have you sit there and watch your muscles tense up. At the same time, you wear headphones and listen to an audiotape with a soothing voice that guides you in deep relaxation exercises. In one sequence, kaleidoscopic patterns and colors on the screen change according to how relaxed you are. Far out! It's legal and cheaper than drugs.

Relax was developed with the help of Dr. Martha Davis, a clinical psychologist at California's Kaiser Permanente Medical Center. I'm not sure if this is the thing that will finally bring us eternal happiness, but it will have to do until the next century, when we'll probably be able to insert electrodes directly into our brains.

Brøderbund/Synapse, for Apple II, Atari, Commodore 64/128, IBM PC.

Other programs to look for: Calmpute *(Thought Technology), for Apple II, Commodore 64/128;* Body-Link *(Body-Log), for Apple II, Commodore 64/128, IBM PC;* Learning to Cope with Pressure *(Sunburst), for Apple II;* Coping with Stress *(Psycomp), for Apple II, IBM PC.* The Surf *(JAL Software), for Commodore 64/128, is an "environmental" program that displays soothing waves crashing to the shore while you listen to "pink noise."*

The Arts

Make Your Own Rock Videos

What do you get when you combine an art program with a music program? Before you answer, throw in an animation program to get your figures moving. Next, top it off with computer-generated music by Michael Jackson, Bruce Springsteen, or other well-known artists. Now, what do you have?

If you answered computerized music videos, you're right. Two companies are producing disks of contemporary music that allow you to make artistic creations that go along with the tunes. Amazingly, you don't have to know anything about music, art, rock-and-roll, or computer programming to use them.

Sight & Sound's *Computer Song Albums* are disks filled with popular tunes arranged with computer-generated bass, rhythm, melody, and harmony. Songs from Michael Jackson ("Thriller"), Joe Jackson ("Steppin' Out"), Willie Nelson ("On the Road Again"), the Eurhythmics ("Sweet Dreams Are Made of This"), Van Halen, and Culture Club are included, along with some blasts from the past like "Duelling Banjos," "Classical Gas," "The Hustle," and even the theme song from "Charlie's Angels." You can use a joystick to change the instrument sounds and add special effects. Color graphics will dance across the screen. The songs have no vocals and don't sound like the original records, but they are excellent, full-sounding synthesized music.

For some people, that will be enough. To create a video, you've got to add *Music Video Kit,* also from Sight & Sound. This program can be used like a standard drawing program to create your own graphics, or you can use the library of preprogrammed objects on the two disks. There are a dozen background scenes, such as city streets, haunted houses, deserts, and sunsets. The available "actors" include robots, flying saucers, musicians, and break dancers. By putting a hit song together with the background and animated foreground of your choosing, you can create your own rock video—and nobody's going to give you a hard time, even if your homemade videos are in poor taste. And if the idea of creating a video to the tune of "Charlie's Angels" turns you off, you can write your own music.

Passport Music Software has taken another approach to computerized rock videos. Their *Computer Hitware* disks include "albums" from individual artists. Their Duran Duran package, for instance, includes ten songs from that band, including hits like "The Reflex," "Hungry Like the Wolf," and "Union of the Snake." The Michael Jackson album includes all the songs from *Thriller.* You can also buy albums of computer music by The Police, Huey Lewis and the News, Bruce Springsteen, and Van Halen. The graphics that go with the songs are colorful, kaleidoscopic images, which can be altered by the user. The lyrics to the songs are also included.

For the time being, *Computer Hitware* and *Music Video Kit* are no threat to MTV. But as new computers get even more sophisticated, they'll put increasingly powerful graphics and musical capabilities into the hands of the average music lover.

Sight & Sound Music Software, for Commodore 64/128.

Passport Music Software, for Apple II, Commodore 64/128.

Create Title Screens For Your Videotapes

A few years ago, the videocassette recorder made it possible for everyday people to screen movies in their homes. Now, camcorders—those little video camera/recorders—are making it possible to shoot movies easily and watch them on TV. The technology is in place for just about anybody to become a filmmaker.

The only things missing are those big, flashy Hollywood title screens. If you're shooting a videotape that you're proud of, you'll

want to shout in big letters—PRODUCED BY JOSEPH _____. DIRECTED BY WENDY _____. STARRING TERRY _____. Real movies cry out for jazzy title screens. There are devices that will create titles for your videos, of course. But character generators, as they're called, cost over $400—probably more than you paid for your VCR to begin with.

Surprise! You can do it on your computer for $29.95 with a program called *Video Title Editor*. You won't catch Steven Spielberg or Woody Allen using one, but it's inexpensive and it does the job for a beginning filmmaker.

It's basically a graphics program that runs while the computer is connected to the VCR. It contains some canned messages for birthdays, weddings, and anniversaries, as well as title screens specifically for people making home video feature films. There's a movie marquee screen with flashing lights that seem to move around, just like at the real movies. You can put one of the canned messages in the middle of the screen or type in a five-line message yourself. Color is under your control. You can instruct your computer to cycle through all its colors and select what you'd like for the letters and the background. The Apple II version of the program even gives you four different typefaces, so you can experiment.

When your computerized title screen looks good, you just find the exact spot on your videotape where you want to insert it. It's a fairly simple procedure to hook the computer to the VCR and make a recording of your title screen.

For $30, *Video Title Editor* doesn't have all the features of a character generator. Your title screens, for instance, have to go before or after your filmed sequences. You can't superimpose the computer graphics over the video images. So if you wanted to add subtitles to your movie, you'd be out of luck. But the program is good for the hobbyist or beginner who wants to experiment with simple, quick, and inexpensive title screens.

Videoware, the company that makes the program, is actually three guys named Mike Siro, Howard Berenbon, and Howard Kahn. Berenbon is the only full-time employee—Kahn is a dentist and Siro is a physician's assistant. This is one of hundreds of companies out there, operating from bedrooms and kitchen tables. *Video Title Editor* is the only program Videoware makes.

Says Howard Berenbon, "There was a need there, and we decided to fill it."

Videoware, for Apple II, Atari, Commodore 64/128, Commodore VIC-20, IBM PC.

Other programs to look for: Video Titler *(Dynacomp), for Atari;* Video Billboard *(Dynacomp), for Atari.*

Arts And Crafts For Kids

The scribbling that your children are doing on scraps of paper and the living room wall can also be done on a computer screen. More than that, a few computer scribbles can be turned into a high-tech arts and crafts studio for kids.

Mindscape's *Color Me: The Computer Coloring Kit* is a simplified version of a drawing program like *MacPaint*. A child can draw on the screen with different pen thicknesses and make letters in different type sizes. Besides this freehand drawing capability, *Color Me* includes dozens of predrawn graphics, which can be "cut and pasted" alongside the child's original drawings. The graphics feature familiar children's characters such as Rainbow Brite, Hug-A-Bunch, Shirt Tales, and TinkTonk.

The figures are in outline, so they can be printed out on paper and colored in like any other coloring book. An optional *Color Me* Supply Box includes buttons, colored paper, adhesive-backed paper (for making stickers), and a binder so that children can put together their own coloring books.

Springboard's *Mask Parade* is a similar program that focuses on making paper costume items that kids can create, print out, and wear. The program includes outlines of masks, badges, jewelry, ties, hairpieces, glasses, funny feet, hats, and name tags. Kids can select from different eyes, noses, and mouths, or they can draw a face of their own. Then they print them out, color them in, and put them on. *Mask Parade* is great for children's parties, Halloween, and Valentine's Day. It's recommended for 4–12 year-olds.

Mindscape, for Apple II, Atari, Commodore 64/128, IBM PC.

Springboard, for Apple II, IBM PC.

Other programs to look for: Stickers *(Springboard), for Apple II, Commodore 64/128, IBM PC.*

Up In The Sky

Look At The Universe

In the larger scheme of things, you and your computer and your house and your hometown and the United States and Earth itself are like an insignificant speck of dust floating in the vast universe. Don't take it personally. That's just the way it is. The sky is filled with zillions of stars and planets, and perhaps there are creatures living on them who go to work each day, put on their pants one leg at a time, and go to the movies on Saturday night. Who knows?

Looking up at the dots in the sky at night gives you a beautiful view, but it doesn't tell you much about what's up there. There's a fascinating computer program that makes it possible to locate constellations, stars, and planets, and gives you a look at the universe as if you were in the most powerful observatory in the world. *TellStar II* is advanced enough to be used by professional astonomers, yet simple enough to be used by children.

After loading the program, you enter the exact latitude and longitude of your location—it can be anywhere on Earth. The instruction manual or any atlas will help you find the exact degrees, minutes, and seconds of where you are. Then you're asked for the month, day, year, and whether or not you're on daylight-saving time. The computer will make the necessary calculations and give you an exact graphic representation of what the heavens look like from your particular vantage point at that moment in time. If you decide to change the date or location coordinates, the computer will recalculate and give you a different view. For instance, you can see what the night sky looks like to the people in Paris, London, or Newark, New Jersey. You can pick a date anytime from

Programming Books

from COMPUTE!

COMPUTE! Books offers a line of programming books for the intermediate to advanced Commodore 64 and 128 users. These reference books take you beyond BASIC and into machine language programming, helping you learn about memory maps, addresses, the new *GEOS*, and time-saving routines you can add to your own programs.

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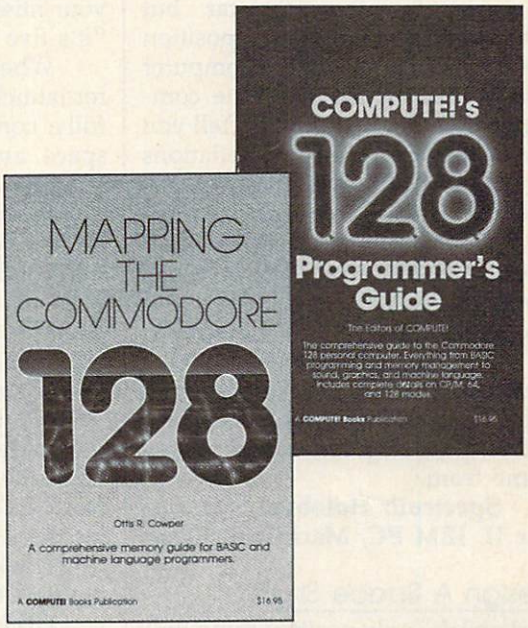
$18.95



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the year 0 to the year A.D. 3000. It's really amazing.

And that's not all *TellStar* can do. You can use your keyboard like a telescope and swing the view back and forth across the sky. You can look at the horizon, or imagine that you're lying on your back and looking straight up in the air. If you're wondering where the North Star is, the program will highlight it and tell you its precise location. If you see an interesting star, but don't know what it is, just position the cursor over it, and the computer will identify it for you. The computer will also be happy to tell you the names of all the constellations as well as their phases, astronomical coordinates, compass headings in relation to where you are, and the time and location of their risings and settings. You can even print out a copy of anything on the screen.

TellStar won't help you track down any E.T.'s or Starmen, but when they *do* land in the backyard, it'll help you figure out where they came from.

Spectrum Holobyte, for Apple II, IBM PC, Macintosh 512K.

Design A Space Shuttle

Perhaps the only positive thing that can be said about the January 1986 space shuttle disaster is that it renewed our respect for the power and danger of technology. Before the Challenger explosion, we had become so used to manned space flight that we took safe launchings and landings for granted. Actually, it's a tremendous achievement to shoot human beings into space and bring them home safely.

HesWare's *Project: Space Station* is a shuttle simulation that could teach the folks at NASA a thing or two. This is no flight simulator. Flying is just a small part of the job. You're the mission coordinator here. You've got to make a budget, select your crew and equipment, plan the mission, choose the research projects you'll be conducting in space, and even design the spacecraft itself. Each piece of equipment and astronaut you choose eats into your ten billion dollar budget. And you ain't going nowhere until you get approval for your flight plan.

This is a complete simulation. In choosing your crew, you've got to select six people from a pool of 32 potential astronauts. Each one has a different personality and level of expertise. Mac Stevens, for instance, is rated as very competent, but not very imaginative. Joe Church is more charismatic and less dependable. For each candidate, you'll also learn the last book read and a favorite quote, and you'll get an evaluation by other astronauts. (You probably won't be willing to trust your mission to the guy who says, "It's five o'clock. Time to party.")

When you finally get the A-OK for launch, you've got to steer skillfully, conduct your experiments in space, and make a perfect landing.

Like all ambitious projects, *Project: Space Station* has a goal. Is it to explore new galaxies and worlds? Is it to boldly go where no human has gone before? Is it to reach a new dimension of space and time? Is it to take a small step for man and a giant leap for mankind?

No. No. No. No. None of that 1960s idealistic stuff. The goal is to make the shuttle a commercial success. This is a real-life simulation for the 1980s. Only in America.

HesWare, for Apple II, Commodore 64/128.

Other programs to look for: Orbiter *(Spectrum Holobyte), for IBM PC, Macintosh;* Space Shuttle: A Journey into Space *(Activision), for Apple II, Atari, Commodore 64/128;* Shuttle Designer *(Simpletec), for Commodore 64/128.*

Miscellaneous

Plug Your Wristwatch Into Your Computer

Chester Gould never lived to see a wristwatch that could be plugged into a computer. Gould died a month before Seiko introduced its PC Datagraph. Somehow it seems fitting that the computer wristwatch wouldn't be invented until the creator of Dick Tracy had passed away.

Gould gave Tracy his famous wristradio, and he probably would have strapped this new electronic gizmo onto Tracy's wrist in a minute. It looks pretty much like a regular watch, but it does a lot more. The watch stores 2K (2000 characters) of memory. Not much, compared with today's 512K computers. But, remember, it doesn't sit on your desk—it weighs two ounces and it's strapped to your arm.

The face of the Seiko RC-4000 has a 24-character readout and will store a list of phone numbers, addresses, your daily schedule of appointments, your grocery list, or maybe some foreign language phrases you need to keep "on hand" while traveling. Dick Tracy might have used one to keep track of his court appearances so that Pruneface, Gravel Gertie, and other assorted creeps would stay safely locked behind bars.

Did you forget your relatives' birthdays or anniversaries this year? You can program reminders into the computer watch up to a *year* in advance, and it will beep when the time comes to tell you to call the folks. Nobody can ever say that you're thoughtless again. For absent-minded people, this may be the greatest thing since lost and found departments. It won't be long before students are hiding electronic crib sheets on their wrists—and teachers have to remove all watches before examinations.

The best thing about the Seiko watch is that you can hook it directly to a computer with a cable that attaches to the serial port. You can, for instance, type your daily schedule into your computer and then transmit that information to the watch so you can look at it during the day.

I know what you're thinking—who needs a computer built into a watch? Most of us get along fine with our paper calendars and scraps of paper. The people who buy computer watches are probably the tekkies, the status seekers, and the guys who want to be the first on their block with the latest electronic gadget.

Oh, by the way, computer watches also keep excellent time.

Seiko, for Apple II, Commodore 64/128, IBM PC.

Find Out How Many Miles You Are From Anywhere

London is 212 miles from Paris, 3451 miles from New York, and 3906 miles from Greensboro, North Carolina. How do I know? I looked it up in the *Concepts Computerized Atlas,* from Software Concepts. The program will tell you how far you

are from just about any city on the planet (2500 of them, anyway). It will also tell you each city's population, latitude, and longitude, and it will even draw a map of the area right on your screen.

Almanacs and atlases aren't particularly exciting. They don't make *People* magazine or "Entertainment Tonight." They sit on the shelf gathering dust until you suddenly need to know the capital of Zimbabwe. But the new breed of computerized reference books that are coming out may shake things up a little. Instead of dragging out a ten-pound book and searching through thousands of pages, you can pop a three-inch disk into your computer and let it do the searching for you.

Admittedly, computerized reference programs don't yet match the bulk of information in books. Hippopotamus Software's *Hippo Computer Almanac* contains just 35,000 facts, compared to over a million in *The 1986 World Almanac and Book of Facts.* But the *Hippo Almanac* excels at *interactive* information. You can instruct it to convert 23 gallons into liters, or 90,067 meters into feet. Your computer will have the answer in seconds. This computerized almanac can translate common words into more than a dozen languages. It can tell you what time it is in Tokyo right now, or how many miles you are from Newark, New Jersey. It will convert units of time, mass, distance, volume, or energy for you.

You can ask *Hippo* a question like, "What is the monthly payment on a $45,000, 12 percent, 30-year loan?" Two seconds later—$411. There isn't a book in the world that can do that.

Unlike most computer programs, *Hippo Computer Almanac* understands English sentences. If you type, "What is the zip code for Duluth?" you get the answer. That's a lot easier than looking up Duluth in the table of contents, finding the page, and then finding the information.

Hippo understands English, but it's not a genius. Here's what I went through to get the answer to a simple question:

Me: How many calories in a Coke?

Hippo: That's not a valid conversion.

Me: How many calories in a soda?

Hippo: There are 12 calories in one average soda cracker.

Me: How many calories in a cola?

Hippo: There are 94 calories in one cup of cola drinks.

They may not replace the paper almanacs yet, but these programs show the potential for using the computer as a reference tool.

Software Concepts, for Apple II, IBM PC, Macintosh.

Hippopotamus Software, for Atari ST, Macintosh.

Other programs to look for: The Millennium Electronic Almanac *(Avant-Garde), for Apple II, IBM PC.*

Software For Just About Any Business

The Gorsline Runciman Funeral Parlor in Lansing, Michigan, is an up-to-date company. It uses a computer program called *Funeral Director's Management System.* "It pays our bills, generates minister's clergy records and death certificates," says chapel manager Jordan Odell. The program is made by Davidson Software Systems, also located in Lansing.

It's no gag—funeral parlors can use computers to streamline their operations, just like any other business.

There seems to be a mistaken belief that computers in business are limited to the accountants of large companies. Since computers are number crunchers, people think, they're only useful to "number people."

In the last few years, software packages that are specifically made for individual types of companies have started coming out. There are programs that help doctors and dentists run their offices. There are programs geared toward video store owners. There are programs, not only for funeral directors, but even for auto body shops, junk yards, and pig farmers.

If you run a business, chances are there's a computer program that can help you run it better. You don't have to do any programming—the software is designed for your particular profession.

In the computer industry, this is called vertical software—programs that have been customized for specific purposes. Every business has its own needs. Doctors need to keep track of upcoming appointments. Sales reps need to keep track of sales leads. Pig farmers need to keep track of . . . well, pigs. Vertical software is designed to accomplish a particular task that is unique to a certain profession. It came about because people realized that the software out there solved only general problems; it didn't solve their particular problem.

If you think computers can be useful only to accountants, here are a few of the vertical software programs available for various professions:

Video Cash Register. Helps a video store keep track of tapes out for rental and members of the video club. (Custom Computer Software.)

Hollander Computer System. For the salvage yard boss who wants to know instantly which parts are in stock, their condition, location, and selling price. (Hollander Publishing, for IBM PC.)

OR-D Medical/Dental Management System. Manages a doctor's patient recall, progress reports, billing statements, insurance forms, prescriptions, referrals, and other paperwork. (OR-D Systems, for Apple II, AT&T, IBM PC, Macintosh.)

The Apparel Manager. Helps fashion apparel retailers write purchase orders, print up price tags, and determine the proper order levels. (Retail Solutions, for IBM PC.)

Real Estate Professional. A calendar/appointment schedule program that also helps a real estate office do expense reports and correspondence. (National Microware, for IBM PC.)

H.E.L.P. Health clubs and athletic trainers can design fitness programs by telling the computer the patient's age, sex, body fat, stress level, lifestyle, and diet. (CMA Micro Computer, for Apple II.)

Auto Body Computer. Auto body shops are using this package to help estimate job costing, write damage reports, and assist with their finances. (Automotive Computer Group, for IBM PC.)

There are hundreds more for every business imaginable. Check for ads and articles in your industry's trade magazines.

☞ Software Sources

For more information on any of the products mentioned in the preceding article, please contact:

Acorn Software
353 W. Lancaster Ave.
Radnor Square
Wayne, PA 19087

Activision
2350 Bayshore Frontage Rd.
Mountain View, CA 94043

Andent
1000 North Ave.
Waukegan, IL 60085

Artworx
1844 Penfield Rd.
Penfield, NY 14526

Automotive Computer Group
1421-B Court St.
Clearwater, FL 33516

Autumn Color Software
4132 Lay St.
Des Moines, IA 50317

Avant-Garde
37B Commercial Blvd.
Novata, CA 94947

Bantam Electronic Publishing
666 Fifth Ave.
New York, NY 10103

Body-Log
120 Mt. Kisco Ave.
Mt. Kisco, NY 10549

Brain Builders
P.O. Box 11324
Hauppauge, NY 11788

Brainpower
24009 Ventura Blvd., Ste. 250
Calabasas, CA 91302

Brøderbund Software
17 Paul Dr.
San Rafael, CA 94903

Camde
46 Prince St.
Rochester, NY 14607

CBS Interactive Learning
1 Fawcett Pl.
Greenwich, CT 06836

CMA Micro Computer
55722 Sante Fe Trail
Yucca Valley, CA 92284

Compu-Job Software
20516 Lorne
Taylor, MI 48180

CTRL Health Software
18653 Ventura Blvd., #348
Tarzana, CA 91356

Custom Computer Software
1108 Woodshire Dr.
Knoxville, TN 37922

Cyclone Software
3305 Macomb St. NW
Washington, DC 20008

Datasoft
19808 Nordhoff Pl.
Chatsworth, CA 91311

Davidson & Associates
3135 Kashiwa St.
Torrance, CA 90505

Designware
185 Berry St.
San Francisco, CA 94107

DHC Educational Software
125 Spring St.
Lexington, MA 02173

Dynacomp
1064 Gravel Rd.
Webster, NY 14580

fischertechnik
fischer America
175 Rte. 46 W.
Fairfield, NJ 07006

F/22 Press
P.O. Box 141
Leonia, NJ 07605

Genealogy Software
P.O. Box 1151
Port Huron, MI 48061

Gessler
900 Broadway
New York, NY 10003

Hayden Software
600 Suffolk St.
Lowell, MA 01854

HesWare
390 Swift Ave. #14
South San Francisco, CA 94080

Hippopotamus Software
985 University Ave., Ste. 12
Los Gatos, CA 95030

Hollander Publishing
P.O. Box 9405
Minneapolis, MN 55440

ISC Consultants
14 E. 4th St., Ste. 602
New York, NY 10012

JAL Software
Box 128
S. Milwaukee, WI 53172

Mindscape
3444 Dundee Rd.
Northbrook, IL 60062

Multibotics
#A2561 South 1560 West
Woodscross, UT 84087

National Microware
2102 Business Center
Irvine, CA 92715

OR-D Systems
1 Martin Ave.
Cherry Hill, NJ 08002

Passport Music Software
625 Miramontes St.
Half Moon Bay, CA 94019

Piedmont Specialty Software
Box 6637
Macon, GA 31208

Polygon Industries
P.O. Box 24615
New Orleans, LA 70184

Psycom Software
2118 Forest Lake Dr.
Cincinnati, OH 45244

Quinsept
P.O. Box 216
Lexington, MA 02173

Retail Solutions
1227 Innsbruck Dr.
Sunnyvale, CA 94089

Russian Software
P.O. Box 36
1744 W. Devon
Chicago, IL 60660

Scarborough Systems
55 South Broadway
Tarrytown, NY 10591

Seiko
Hattori Corporation
Consumer Electronics
1330 W. Walnut Pkwy.
Compton, CA 90220

Shenandoah Software
P.O. Box 776
Harrisonburg, VA 22801

Sight & Sound Music Software
3200 S. 166th St.
New Berlin, WI 53151

Simon & Schuster
Electronic Publishing Group
Gulf & Western Building
1 G & W Plaza
New York, NY 10023

Softsync
162 Madison Ave.
New York, NY 10016

Software Concepts
1116 Summer St.
Stamford, CT 06905

Spectrum Holobyte
1050 Walnut, Ste. 325
Boulder, CO 80302

Spinnaker
1 Kendall Square
Cambridge, MA 02139

Springboard
7808 Creekridge Cir.
Minneapolis, MN 55435

Sunburst
39 Washington Ave.
Pleasantville, NY 10570

Tech 2000 Software
263 Lugonia St.
Newport Beach, CA 92663

Thought Technology
2180 Belgrave Ave.
Montreal, Quebec,
Canada H4A 2L8

Timeworks
444 Lake Cook Rd.
Deerfield, IL 60015

Videoware
19777 W. 12 Mile Rd., Ste. 180
Southfield, MI 48076

ProWrite For The Amiga

Ervin Bobo

Requirements: Amiga with 512K minimum of memory (1 megabyte recommended) and Kickstart 1.2.

At first glance, *ProWrite* appeared to be a fancy word processor, but it soon proved to be more than that. It is a kind of bridge between word processing and desktop publishing, and because of this we thought it best to look at the separate parts and then see how they add up.

As a word processor, *ProWrite* gives you many useful features, including a working mode of Insert, which we've always found preferable to Strikeover. The default font is 12-point diamond, which gives you a large and readable screen display as well as a clear hardcopy. Left and right margins are set by moving arrows on the ruler at the top of the page, and paragraph indention can be automatic. Headers and footers are supported, and these can either be displayed as you work or be hidden until the document becomes hardcopy.

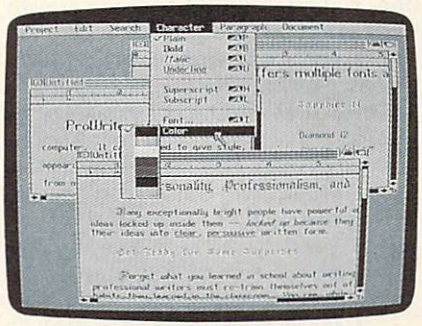
The "clipboard" buffer makes cutting and moving of text easy, and since *ProWrite* is multitasking—giving you the ability to work on several documents simultaneously—this moving and pasting may take place between documents as well as within a single document.

Since *ProWrite* is a WYSIWYG (What You See Is What You Get) word processor, there is never any doubt about how your document will look as hardcopy: It will look as it does on the screen display, down to and including the colors. The program supports a variety of color printers.

Other features include Find and Change—which most of us know as Search and Replace—as well as the ability to emphasize words or phrases by means of underlining, boldface, italics, or using all three in combination.

Combining Text And Graphics

As a publishing program, *ProWrite* is effective and imaginative because of its ability to combine text with graphics, to mix as many as ten fonts in a variety of sizes, to show and print your text in a rainbow of colors, and to place text so that it will wrap around a graphic.



ProWrite *offers a unique combination of word processing and graphics.*

In using graphics, *ProWrite* supports IFF (Interchange File Format), which has become a standard. Because of this, you can incorporate into your document pictures made with such programs as *Deluxe Paint, Aegis Images, Draw Plus,* and more. Creating your own pictures with such programs and then using them with text will personalize your memos and manifestos in a way that no word processor could.

Because it treats text and graphics as equals, no arcane moves are necessary to add a picture to your document. Select the desired image from a pop-up directory and select the amount of shading you wish *ProWrite* to give it, and the graphic appears on your screen where it can be dragged into the appropriate place among your words. You'll also find it convenient that pictures can be moved between documents just as easily as you'd move text.

(A special note: The original release of *ProWrite* worked only in hi-res mode. Because of the screen flicker inherent with hi res, the upgrade version now offers a medium-res flicker-free mode. Drawings loaded into a medium-res document will be compressed horizontally but will print with correct proportions. The upgrade version is free to all registered owners of *ProWrite.*)

Where words are concerned, *ProWrite* gives you the standard Amiga fonts as well as an additional three. The largest size offered is 20 points, precluding you from making large headlines, but you still should be able to grab attention. If the size of the type won't do it, try coloring. Highlight an area as small as one letter or as large as an entire page, then go to the pulldown menu and select another color. Or gain emphasis by mixing fonts. As with every operation in *ProWrite,* these are quick and simple.

Desktop Publishing?

In referring to *ProWrite* as a desktop publishing program, we are using one of the broader definitions of a term that will surely be bandied about and misused for years to come. Since *ProWrite* does not contain routines for creating graphics (such as drawing lines or boxes), since it does not support fonts larger than 20 points, and since it will not format text into newspaperlike columns, it will not fit the narrower definitions.

Yet while you can't publish a newspaper, you could use it to combine text and illustrations into a children's book, a company report or memo, or a uniquely personal note.

As with any graphics-oriented program, memory is at a premium when using *ProWrite.* Expansion memory will help, but the Amiga can address only 512K of graphics memory, and it is possible to use up the graphics memory and crash while still having free expansion memory. Fortunately, a touch of the Help key will invoke a pop-up window to inform you of memory usage. We'd suggest you refer to this before bringing in a new graphic or opening a new document.

Because all final drafts of a document are printed as graphics (even if your work contains only text), expect to spend some time waiting for hardcopy to emerge from your printer. If nothing emerges, check the settings in Preferences—*ProWrite* may be the first software you've seen to have serial printing set as a default. This is because the default printer is the Apple Imagewriter II. After changing to parallel output, we found that the Okimate 20 color printer works quite well.

Documentation is good, without being overlong or overbearing. Because it incorporates so many of the Amiga protocols, we think you'll find the use of *ProWrite* almost instinctive, and that you'll use the documentation simply as a reference tool for some of the finer points of usage and creation.

Although *ProWrite* is neither an excellent word processor nor a full-fledged publishing program, it fills a gap between the two, and it is for those who occasionally wish to create a document that grabs attention quickly. It is a program you'll use when words alone can't express what you must say. And, because a picture is worth a thousand words, *ProWrite* can turn what might have been a long document into a page of text with a picture.

Prowrite
New Horizons Software
P.O. Box 43167
Austin, TX 78745
$124.95

Tornado Notes

Keith Ferrell, Features Editor

Requirements: IBM PC, XT, or AT, or compatibles; DOS 2.0 or higher; 128K RAM or higher.

Several times a day I find myself making the following resolution: This time the desk stays *clean.*

It doesn't, of course. Ideas occur and get jotted on whatever paper is closest to hand; notes and requests arrive from various sources and find their way into the mix; scribbled reminders of items on my agenda, reference notes and citations, phone messages—it can take a few hours to clean my desk but only a few minutes to pile it high once more.

I'm not alone in this. Harold Geneen, former head of ITT, can become positively poetic extolling the virtues of a cluttered, busy desk, and in his management book advises distrust of those whose desks are too often too clean. Not that there are many of those: From vivid evidence obtained on visits to other offices, sessions seated on the other side of other cluttered desks, I've gathered pretty conclusively that the at least occasionally chaotic desk is pretty close to being a species norm.

Tornado Notes offers a clever RAM-resident solution to the chaotic desk approach to work. The program uses windows to simulate notes of various sizes and configurations, interleaving and overlapping them on the monitor so that you face an apparent pile of notes, ready to be sorted.

Browsing Is A Breeze

That sorting, though, like almost all of the other features of *Tornado Notes,* is elegantly programmed, and is available to users in a variety of ways. Using the up- and down-arrow keys, you can browse through the pile a note at a time, setting a leisurely pace for cleaning out the notefile, or flying through the pile almost faster than your eye can follow. The current note is highlighted to catch your attention. A simple two-key command (and one of those accesses an alternate menu) lets your computer do the walking, flipping automatically through the whole pile of notes.

Keepers of chaotic desktops occasionally seek to impose order through coding schemes—this color for all notes related to that matter, pink for all phone messages, and so on. Given enough time and sufficient clutter, you can conceive pure palettes of potential organization—and have the whole rainbow fall apart the first time you apply the wrong color to a purpose.

Tornado Notes deals with that dilemma by way of a search mode through which you can separate a specific pile of notes from the general morass. The key that you search for to create your subpile can be any word, graphics symbol, or combination contained in a note. Once the key is requested, the program gathers all the notes sharing the key, and you have a dedicated pile of notes at your disposal. The search mode is smart and quick. No matter how I tried to fool it, the Get function provided me with the right group of common notes each time I tested or used the function.

Not all notes are created equal. Some of mine are little more than a hurriedly scribbled word or phrase; others are several lines or even paragraphs long. *Tornado Notes* accommodates the occasional need for length—or longwindedness—with a function that lets users alter the dimensions of the notefield. If you wish, notes can be stretched to cover the whole screen, shrunk to encapsulate a single word or phrase, made tall and narrow or squat and wide. I've found the program's default to be sensibly sized for the majority of my notes: three inches tall by two inches wide. Once the note is entered, the box shrinks to the minimum size.

Easy To Use

Getting into *Tornado Notes* is easy (easier, in fact, than it sometimes is to find an appropriate scrap of paper for a note). Once the program is loaded into memory, accessing it is simply a matter of pressing Alt-J. Once you're done with your notes—and they're saved to disk—returning to your other work is as easy as pressing the C key. When a note has outlived its usefulness, the T key provides a trashcan for dumping it.

The introductory tutorial is brief and engaging, guiding you through the basic functions and features of the program without going into exhaustive detail. One of the notes in the tutorial explains Micro Logic's thinking, advising users simply to get started making notes. A new notefield is called up by pressing N; Esc gets you out of the edit mode and adds the new note to the pile. *Tornado Notes* makes it easy to create dedicated piles of notes—this one for phone messages, that one for reference notes, and so on.

There are all sorts of elegant and engaging extras built into *Tornado Notes.* A special notepile called Facts is a collection of just that: measurement conventions and conversions, ASCII code tables, forms that can prove useful as standard note formats for messages and memoranda, and so on. The program constantly reminds users to save their notes to disk, lest they be lost when the computer is shut off; once the habit of saving is acquired, the reminders can be turned off. Color is adjustable on color monitors, as is shading on monochrome. Dating each note is as simple as pressing Esc-T. Time-stamping notes is a bit problematical, as it is invoked by Esc-T; until I got the right key rhythm for time-stamping, I found that when I pressed Esc-T, it tended to summon the trashcan instead of placing the time.

Tornado Notes resides neatly in RAM, with its default set at 20K. The residency is easily reconfigured to use as little as 5K, or—for those who take lots of notes—it can use much more than 20K. Included in a read.me file on the disk are those programs with which *Tornado Notes* has trouble sharing residency. The program is not copy-protected, so it can be backed up or added to a mass storage device. The manual provides clear instructions on loading the program onto a hard disk, if one is available. I added *Tornado Notes* to my autoexec batch file; when my computer boots up, so does *Tornado Notes,* ready to go at the stroke of a key.

Did *Tornado Notes* solve the problem of my cluttered desk? Sort of. Handwritten notes have disappeared—everything goes to *Tornado Notes* right away. The desk space freed by the program, though, quickly became filled by books, magazines, more. Maybe there's a marketing opportunity here—*Tornado Tomes* anyone?

Tornado Notes
Micro Logic
Box 174
Hackensack, NJ 07602
$49.95; volume discounts available.

Warship

Neil Randall

Requirements: Commodore 64, Apple II series, or Atari 8-bit computer.

To quote the game's introduction, "Warship is a game of tactical-level naval combat between Japanese and Allied ships from 1941 to 1945." For those familiar with computer wargames, this is self-explanatory. For others, the statement is almost certain to destroy whatever interest they may have had.

I have always wondered why SSI begins its manuals in this manner. True, SSI's games appeal mostly to an audience experienced in wargames, but surely a friendlier, more explanatory introduction would at least allow a newcomer to get involved. SSI's manuals are otherwise consistently superb. Colorful and well-organized, the typical SSI manual provides more pure information about the topic than practically any other game manuals.

Like most SSI games, *Warship* provides a wealth of detail about its subject. Here the topic is World War II naval combat, with Japanese ships fighting against ships from the Allied countries. The section of the manual entitled Ship Data, with its attractive pictures of individual ships and its concisely displayed information, gives a hint of the complexity built into the game. But in fact the game plays much more smoothly than this wealth of information would suggest.

During each turn, players move their ships, set targets, fire guns and torpedoes at enemy ships, and try to maneuver into favorable positions. Ships can be commanded either individually or as part of a division, which means that the game will play as quickly or as slowly as the players wish. If they want a quick game, the players need use only the division menu, commanding each division to move in a specific direction, firing when the computer deems it appropriate, changing commands only when the original plan begins to go awry. If the players want more control over their fleets, they can command each ship in turn, worrying about such details as visual-fire control versus radar-fire control, assigning ships to particular divisions, targeting on individual enemy ships, and even making smoke.

Warship provides three historical scenarios and one hypothetical scenario. Challenging enough on their own, these scenarios can be supplemented by scenarios created by the players from scratch. The game allows you to design your own maps, modify the technical data for each ship, and even set damage control levels. In other words, if you are interested in WWII tactical naval combat, or if you become interested as a result of playing the game, the game itself will never grow stale. You can set up and play any historical or hypothetical engagement, altering history to suit your particular interest.

Warship is entertaining, either solitaire or against a human opponent. It plays quite quickly, and the interface is less intimidating than that of many other wargames. With its informative and thoroughly professional manual, the game should teach even the most experienced wargamer a considerable amount about naval battles in the Pacific.

Warship
Strategic Simulations (SSI)
1046 N. Rengstorff Ave.
Mountain View, CA 94093
$59.95

PHM Pegasus

James V. Trunzo

Requirements: Apple II series and Commodore 64 computers.

Recent releases like *Skyfox* and *Arcticfox* have placed gamers in the pilot seats of futuristic supercraft—vehicles complete with incredible weapons, defenses, and surveillance equipment. Electronic Arts' newest arcade/simulation is based in present-day reality; yet once you've experienced the immense firepower and maneuverability of this latest toy, you'll swear you've gone "back to the future."

PHM Pegasus installs you at the helm of one of three different NATO hydrofoils, equipped with the most advanced instrumentation and weapons systems currently available. These hydrofoils, authentic to the last detail thanks to technical consulting done by Boeing Marine systems, are the jets of sea surface, combining mindboggling speed with devastating firepower.

Once you take command of a (P)atrol (H)ydrofoil (M)isslecraft, your training commences with "simple" seek-and-destroy missions. These introductory scenarios allow you to familiarize yourself with the controls of the craft in which you are in charge.

A large-scale view of the theater of operations permits you to set an autocourse for your target area (and in more advanced scenarios, you control search helicopters and convoy ships). Once there, the bridge view allows you to engage and control the functions available on the control panel in front of you, while scanning the enemy-crowded seascape.

Excellent 3-D Graphics

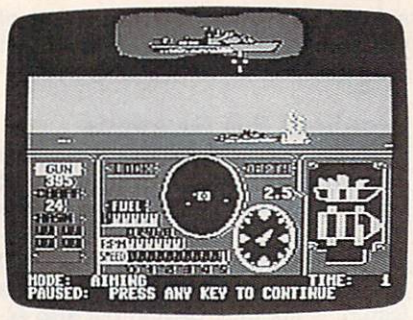
Graphics in *PHM Pegasus* are up to Electronic Arts' usual standards, and unlike many arcade/war simulations currently on the market (including *Skyfox* and *Arcticfox*), the simulated 3-D graphics are solid-fill, not outlines. This feature is not only helpful but also essential when it comes to identifying vessel type. Such identification takes practice, and the enclosed cardboard spotter cards are a must, especially in advanced scenarios when many of the ships encountered are not enemy vessels—and you don't want to destroy those unless you want to be demoted to deck-mopper status.

When combat does occur, your arsenal consists of a 76mm water-cooled naval gun—a short-ranged rapid fire cannon which is great against enemy patrol boats; Harpoon-, Exorcet-, or Gabriel-guided missiles—whose 90 percent accuracy comes in handy against such heavyweight antagonists as the 900-ton Nanuchuka II Missile Corvettes and ASSAD missile boats (the latter capable of attacking from 80 miles away—your effective firing range is half of that); and Chaff Rockets—exploding rockets that disperse aluminum foil in the air, attracting and deflecting enemy missiles away from your hydrofoil.

Game play is fast and furious. Strategy is important, especially in escort or scouting missions when observation or escape is more important than destruction of enemy craft. Ship repairs are not possible during a scenario, so damage is a factor which must be monitored carefully. Loss of speed, for example, can be as harmful as loss of firepower. As long as the hydrofoil is skimming the water, it can't sink, even with hull damage; however, as soon as the foil slows down, it settles into the water and the hull fills.

Contemporary Scenarios

Eight scenarios are available for play, their objectives ranging from escorting ships out of the Persian Gulf to photographic surveillance of ships smuggling military equipment to Nicaragua. You might be ordered to destroy terrorist ships off the coast of Sicily or to navigate the Yucatan Straits between Mexico and Cuba on your way to South America. Part of the enjoyment of *PHM Pegasus* lies in the fact that your missions take place in today's hot spots like the Gulf of Sidra and the Eastern Mediterranean. You can almost feel the tension as you spot Soviet-built ships heading towards you across the "Line



PHM Pegasus *is an authentic simulation that places you at the helm of one of three NATO hydrofoils.*

of Death."

PHM Pegasus is a well-balanced blend of complexity and playability. It isn't an overly difficult game to play, yet it is a very challenging game to master. Sound effects synchronize perfectly with the splash of missed shots or the explosion of ships hit by your guided missles; full-screen graphics clearly depict the action in both the strategic and tactical modes; and a thoroughly documented manual gets you into the action quickly. What more could you ask for from a game of this type?

PHM Pegasus is a worthy addition to even the casual game player's collection. It's a must if you are an action fanatic looking for a new challenge.

PHM Pegasus
Electronic Arts
1820 Gateway Dr.
San Mateo, CA 94404
$29.95 Commodore 64 version
$39.95 Apple II-series version

Create A Calendar

Ervin Bobo

Requirements: Commodore 64, Apple II-series with a minimum of 64K, and IBM PC and compatibles with a minimum of 256K.

At first glance, a program for creating calendars may seem superfluous; each year, most of us are inundated with calendars from funeral homes and insurance agents (probably to remind us that time is running out)—so much so that it becomes difficult to find enough wall or desk space for them all.

Create a Calendar from Epyx, however, does just what its title implies: It allows you to create a calendar from scratch or from a template, and to populate it with the events you feel are most important. In doing so, you may highlight Aunt Martha's birthday, your next dental appointment, Walpurgis-Nacht (these days found on very few commercial calendars)—anything, in fact, that may assume more than momentary importance.

In using *Calendar*, you'll first be asked to insert a data disk for initialization. Bear in mind that there will be only one calendar per data disk, which at first may seem wasteful, but that single calendar can be printed in a variety of ways and can be re-edited at any time. If you become upset with George Washington and decide to eliminate his birthday from your party planning calendar, you may do so.

Next, select a title for the calendar. There is no need to get cute about this, since the title is for filing purposes only: It will not appear on the printed result. Then type in the numbers of the year in which you are interested. Unless you are doing research for a novel or a historical treatise, there seems little point to going backward in time, or too far forward, for that matter. But both can be done—you can go back as far as 1753 or as far forward as 9999.

Then choose the template with which you wish to work. There is one for historical dates, another for holidays, still another for Jewish holidays, one for holidays plus, and one blank. In making your choice, you are opting for a template where pertinent dates will be highlighted automatically with text and graphics.

Scheduling Aunt Martha

Once you have filled in this date, you select a month on which to work. Here we get to the meat of the program, where dates can be individually edited. It is in this mode, for example, that you enter and edit text pertaining to Aunt Martha's birthday—or to her impending two-week visit.

Choose a date, and the screen changes to show only that day. The cursor takes position at the vertical middle, and you can enter as many as five lines of text. Each line is necessarily short, but should be enough to call attention to the date and its special events. If it's not, you may also select a graphic from more than eighty on the flip side of the program disk, or from a compatible graphics library such as Epyx's Graphic Scrapbook Collection. The graphic will appear in the upper part of the box.

Should you wish only a monthly calendar, you may stop there. Otherwise, you may fill in important dates for each month of the year. If you deal with recurring events, such as a user's group meeting on the fifteenth of each month, the "repeat this date" option will automatically fill them in for every month.

When the calendar has been created and is ready to be printed, you may include a credit line to let everyone know who was responsible. Prior to printing, you'll make a choice of whether you want a daily calendar, in which one full sheet will hold only two days; a weekly, in which a single week is printed vertically on a full page; an annual, which shows the entire year (with highlighted dates indicated by bold type only); a banner, in which a year is printed horizontally over six pages; or an events list, which extracts all important dates, groups them by month, and prints them as a list. With the exception of the yearly calendar and the events list, all printouts will show the text and graphics you used to highlight dates.

It is primarily in the printing mode that *Create a Calendar* exhibits its one drawback. Because of the broad nature of the piece, the program is on side A of the disk; graphics, fonts (five of them) and borders (twelve from which to choose) are on side B; and your personally created parameters are on your data disk. This situation necessitates a great deal of disk-swapping, yet there seems no way in which it could have been minimized. The program is tight and organized, and the slight inconvenience results from the complexity of the subject rather than from sloppy work.

Since it is a dedicated program, *Create a Calendar* offers a greater variety of choices than programs which have simply included calendars as one more option in a printing program. Once you've set up a particular year on a data disk, you may go back to it time and again to print out whichever type of calendar is currently most useful.

Documentation is good, leading you through the creative process one step at a time and providing ample illustrations so you'll know what to expect. Your printer configuration is saved to the master disk so that it need be done only upon the program's first booting, and all fonts used by the program result in text that is clear and easy to read at a glance. Daily, weekly, and monthly calendars use date boxes large enough that you may pencil in any important dates forgotten during the creative process—large enough even for the chilling message that Aunt Martha will arrive early and stay longer.

Create A Calendar
Epyx
600 Galveston Dr.
Redwood City, CA 94063
$29.95

From the publishers of *COMPUTE!*

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All the exciting programs from the past three issues of *COMPUTE!* are on timesaving, error-free, floppy disks that are ready to load on your IBM PC and PCjr or Commodore 64 and 128. The September 1987 *COMPUTE! Disks* contain the entertaining and useful Commodore or IBM programs from the July, August, and September 1987 issues of *COMPUTE!*.

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The Beginner's Page

C. Regena

Interactive Programming

Many people start programming by writing a demonstration program—type RUN and the computer performs. The beginning programmer may write PRINT statements that leave a message for the person running the program, or create a graphics or music demo to show off the computer's capabilities. The next step is to write an *interactive* program—one that involves the user.

An interactive program asks a question, and the user either types an answer or presses a key to answer. The computer then acts upon that input. The command most commonly used for interaction is INPUT, and there are many forms of the INPUT statement. We'll cover the general forms in this column, and then you can experiment and see what will actually work on your particular computer.

When INPUT is used, the computer waits for the user to type something and then press the ENTER or RETURN key. (To simplify matters, I'll just refer to the key as RETURN—your computer may call it the ENTER key instead.) Some computers automatically print a question mark, or a question mark and a space, and then show the cursor to indicate the user's turn to do something. Two sample statements are:

```
200 INPUT N
300 INPUT S$
```

Line 200 asks for a number, so whatever value the user types will be assigned to the numeric variable N. Line 300 asks for a string; the user's input will be assigned to the string variable S$. A string variable can contain alphabetic or numeric characters and symbols, or even a null string (entered by pressing RETURN without typing anything else), but a numeric variable must be a number only—the computer will print an error message if a string is entered.

The previous example lines will cause the program to wait for the user to enter something. Notice that nothing else happens until the RETURN key is pressed. When writing a program, you'll need to tell the user what you want. You can use PRINT statements to print a message and then use the INPUT statement to receive the answer. For example:

```
100 PRINT "TYPE A NUMBER"
110 INPUT N
200 PRINT "WHAT IS YOUR NAME?"
210 INPUT NAME$
```

Another form of using the INPUT command is to combine the PRINT and the INPUT into one statement using an *input prompt*. After the INPUT command, put in quotation marks the prompting message you want to print. Follow the last quotation mark with a semicolon and then the variable name:

```
100 INPUT "WHAT IS THE ANSWER";A
200 INPUT "WHAT IS YOUR NAME"
    ;NAME$
```

This method keeps the input cursor on the same line as the prompt message. The printing method puts the input on the next line. You can also print a message, put a semicolon after the printed message, and then use an INPUT command.

```
100 PRINT "ENTER THE MONTH. ";
110 INPUT MONTH$
```

The version of BASIC for Atari eight-bit computers (those other than the ST line) does not allow an input prompt with the INPUT statement. Users of this dialect must always use the PRINT/INPUT combination.

Notice that INPUT normally prints a question mark to indicate that it is waiting for input. Some versions of BASIC allow you to suppress the question mark by using a comma instead of the semicolon after the input-prompt message:

```
200 INPUT "THE ANSWER IS ",A
```

Notice that I included a space before the last quotation mark to get a space before the input cursor. You can experiment with input prompts to get the proper spacing and to understand the differences between using a semicolon and a colon. (The IBM, Amiga, and Atari ST versions of BASIC allow this format; the Commodore, Atari eight-bit, and Applesoft versions do not.)

You may ask for more than one variable in a single INPUT statement, but the variable names must be separated by commas. In this case, the user must enter the numbers or strings in the proper order, separated by commas:

```
200 INPUT "ENTER LAST NAME,
    FIRST NAME, CODE";L$,F$,C
```

The user must enter three items separated by commas such as SMITH,CINDY,456.

Using more than one variable in the INPUT statement can cause confusion, because a user who is unfamiliar with the program may not know exactly what is expected and may not use the commas properly. The error message in this case may also be confusing. Some computers use ?REDO FROM START to indicate insufficient input; you're then required to enter all items again. Other versions indicate that additional input is needed, in which case values or strings are accepted for the rest of the input items. The Commodore and Applesoft versions of BASIC print a pair of question marks to request additional input; BASIC for the Atari eight-bit models uses a single question mark.

To avoid problems, I prefer using a different INPUT statement for each item desired.

If you provide more values than the input requests, most versions of BASIC provide an error message to indicate this (?EXTRA IGNORED, for example). However,

unlike other BASIC errors, this one does not halt program execution in most dialects.

The use of the comma as a separator imposes a restriction on what can be typed in response to an INPUT request. Specifically, your input cannot contain a comma. Some versions of BASIC also will not allow a colon (:) in the input line.

The following short interactive program illustrates different ways to use INPUT. Line 30 asks a question, and then line 40 receives an answer and puts it into the string variable N$. Line 50 uses that variable N$ in the PRINT statement. Line 70 asks a question requiring a numeric answer A. Line 80 then uses A in the printed response. Lines 100–140 illustrate one way of receiving input to add two numbers. The numbers are entered individually.

Line 30 uses a PRINT statement to ask for the input, and then line 40 uses INPUT alone. Line 70 uses an input prompt with a semicolon so the question mark is printed automatically. Lines 110 and 120 suppress the question mark by using the comma after an input prompt. You may find it necessary to modify this program to meet the restrictions of the INPUT statement in your dialect of BASIC.

```
30 PRINT "WHAT IS YOUR NAME?"
40 INPUT N$
50 PRINT "HELLO, ";N$
60 PRINT
70 INPUT "HOW OLD ARE YOU";A
80 PRINT A;"IS A GOOD AGE."
90 PRINT
100 PRINT "NOW ADD TWO
    NUMBERS."
110 INPUT "FIRST NUMBER IS ",N1
120 INPUT "SECOND NUMBER IS ",N2
130 PRINT
140 PRINT "THE SUM IS";N1+N2
150 END
```

INPUT receives whatever the user types in before pressing the RETURN key—whether it is one character, several lines of characters, or nothing. With INPUT, it is easy for the user to cause errors by entering something the program is not expecting. The result can be error messages or program crashes. You do need to be careful when using the INPUT statement. Try to be as specific as possible in asking for the input items. Next month, we'll discuss other methods of interactive programming that help the user to avoid INPUT errors. ©

Fred D'Ignazio, Associate Editor

Music, Video, And FOR-NEXT Loops

When you walk into Bridget Logan's computer lab at Mountain Brook High School near Birmingham, Alabama, you take a giant step into the future.

The first thing you notice is that the student workstations are lined up along the wall instead of in rows facing the front of the room. The second thing you notice is the rock music coming softly from the speakers of the students' computer monitors. If you peer over the students' shoulders, you see BASIC programs on the monitors. But if you keep watching, the programs suddenly disappear and instead you see Bridget herself on the screens, talking about FOR-NEXT loops. A moment later, her face disappears from the screens and is replaced by the original BASIC program. As if guided by a ghostly hand, the program runs itself, and you hear Bridget's voice pointing out the program's highlights.

When you walk deeper into the room, you see Bridget's teacher workstation, which, with its two computers, VCR, video camera, and microphone, looks like the console on the Starship Enterprise. On one computer monitor is the FOR-NEXT video being "piped" into the student monitors. Bridget is at the second computer using a word processor to type the day's assignment onto the screen, which acts as an electronic blackboard.

When the FOR-NEXT video is over, she switches off the VCR, and an instant later the day's assignment appears on all the students' computers. Bridget leans over to her microphone and says, "All right, everyone, if you want to hear that next Bruce Springsteen cut, you'd better get busy on these programming problems." All the students hurry to press switches atop their monitors. The staccato sounds of keys clicking on keyboards mixes with the newest Springsteen single playing on 15 speakers.

Meanwhile, Bridget begins preparing for the next lesson. She pops the FOR-NEXT videotape out of her VCR and loads in a videotape marked "The GOSUB Command." She turns to her second computer and loads a new demonstration program from the disk. She spins around and smiles. "One of the biggest advantages of this system," she says, "is that I can let students work at their own pace. While some students are working on FOR-NEXT loops or GOSUB commands, other students can be solving advanced programming problems. Still others may need extra help, and I can replay my beginner tapes, visit their workstations, and give them personal attention. *Distrivid* makes individualized instruction a reality in the computer lab."

The Classroom Of The Future

Distrivid is the product that has turned Bridget Logan's computer lab into a classroom of the future. It was developed by Jimmy Alford and is being marketed by Micrologic, Inc. Jimmy, a computer engineer at Micrologic's retail store, Village Computers, came up with the idea when Bridget asked him to help her find large-screen monitors for her computer lab. Bridget needed the monitors to display computer problems and daily assignments for the 15–30 students in her six daily labs.

While he was looking around for monitors, Jimmy had an ingenious idea. Why not use a daisy-chain to wire the video signal from Bridget's master computer directly into all of her students' computers? With a little switch box mounted atop each computer monitor, a student could switch between the display coming from Bridget's computer and the display coming from his or her own computer.

Bridget grew excited about the idea and collaborated with Jimmy on its development. As the product evolved, Jimmy added the capability to plug in a VCR and send a video, movie, or TV program to each workstation. And he added both a microphone at the teacher workstation and the ability to mix audio sources so teachers could lecture with music or mix their voices with the sound from a video.

Distrivid has turned out to be more successful than Jimmy or Bridget ever imagined. It is the perfect "bridge" product for schools that are interested in interactive video but that cannot pay the high price of networked CD-ROMs and interactive videodisks. (*Distrivid* costs $1,095 for the teacher's master unit and five student boxes, including cables and teacher's microphone. Each additional student box costs $72.50. Micrologic will customize cables to fit different-sized classrooms. There is no practical limit to the number of workstations in a *Distrivid* network.)

Distrivid has been a hit at Mountain Brook High School. English teachers can show a movie to their students at their workstations; then the students can switch to their word processors and write about the movie. Social studies teachers can show movies, and students can switch to their database programs. Business teachers can show movies, and students can use their spreadsheets. Even the school's football coach is hooked. Each week before a game, he brings his team into Bridget's lab and shows his players a tape of the team they'll be playing next.

For more information about *Distrivid*, write: Jim Anderson, President, Micrologic, Inc.; 1720 Twenty-eighth Ave. S.; Homewood, AL 35243. ©

Microscope

Sheldon Leemon

The Micros Market Gets Serious

When the IBM PC first appeared, it divided the micro computer world into two distinct camps. On the low end of the price scale were *home* computers, like the Apple II, the Atari 800, and the Commodore 64. On the high end were the IBM PC and compatible computers. The PC computers were sold strictly as *business* machines, and most people bought them for the express purpose of running one or two specific business programs like *Lotus 1-2-3*, *Wordstar*, or *dBase*.

The focus of the home computer market, however, was much less precise. People bought inexpensive micros for a variety of reasons, sometimes with no clear idea of what they were going to do with them, other than play a few games and maybe balance their checkbooks. Some were hobbyists who liked to tinker with hardware and software, while others were just curious about what a computer could do. Even the advertisments for these home computers were a little vague as to their uses, talking about things like computer literacy, education, and entertainment (a euphemism for games).

In the last couple of years, however, the distinctions between home computers and business computers have begun to blur. On one hand, the computers from the traditional home computer companies like Atari and Commodore have become much more sophisticated. Nobody can seriously contend that a computer with a powerful 16-bit processor, a megabyte of RAM, and large disk storage capacity is a toy, even if it does cost under $1,000. On the other hand, PC compatible computers have become much more affordable. Many large companies are following the lead of the Tandy 1000 and are introducing low-cost, easy-to-use PC compatibles.

Marketing distinctions between the two types of computers have also started to blur. Epson, for example, has announced that its new, low-price personal computer will be sold through the mass market—departments stores and discount houses. Atari and Commodore, on the other hand, seem to have abandoned the mass market as an outlet for their more powerful PCs. Atari announced that it will not be selling the ST at Toys "R" Us just about the time that Commodore said that it will sell the Amiga 500 only at specialty computer stores. Both companies have also announced that they'll begin extensive advertising campaigns in the fall, and their themes sound surprisingly similar.

Instead of selling computers, they're going to be selling "business solutions." The goal is to show how you can use the _____ (Amiga, Atari ST) to do _____ (desktop publishing, word processing, graphic design, mailing lists, accounting, MIDI music composition) much more cheaply and easily than with the _____ (IBM, Macintosh). This approach may ignore the fun aspect of computers that attracted early computer buyers, but at least it may finally dispell the "what do you do with it" attitude many people still feel toward personal computers.

****

It hasn't been too long since the announcement of the IBM PS/2 computers, but rumors of clones have already begun. Several companies have announced or shown graphics adapters that will upgrade existing compatibles to the new VGA graphics standard. Chips and Technologies, the noted manufacturer of high-density VLSI chip sets used in many compatibles, has been busy tearing apart the new models. They hope to have chips ready to ship to clone makers by the end of the year. The biggest challenge seems to be the new Micro Channel architecture. Although IBM has been comparing it to a four-lane highway, some engineers have found that there are a lot of tricky cloverleafs and detours. Still, Chips believes that it can come up with a system that's functionally identical without infringing on IBM's patents. Rather than copying IBM, they hope to come up with an alternate approach that will result in improved performance.

****

Intel recently announced that it had formalized specs for the 80486 microprocessor. The new model will have the equivalent of about ten times the number of transistor ciruits found on the just-introduced 80386. This will allow on-board functions like a memory-management unit (MMU) and floating point math operations. In fact, designers think that this chip will have all of the processing power of current IBM mainframes. But don't hold your breath waiting for it—the first samples won't be available until sometime after 1990.

In the meantime, Motorola isn't standing still, either. The 68030, the successor to the 68000 and 68020 should be available soon. This powerful chip is going to include a 256-word instruction cache, which should allow small program loops to execute super quickly. Work is also underway on the 78000 processor, a Reduced Instruction Set Chip (RISC). Instead of the 256-word instruction cache, this chip will have 256 general purpose registers. In addition to about 150 very short instructions, it's said to have programmable microcode, so that it can easily emulate the instruction set of other processors, like the 68030 or even Intel chips.©

Telecomputing Today

Arlan R. Levitan

Just When You Thought It Was Safe . . .

The tribe at the Federal Communications Commission is at it again. In April of this year, the Commission bowed to public pressure against surcharges for local computer access numbers provided by commercial information services, and dropped the matter from its Computer III inquiry. Two months later, in a classic demonstration of the concept of volatile memory, the Commission voted 4-0 to eliminate the present exemption against such surcharges on January 1, 1988. The FCC estimates that the surcharges could add as much as $4.50 an hour to the cost of providing local access to commercial info services and $9 an hour to Telenet's PC Pursuit. Anyone interested in jogging the Commission's recall is encouraged to write:

Dennis Patrick, Chairman
Mimi Weyforth Dawson
James Quello
Patricia Dennis
1919 M Street NW
Washington, DC 20554

Southern Boarder

I managed to break away at the last minute to attend Spring COMDEX in Atlanta and camped at the IBIS Hotel, a French-owned inn which was so European that there was not a single drawer in the room. The staff wasn't even put off by my removing the room telephone's wall plate and installing an evil-looking tangle of wires to hook up my trusty laptop's internal modem. Nice folks.

At the show, Touchbase Systems, manufacturers of the popular pocket-sized Worldport 1200-bps modem, displayed prototypes of a 2400-bps Worldport with a projected list price of $349. The Worldport 2400 is no larger than its slower cousin and, according to Touchbase, will be available in September.

Hayes celebrated its tenth birthday by dropping the list prices of its 1200-and 2400-bps modems $200 and $300 respectively, and by announcing its new 9600-bps ($1199) and 2400-bps ($899) V-Series modems. The new units include automatic correction circuitry for error-free transmission, but shun the more common Microcom Networking Protocol (MNP), opting instead for support of protocols that are compatible with the business world's X.25 communications scheme.

Automatic data compression/decompression circuitry is incorporated in the V-Series modems as well. Hayes estimates that transmission times for text-type files will be cut in half when the file transfer occurs between two V-Series compatible modems. Automatic Negotiation circuitry in the new products detect whether the modem on the other end is a V-Series and turns the compression and error correction options on if one of its brethren is sensed.

Owners of Hayes modems who wish to add the error correction, data compression, and automatic negotiation features to their existing units may purchase a stand-alone V-Series Modem Enhancer for $199 until September 30, and for $349 thereafter.

The jury is still out on whether Hayes's V-Series will fare better than the same-named "Lizards from Space" television fiasco of several years ago. Most experienced telecomputerists have been enjoying the benefits of data compression by using public domain Archive and Squeeze programs for years. While not automatic, compression ratios exceeding the projected 2:1 of the V-Series are the norm for such programs when dealing with text and spreadsheet files. Furthermore, the ARC programs allow multiple files to be combined into one for ease of transmission. Adding to the general confusion is the fact that the new Hayes 9600 and the US Robotics Courier HST, which has been finding favor with bulletin board SYSOPs, are not compatible with each other at 9600 bps.

Tymnet's Clock Keeps Ticking—Users Take A Licking

Packet-switcher Tymnet mystified everyone and raised the dander of the hobbyist community at large in June by announcing that it was expanding its prime time period by an hour on each end. Tymnet users will now pay premium rates from 6 a.m. to 7 p.m. (instead of 7 a.m. to 6 p.m.). The rate increase fueled speculation that the number three packet-switching firm lacks the means to expand its present network without added capital.

For The Telecomputerist Who Has Everything

Collectors of telecomputing curiosities should take note of the IXO Computer, a paperback-sized terminal with built-in 300 baud modem. The IXO was spawned in the early eighties by a group of renegade engineers who left Mattel after designing that toy manufacturer's Intellivision video game unit. The tiny terminal's high price (about $600) and radical design made it an instant Edsel. The skimpy one-line LCD display and calculator-like keyboard of the IXO are eminently unusable on a regular basis, but it's still one of the slickest pieces of engineering I've ever seen. The few IXOs that were manufactured are being dumped by some computer and specialty liquidators for under a hundred dollars, which makes it an attractive acquisition for its historical and conversation piece value alone. ©

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Computers and Society

David D. Thornburg, Associate Editor

The Classroom Computer—A Tool For Teachers

While the use of computers as educational tools goes back 20 years or more, the current interest in educational computing is the result of the creation of powerful microcomputers in the late 1970s. By 1979, those teachers who were interested in educational computing were coping with the rapid introduction of new hardware and were confronted with very few choices in the area of educational software.

Computer manufacturers—unsure of the role of their product in schools—used every trick in the book to promote the computer as an educational tool. I remember one advertisement for the Radio Shack Model I that included this line: *Parents—For the price of a good bicycle you can make an investment in your child's future.* This strategy, and others like it, succeeded in pushing small computers into the classroom, even though most educators were unsure how to use them. The only thing that seemed certain was that the computer was being promoted as a tool for students, not for teachers.

The ensuing years saw an inevitable shakeout as some manufacturers dropped out of sight. The teacher's choice was soon limited to a few brand names, and software companies devoted to student-based educational software started to blossom like wildflowers after a spring rain. One result of the sudden growth of the software industry, was that confusion in the area of computer hardware shifted to confusion in the realm of software instead. Many industry leaders picked (or created) bandwagons of their own, and teachers were bombarded with messages from all sides, each promoting one use of computers at the expense of others.

Philosophical debates raged as to the best use of computers: Should they be used as primary delivery vehicles for instruction? Should they be used to supplement the teacher's efforts? Should computers be used to structure the educational experience or to liberate it?

In an attempt to bring organization to people's thinking about educational software, some people latched on to the Tutor, Tool, Tutee model of computer use, described by Robert Taylor in his book, *The Computer in the School: Tutor, Tool, Tutee* (Teacher's College Press, 1980). His model divided most educational software into three classes based on the function of the computer, the scope of its application, and the nature of the student's interaction with it.

Tutor, Tool, Tutee

Tutor software is designed to help the student acquire a specific skill—number facts, for example. The content and instructional style of this type of software covers the range from simulation of a task (running a lemonade stand, for example) to rote drill and practice.

Tool software includes word processors, databases, spreadsheets, graphics programs, music composition tools, etc. The focus here is on using the computer as a tool for the creation, capture, development and exploration of ideas in many subject domains. A word processor, for example, is of as much utility to a student in English as it is to a student in History.

Tutee software is based on a model that the student learns best by teaching a concept to others. In this case the "other" is a computer, and the vehicle for communicating ideas to the computer is a programming language. Logo, for a variety of reasons, is considered by many to be an excellent language for this task.

What About The Teacher?

A brief glance at the three categories mentioned above—Tutor, Tool, Tutee—reveals one aspect in common: Each of these applications treats the computer as a device for the student, not for the teacher.

Is this a reasonable expectation? As valuable as these applications are, it may well be that our focus has been benevolently misplaced. Educators naturally place their children ahead of themselves. But given the scarcity of computers in the classroom, there may be a better way to use technology for the benefit of children and teachers—and education in general.

To see why, let's explore the reality of computers in today's schools.

Where Are The Computers?

As popular as educational computing may seem from the total volume of sales into the classroom, the penetration of computer technology has barely scratched the surface. In 1983, for example, only 7 percent of the elementary schools in the United States had five or more computers. According to a survey conducted by Henry J. Becker, at Johns Hopkins University, the number of classroom computers quadrupled by 1985. But even then the overall ratio of students to computers was a pitiful 42 to 1. Allowing for the purchase of more computers in the interim, today's student to computer ratio is probably about 25 to 1—still too small for computers to reach their fullest potential.

It should come as no surprise, then, that many schools concentrated most of their computers in a "computer lab," where students get access to the machines for about 20 minutes per week. The remaining

one or two computers in the school are often put on movable carts, like movie projectors, to be wheeled from room to room on an "as needed" basis.

To see how limiting this is, imagine what impact the pencil would have on students if they could only use one for 20 minutes a week—and they would have to go to a "pencil lab" to find one. And yet many of us (myself included) were blinded by the promise of student-based educational computing, and we saw the scarcity of classroom computers as only a temporary inconvenience.

The reality is quite different.

The investment required to place the power of the computer in each student's hands—an investment of $2,000 per student—is beyond the scope of educational budgets in this country. And yet, because of our focus on the computer as a tool for student use, we have overlooked an important opportunity. While the ratio of students to computers may be 25 to 1, the ratio of teachers to computers is nearly 1 to 1. Provided that a way can be found to make the computer into a power tool for educators—a tool that lets teachers teach what they want to teach the way they want to teach it—educational computing may finally come of age.

Interestingly enough, the technology to make this happen has nothing to do with computers. The tool that can make the classroom computer into a powerful teaching tool is the inexpensive liquid-crystal display plate. This new display technology, available from several vendors for well under $2,000, sits on top of a standard overhead projector. Anything that would be displayed on the computer screen is projected onto a standard movie screen at the front of the room for all to see. For less than the cost of another complete computer system, the teacher can increase the effectiveness of the classroom computer by 30.

With The Computer

The model I envision for classroom computing places the computer in the hands of the teacher. Using special software, the teacher can use the computer as an electronic blackboard. Unlike conventional blackboards, the teacher's computer can hold a lot of information, can bring up high-quality graphic images in a few seconds, and can provide a printed copy of anything that has been displayed. This printout can serve as class notes, the recording of classroom brainstorms, and so on.

The challenge for software developers now, is to respond to the needs of the teacher who wants to use the computer as a direct tool of instruction from the front of the room. I, for one, have elected to concentrate my efforts in this area of software development.

I think it is time that we shifted our focus slightly from educational computing from the student's desk to the front of the room. The benefits are tremendous.

This article is excerpted from Dr. Thornburg's latest book, The Empowered Teacher, *published by Starsong Publications. He welcomes letters from readers and can be reached at P.O. Box 1317, Los Altos, CA 94023.* ©

CAPUTE!

Atari *Laser Chess*™ On Disk

The *Laser Chess* program on the April–June COMPUTE! Disk for Atari computers will not run properly when selected from the disk menu. However, the program runs just fine when loaded and run without the menu. Simply use the command RUN "D:LASER.JUN".

IBM Fast Fractal Landscapes

This program from the June issue (p. 88) works as published on IBM PCs and compatibles equipped with color/graphics adapter (CGA) cards or equivalent hardware. However, we have learned that the landscape display may be distorted when the program is used on systems with enhanced graphics adapter (EGA) hardware. The program may also fail to perform properly on high-speed PC AT and compatible systems, even when CGA hardware is used. We regret that there is no simple solution to this incompatibility problem.

The Power Of ON-GOTO And ON-GOSUB

The "Calendar" program in this article from the August issue (p. 105) reports incorrect weekdays for dates in some leap years. This problem occurs because the formula used in line 110 requires greater numerical precision than the Atari provides. Reader Paul Schaefer suggests a modification, which substitutes an alternate date formula known as Zeller's Congruence. Add or replace the following lines:

```
85 ON YEAR<1752 GOTO 180:
   ON (YEAR=1752 AND M<=9
    AND DAY<=13) GOTO 180
110 X=M+10:IF X>12 THEN X
   =X-12
112 C=INT(YEAR/100):D=YEA
   R-C*100:IF X>10 THEN
   D=D-1:IF D<0 THEN D=9
   9:C=C-1
114 DAYS=DAY+INT(2.6*X-0.
   02)+D+INT(D/4)+INT(C/
   4)-2*C
```

This modification also needs to be made to the version of the program supplied on the July–September COMPUTE! Disk. The program is stored on the disk with the filename ONGOTO.AUG.

Pop-Up ASCII Table For IBM

This program, from the August issue (p. 91), is not compatible with the IBM PCjr. It should, however, function properly with any other IBM model or compatible. ©

Bill Wilkinson

Machine Language Graphics

Last month we looked at how Atari BASIC translates its own graphics-oriented statements into simpler pieces for its calls to the Atari's operating system (the *OS*). Or, more correctly, we showed how *you* could do such an expansion. When Atari BASIC executes a statement in your program, it actually interprets it as a request to do a series of machine language operations—the equivalents of the simplified pieces we discussed last month.

The only example we've taken a close look at so far is POKE. I showed you that

POKE 85,*xpos*

may be accomplished by the machine language instructions

LDA *xpos*
STA 85

(Remember, I'm using variable names with lowercase letters on purpose, to remind you that the names are arbitrary. Please pick your own.)

Again, if you go back to last month's column, you'll find that the only BASIC statements I used to simulate the graphics commands of BASIC were OPEN, CLOSE, PUT, GET, and XIO. You may also have noted that each of these statements was associated with a channel number (specifically, channel 6, because that's where BASIC does all its graphics operations). You won't be too surprised, then, when I tell you that each of these five is actually a fundamental OS operation. Specifically, each involves a direct call to Atari's Central Input/Output (CIO) processor. You may, however, be a little startled when I tell you these five calls represent all but one of the fundamental OS operations. (The missing one is represented by BASIC's STATUS statement, which is generally used only for modem operations because of a flaw in BASIC's implementation of the OS call.)

The point of all this is both simple and important: If you master these five OS calls from machine language, you can use virtually any input/output (I/O) operations you might need or want. For example, you can read records from a disk file using only three of these operations (OPEN, GET, and CLOSE). True, there are some variations on GET and PUT that are useful with lines of text or with large files, but the concepts are all the same. So, without further delay, let's translate the five BASIC I/O statements into five machine language routines.

All I/O on the Atari is controlled through eight Input/Output Control Blocks (*IOCBs*), one for each *channel* or *file number*. Each IOCB is 16 bytes long and is located adjacent to another, beginning at addresses 832, 848, 864, and so on. (In hexadecimal, the sequence is $340, $350, $360, and so on.) The channels are numbered 0–7 in BASIC, but in machine language, we use the offset from the start of the first IOCB as the IOCB number. Under this system, the first block is still IOCB 0, but the fourth, known as channel 3 in BASIC, is designated as IOCB number 48 ($30). The reason for this is because it begins at memory location 880 ($370), which is 48 bytes beyond the start of IOCBs at location 832.

Graphics I/O

To perform any I/O operation, you put information into certain places in the IOCB of your choice. Then you put the IOCB number into the processor's X register and call the CIO routine at address $E456 in ROM. (I'm not going to put in the decimal equivalents from now on. You really should learn to use hexadecimal—it's much more logical for machine language.) The only magic, then, is in learning just *what* to put into the IOCBs.

Each IOCB consists of 16 bytes, as shown in Table 1.

All of these labels and bytes

Table 1

Label Name	Size in bytes	Offset in IOCB	Mnemonic Description
ICHID	1	0	Identifier
ICDNO	1	1	Device number
ICCOM	1	2	Command
ICSTA	1	3	Status
ICBA	2	4	Buffer address
ICPT	2	6	Put vector
ICBL	2	8	Buffer length
ICAX1	1	10	Auxillary byte 1
ICAX2	1	11	Auxillary byte 2
ICAX3	1	12	Auxillary byte 3
ICAX4	1	13	Auxillary byte 4
ICAX5	1	14	Auxillary byte 5
ICAX6	1	15	Auxillary byte 6

Table 2

Command	ICCOM	ICBA	ICBL	ICAX1	ICAX2
OPEN	3	*device*	X	*type*	*mode*
CLOSE	12	X	X	X	X
GET	7	X	$0000	===	===
PUT	11	X	$0000	===	===
XIO	*xio*	*device*	X	===	===

have uses (*I refer you to Mapping the Atari*, or *Atari Roots* for more details), but for our purposes, we need to learn about only a few of them. Again, I have prepared a chart (Table 2) to summarize which labels are meaningful for which graphics-related commands. (Remember, see last month's column for examples of the BASIC commands we are using.)

If a labeled location has a number assigned to it, then use that number with the operation. Descriptions in italics (*device*, for example) will be explained in the text that follows. An X means that the value in the corresponding location has no effect for the operation, and === means that the contents of the corresponding location should not be disturbed. For our purposes, these two symbols are equivalent: We won't change the contents of these locations.

CLOSE is the simplest of the routines. To do a CLOSE, you simply place the command number in the appropriate location, load the X register properly, and call CIO. The complete routine looks like this:

```
LDX #$60        ; using channel 6—graphics
LDA #12         ; CLOSE command
STA ICCOM,X     ; put command in place
JSR $E456       ; call CIO
```

Don't understand all that? Don't worry. A few sessions with an assembler and a good tutorial will help you get started.

For OPEN and XIO, the buffer address (ICBA) field should contain the address in memory of the beginning of a string, and that string should have the name of the device (and/or file) that you wish to work with. For graphics, the device name is always S:. The command value (ICCOM) is always 3, for OPEN. For XIO, you use the same number you would in BASIC. (For example, 17 for DRAWTO, as we saw last month.)

For OPEN, the first two auxillary bytes (ICAX1 and ICAX2) correspond to the two auxillary values in the BASIC version of the statement. Although ICAX2 is usually given a zero value, when opening a graphics screen, it gets the number of the appropriate graphics mode instead. Usually no command, except OPEN, should touch the auxillary two bytes. (Atari BASIC actually errs in making them part of the normal XIO commands, and that's why we had to stick in a value of 12 in our DRAWTO equivalent last month. The exceptions that prove the rule are various modem command XIOs, used with the R: device.)

Finally, for GET and PUT, as we will use them for graphics, you need only put a value of zero in both bytes of the buffer length (ICBL), put the appropriate command value (7 or 11) in its field (ICCOM), set up the X register, and use the A register to transfer the byte. That is, if you want to PUT a byte to the screen—which, as I hope you remember from last month, is how you implement PLOT—put the byte (for example, the color value) in the A register just before calling CIO. If you want to GET a byte from the screen to simulate the LOCATE command, do all of the above and the byte will be in the A register after your call to CIO.

Too complicated? Cheer up. This is the worst of it. Next month we'll put together some bona fide examples to try out. Next month will also be the last part of this series on converting BASIC graphics commands to machine language. I intended all of this to be an introduction (or refresher, for you old-timers) to machine language. If you want to take this topic further, you really *must* get an assembler and a couple of books. Good luck.©

All the programs in this issue are available on the ready-to-load *COMPUTE! Disk*. To order a one-year (four-disk) subscription, call toll free **1-800-727-6937**. Please specify which computer you are using.

ST Outlook

Philip I Nelson

One Last Bug

I vowed to refrain from flogging this particular dead horse, but here's an ST BASIC bug that ranks among the worst BASIC bugs of all time. Type this line in the Command window and press Return:

```
x = 18.9
```

The computer prints these messages:

```
function not yet done
System error #%N, please restart
```

Don't bother searching for an explanation in your BASIC manual; these are not BASIC messages. The bug appears when you assign certain values—multiples or fractions of 18.9—to a variable. The value 18.7 works just fine, but 18.8 is close enough to the demon quantity to generate part of the weird error message. And the problem involves more than mere messages. Enter this statement from the Command window:

```
x = 37.8
```

This time, ST BASIC crashes completely. The computer puts up a pair of cherry bombs, signaling a bus error, and dumps you back onto the desktop. Things look fine there until you touch a key, whereupon the system locks with four cherry bombs. If you're still feeling adventurous, try either of these:

```
x = 4.725
```

or

```
x = 1.18125
```

BASIC bombs with two cherries. When you dash back to the desktop, the computer locks with ten cherry bombs on the screen. That's as bad a crash as you can get on the ST without seeing the machine rip free from its cables, drag itself to the edge of the desk, and leap into the trash bin.

If that doesn't convince you to avoid ST BASIC for serious programming, enter these two lines from the Command window and compare the results:

```
? 257 * 257
```

and

```
? 257 ^ 2
```

Most Earthlings recognize these statements as mathematically equivalent, but in ST BASIC, it just ain't so. While users struggle with bugs like these, Atari has spent the last year waiting for MetaComCo to finish a revision of ST BASIC. Last year, based on a copy of Atari's draft manual, I wrote a column outlining the features of the new BASIC. Although it has yet to appear, one highly placed Atari source has been heard to say that the new version is only "one bug away" from completion—prompting some wags to ask whether Atari has only one more bug to eliminate from ST BASIC or one more to add.

Adding insult to injury, Atari has quit bundling *NEOchrome* and *First Word* with the computer. So while early ST buyers got a great graphics program and a decent word processor in addition to ST BASIC and Logo, current ST purchasers get only the languages.

LET Rides Again

In the meantime, others have been quick to market alternatives to ST BASIC. The most popular third party BASIC to date is *GFA BASIC*, which I've mentioned in past columns. A more recent offering is *True BASIC*, marketed under the auspices of John Kemeny and Thomas Kurtz, whom you may remember as the originators of the first BASIC language.

True BASIC has a certain fundamentalist appeal; after all, who better than the original authors to tell us how BASIC ought to work? The only problem is that computers and computer programming have changed a lot in the decades since BASIC was first devised. For instance, when was the last time you used LET or END in a BASIC program? END is mandatory in *True BASIC*, even if you're writing a quick five-line program for test purposes. And the statement LET, as in LET X = 20, is mandatory unless you begin the program with the statement OPTION NOLET. Tortured didacticism of that sort may win raves in an academic setting, but it's not going to earn many friends among practical programmers.

True BASIC provides a comfortable, GEM-based programming environment, and its documentation is thorough, but the language is a disappointing performer. Everything seems to run at about half speed, and many ST features are purposely made inaccessible—presumably so that *True BASIC* programs can run on less powerful machines like the IBM PC. Following the emerging norm, *True BASIC* includes a compile option. However, I didn't notice any significant speed increase after compiling the demo programs, all of which are on the order of drawing a flag or solving the *Towers of Hanoi* puzzle. *True BASIC* may be hot stuff on the PC, for which it evidently was designed. However, it's hard to imagine such a stiff language gaining wide approval among ST owners.©

Donald B. Trivette

Creating A Blues Symphony

The introduction of the IBM Personal System/2 received so much ballyhoo that it overshadowed another announcement on the same day—the IBM Music Feature.

The Music Feature is a professional-quality music synthesizer contained on a full-length expansion card that fits in the IBM PC, XT, AT, and PS/2 Model 30; it does *not* fit in the PCjr, the IBM Portable, or the Convertible. It may or may not work with IBM compatibles—although my best guess is that it will. On the back of the card are three RCA-type plugs and a D-shell connector which provide input and output to the music card.

Two of the RCA-plugs are for input to a home stereo amplifier—left and right audio outputs—and the third is for headphones. The D-shell plug accommodates a short cable connected to a MIDI (Musical Instrument Digital Interface) adapter box, which is part of the Music Feature. Into the MIDI box (MIDI in, out, and through) you may plug a keyboard or other musical apparatus. A typical home installation might have two cables (left and right channel) running from the PC's Music Feature to the input jacks on your stereo, and a keyboard such as the Yamaha DX-100 attached to the MIDI adapter box.

Once all the hardware is connected—it takes about 10 minutes—you have an FM synthesis of up to 336 instrumental sounds in any musical style from jazz to classical, with as many as eight instruments or voices playing at one time. If eight instruments aren't enough, you can install two IBM Music Feature boards in the PC and have up to 16 voices. But you won't get nary a whistle if you don't buy some software, because even at $495 the IBM Music Feature is softwareless.

Fortunately, there are already dozens of products on the market that work with the Music Feature—and there are more on the way. However, you must be careful if you're installing the system on IBM's PS/2 Model 30, as I did. That machine has only the new 3½-inch disk drive, and most music programs are currently available only in the 5¼-inch format. I tried to transfer some of the better programs through a floppy-disk equipped PC to the Model 30 via a modem connection, but their copy-protection scheme prevented me from using them.

Playing The Blues

The only software I was able to test was Yamaha's *PlayRec*—which is the *1-2-3* of music software—and it made me wish I knew more about notes, keys, and beat. The manual says you can create music by playing a chord on the keyboard, and *PlayRec* will create an entire accompaniment played by up to five separate instruments. Since I'm not particularly musical, I had to rely on some prerecorded songs thoughtfully sent to me by a musically inclined IBMer. I *was* able to load and play them without difficulty. The 3½-inch disk can hold up to an hour of music; a floppy can store about 35 minutes.

The *PlayRec* screen is divided into four parts: Master Block Window, Instrument Window, Play/Record Window, and a graphics keyboard across the bottom. When I loaded a prerecorded blues piece, the Instrument Window indicated that it was played with five instruments: Upright Bass, Piano, Hard Brass, Jazz Organ, and New Electric Piano. Moving the cursor to highlight any one of these instruments, and pressing Enter, caused a list of 336 other instruments to appear on the screen. Then, by moving the cursor though the list, I could hear how the music sounded with each instrument.

I spent hours "improving" the blues piece until it was completely unrecognizable—and quite awful. Imagine blues played with Whistle, Marimba, Tom Tom, Concert Organ, and Thunder Storm. Yes, sound effects are included. Chris the Surfer, my equally musically-ignorant neighbor, composed a symphony with Martian noises, ghost sounds, a race car, and Maui's thundering surf.

Of course IBM and Yamaha didn't spend hundreds of thousands of dollars developing this equipment so we could play with funny noises. The *PlayRec* program allows serious musicians to compose, record, edit, and modify musical scores. The Play/Record Window has the controls to simulate a 16-track digital tape deck; different parts can be recorded on different tracks. The individual instrument sounds can be modified to have as much variety and volume as those in a concert hall.

An Instrument Control Window allows you to set octave range for each instrument; a pan control lets you direct sound to left, right, or both channels; the portamento adjustment determines how smoothly one note slides into another; and the bend parameter gives you the ability to bend an instrument's pitch in response to a message from the keyboard. This window also controls over a dozen other parameters—like vibrato/tremolo, poly/mono modes, detune, and range.

PlayRec is wonderfully instructional. Students can see notes as they are played, and make modifications to existing music. If I hadn't had to return the DX-100 keyboard that Yamaha lent me, I believe I eventually might have learned to play a bit. As it is, I'll have to be satisfied with knowing *Lotus 1-2-3*.©

The Great Amiga Reboot

Summer is traditionally a slow season in the computer business, but as far as the Amiga is concerned, this summer has been anything but slow. The first production units of the Sidecar and the Amiga 500 were arriving in stores just as Commodore was preparing to show off the new line at the Spring COMDEX (COMputer Dealers EXposition) in Atlanta. Prior to the show, Commodore held a national sales meeting which was attended by more than 200 Amiga dealers. Though the main purpose of the meeting was to give dealers an opportunity to meet the new management team, a couple of substantive items were discussed.

Selling The New Amigas

Commodore execs pledged that they'd finally do some advertising of the Amiga. They also pledged that the Amiga 500 wouldn't be sold in mass market outlets like K mart. This was a surprise, since it was rumored that one of the reasons Irving Gould ousted Tom Rattigan from the top spot was that Gould wanted to market the 500 like the 64, and Rattigan disagreed. But Gould made it clear that the new management team's mission is to try and duplicate Commodore's success in Europe, here in the U.S. The plan apparently includes emulating the marketing methods used in Europe, where Commodore is seen as a manufacturer of serious business machines. Finally, plans were confirmed for some promotional offers. One of these is a repeat of the old "buy two, get one free" offer, which was used so successfully in the days of the Commodore PET. Under this plan, schools get one free Amiga system for every two they purchase. Commodore also confirmed that a trade-in program will be offered to current model 1000 owners who want to move up to the 2000. The plan allows for the purchase of a 2000 for $1,000 with a trade-in of a 256K one-drive Amiga system.

Desktop Video

Meanwhile, back at the show, Commodore hosted a large and active booth on the show floor. About three dozen Amiga 2000s were set up, along with a few 500s and PC compatibles. And dozens of third-party developers were on hand to demonstrate their hardware and software on the new machines. Among the most interesting developments were new video products. The Amiga genlock interface, which Commodore introduced recently, represented a first step towards realizing the Amiga's potential as a "desktop video" machine that can be used to add fancy titles and special effects to videotape recordings. But Commodore's genlock unit, though the least expensive interface of its kind, doesn't produce a clean enough signal for broadcast, or even some commercial applications. That's why it was particularly encouraging to see third parties developing high-quality genlock interfaces for the Amiga.

The least expensive of these is a $179 unit from Mimetics. This interface, roughly the size of a pack of playing cards, works with all Amiga models and is said to produce a better video signal than the $300 Amiga genlock. And it provides a composite video output for the 2000 and 500, to boot. Mimetics hopes to bring it out by fall, with a higher priced broadcast-quality unit to follow. Mimetics also plans an interesting video frame buffer product that will allow the creation of hi-res video still images with millions of colors. Commodore was also showing a better quality internal genlock for the Amiga 2000, though price and availability weren't discussed. Finally, a group from the New York Institute of Technology's Computer Graphics Laboratories was showing an early prototype of a professional video card for the Amiga 2000. This unit is a combination genlock, frame buffer, and digitizer. The frame buffer allows you to freeze a single video frame from an external live-action source; the digitizer then lets you turn it into a computer image. The genlock interface produces broadcast-quality output. Although still in the early stages, the current plan calls for Commodore to manufacture and sell the interface—at $600–$700—sometime this year.

One exciting new Amiga video peripheral wasn't shown at COMDEX. That's because the Sci-Tech Gen-key interface won a Product of the Year Award at the Consumer Electronics Show, which was being held at the same time. The Gen-key is a combination genlock, chroma keyer, and time-base corrector. Although the product sells for $995, it produces broadcast quality RS 170A video, and offers features usually found only on much more expensive equipment. With a Gen-key and an Amiga, you can easily do the kind of video titling usually performed by a dedicated character generator unit costing thousands of dollars more.

This isn't to say that video hardware products were the only items of interest at COMDEX. There were lots of great new software products like the Amiga version of *WordPerfect*, and there were interesting sidelights like a software 64 emulator and a utility called *Fruit Friend*, which reads Apple II disks from the Amiga. But desktop video production is one of the important markets that could really make things happen for the Amiga, and anything that brings that day closer is really big news. ©

Smart Alec

Ronald Carnell

Who says a computer can't think? "Smart Alec" emulates an important part of human logic and can provide intriguing insights into how we reason deductively. Although it's written in machine language, this Commodore 64 program is as easy to use as BASIC. A disk drive is required.

"Smart Alec" is a program that simulates human thinking, or at least one portion of it. That portion is the realm of deductive reasoning through syllogistic logic. A syllogism is an argument in which a conclusion is inferred from two premises. Here is a simple example:

a Greek is a human
an Athenian is a Greek
therefore an Athenian is a human

The conclusion is derived from the first two statements, which are called categorical propositions. Categorical propositions either affirm or deny that one class or category is included in another. The example shows that we can use two categorical propositions to arrive at a logically correct conclusion. Although humans seldom think in such formal terms, syllogisms are an important part of our reasoning process.

Syllogisms are important to Alec, too. The premises you supply to him are his food (and he's always hungry), and the conclusions he draws are his only reason for existence.

Type in and save Program 1 using the "MLX" machine language entry program found elsewhere in this issue. When you run MLX, you'll be asked for a starting and an ending address for the data you'll be entering. Here are the values to use for Smart Alec:

Starting address: 0801
Ending address: 15F0

Although Smart Alec is written in machine language, it loads and runs exactly like a BASIC program. To help distinguish your input from Alec's responses, your input statements appear in white; his statements appear in black. If these colors are hard to read on your TV or monitor, change the screen background color before you run the program. For instance, type POKE 53281,12 and press RETURN to change the background color to gray. When you're ready to proceed, load and run Smart Alec as you would a BASIC program.

Statements

Smart Alec accepts three different kinds of input from you: statements, questions, and direct commands. Let's look at each one in turn, beginning with statements.

A statement is a sentence that can be used as a premise in a syllogism. A statement must be expressed in a format that Alec can understand. Here is the correct format for statements:

***article*, subject, verb, *negation*, *article*, predicate**

The italicized items are optional, while those in normal type must appear in every statement. Consider the following sentence:

an apple is not a vegetable

The words *a* and *an* are articles. Alec recognizes these, plus *the*, *all*, and *every* as words that may precede a noun. The subject of our sentence is *apple* and the predicate is *vegetables*. Our example sentence is a negation—it says an apple is not part of the class known as vegetables—so the optional *not* has been included. Finally, the sentence is joined by a verb, *is*.

Most of the verbs recognized by Alec are some form of the verb *to be*. These include *am*, *are*, *is*, *was*, *were*, *will be*, *has been*, *be*, *will*, *does*, *do*, and *would*.

Alec also accepts a special verb phrase as an assignment. When you tell Alec *an apple is a fruit*, he is smart enough to know that the reverse isn't necessarily true: *a fruit is an apple* would be an invalid deduction. There will be times, however, when you will want one thing to equal another—to be exactly the same. Alec accepts the phrase *is the same as*, or more simply, an equal sign (=) as such an assignment. This verb phrase allows you to set up synonyms that Alec will understand. For example, the statement *smart is the same as intelligent* instructs Alec that the words *smart* and *intelligent* are completely interchangeable. You could also use the phrase *smart = intelligent* to accomplish the same goal.

If Alec responds with OK, he understands your statement. Other responses depend on the situation. If he doesn't understand the statement, he'll ask you to rephrase it. If you try to tell Alec something he already knows, he'll notify you of that fact. Alec will also respond with *I know* if you try to directly contradict an existing fact, meaning that he knows the statement cannot be true.

Two Input Modes

There are two ways to supply statements to Alec. The first, an interactive method, involves simply typing the statements. This mode is quite interesting in that you can type in several statements about a given subject and then question Alec immediately about his deductions.

The second way is to enter your statements in the form of program lines, save the file to disk, and then ask Alec to read the file. This is more efficient for complex situations because it allows you to edit the statements and rerun the entire session. Once you have supplied a statement in interactive mode, there is no way to edit it. For instance, I once told Alec that *man is the same as human*, thinking of *man* in the sense of *mankind*. When I later stated that *a woman is not a man*, Alec was led to the erroneous conclusion that *a woman is not human*. If you store statements in a file, you can change only the statements you need, without having to retype everything from scratch.

Program 2 is an example of a statement file, which is simply a numbered list of sentences each enclosed in quotation marks.

One final note about statements before we discuss questions: A statement to Alec is not a mere intangible that can be used to reach deductions; it is the very sustenance of his life. Alec calls a statement a *morsel*, and with good reason. He hungers for morsels just as you and I might crave a peanut. If Alec answers too many questions without being fed any morsels, he begins to get hungry and he will let you know it's time to feed him. His degree of hunger and how often it arrives will depend on just how full Alec already is. If Alec has little information on hand, he begins to hunger quickly and his hunger increases rapidly. If you ignore his requests, Alec's hunger eventually reaches the point where he can't think and will refuse to answer questions until he's fed. If Alec's database is close to full, however, he will get hungry infrequently, and not very significantly.

Questions

As noted earlier, you can also ask questions of Smart Alec. The format for questions is just a slightly rearranged version of the statement:

verb ***article*** **subject term** ***article negation*** **predicate term**

The words that Alec recognizes as articles and verbs are identical to those he recognizes in a statement (see above).

Alec can respond in four different ways to a question, with *yes*, *no*, *I don't know*, or *I don't know anything about that*. The first two responses are self-explanatory. The third response means that Alec can't reach a conclusive deduction. The last means that you are asking about a subject which Alec can't find in his memory.

Commands

Alec understands the following words as direct commands:

read
save
load
discuss
explain
why
don't explain
always explain
dump
bye

Some of the commands involve statement files. For instance, the command READ HUMANS causes Alec to read a statement file named *humans*.

Note that the filename is not enclosed in quotation marks. You can also tell Alec to load or save his entire database for future sessions. The syntax is similar to the read command: The command SAVE HUMANS saves the database with the filename HUMANS, and the command LOAD HUMANS loads the file HUMANS into memory. The size of data files is always the same.

In some cases you might want to learn how much Alec knows about a particular subject. The DISCUSS command causes Alec to disgorge everything he knows about a topic. For instance, if you're curious about how much Alec has learned about humans, you might command him to DISCUSS HUMAN. Alec searches his entire database for any reference to *human* and repeats everything he has previously been told about that word.

When you first run Smart Alec, he is designed to answer questions concisely, without explaining the underlying logic. The commands EXPLAIN and WHY are synonyms which cause Alec to display the entire chain of logic behind a conclusion, including false starts and interrupted chains of thought. The command ALWAYS EXPLAIN causes Alec to explain his thought process after each question without the need to ask. The command DON'T EXPLAIN resets the original concise mode.

The DUMP command causes Alec to dump, or display, his entire database to a printer. Alec dumps only the words that appear in his memory, without reconstituting them into sentences.

The last command, which Alec hates to receive, is BYE. When you issue this command, indicating that you wish to terminate the session, Alec asks for confirmation. If you respond by pressing *Y* for yes, Alec returns control of the computer to you. Because he has made so many temporary changes to the computer, the only way Alec can depart safely is by causing the computer to reset.

Accuracy

There are instances where Alec might appear to be wrong. The first such instance is by far the most prevalent. Alec's conclusions are only as accurate as the premises you supply; he depends totally on you to supply factual and unambiguous statements. The example cited earlier, where we told Alec that *man is the same as human*, is a typically ambiguous premise. The word *man* was used incorrectly to mean *mankind* or *humanity*; when *man* later appeared in a different context, Alec became confused. Logicians call this the *fallacy of equivocation* and it emphasizes that Alec is subject to the same fallacies of logic that we humans face.

Sometimes you may suspect that Alec *should* know something when he doesn't. Consider these propositions:

a mortal will die
a unicorn is not mortal

When Alec was asked if a unicorn would die, he responded *I don't know*. At first you might think that Alec should be able to deduce the correct answer. However, that reasoning includes assumptions that Alec could not know at that point. You and I know that an entity is either mortal or not mortal—there is no third alternative. But Alec doesn't know this and would not assume it. Based on the information available to Alec at the time, the fact that a unicorn is not mortal does not necessarily make it im-

mortal. In addition, this pair of statements equates the words *mortal* and *die*, but that is not what we told Alec. These statements may illustrate the point more clearly:

water will evaporate
alcohol is not water

It becomes obvious, now, that just because alcohol is not water doesn't mean it won't evaporate. Given only the information Alec had in the previous example, you can see that just because a unicorn is not mortal, doesn't mean it won't die.

This example points out one of the more intriguing features of this program. When Smart Alec reaches a conclusion that we suspected, we find it interesting. But when Alec quite correctly reaches a conclusion that goes against our own sense of logic—our own experience of right and wrong—we are forced to examine our own thought processes to see how they differ from Alec's. We discover not only how Alec thinks, but how we think as well.

How Smart Alec Thinks

Smart Alec simulates the appearance of human thought, but he certainly doesn't think in the same manner we do. Alec's "mind" is composed of a two-dimensional array which contains the subjects and predicate terms you supply. A very simple entry might look like this:

Subject:	**man**	**human**	**mortal**
Predicate:	**human**	**mortal**	**die**

In this instance, we have told Alec that *a man is the same as a human, a human is mortal,* and *a mortal will die.* The subject of each statement is stored as a header in the array, and the predicate terms are stored beneath the proper header. If we added the statement *a man is a mammal,* Alec would store *mammal* beneath the already created header of *man.*

Smart Alec has room for 256 different headers in his memory. He will refuse to accept more. Under each header, he can store 20 different predicate terms. If a twenty-first term is entered, Alec accepts it and allows it to replace the first predicate term that was entered under that header. In effect, he forgets the first entry.

In addition to each header and predicate term, Alec also stores the articles and verb that were used in the sentence. These are stored as one-byte numbers to conserve memory; they can later be retrieved to reconstruct the original statements.

Using the array we set up as an example, let's ask Alec a question and see how he answers it. The question is *will a man die?*

Alec dissects the question and discovers that *man* is the subject and *die* is the predicate term. He sets *man* aside for a moment and looks through his memory for *die* stored as a predicate term. He finds it under the header of *mortal.* Retrieving *man,* he compares it to the current header and finds that *mortal* and *man* do not match. Alec sets *man* aside again, and replaces the original predicate term with the current header. In effect, he transforms our question from *will a man die?* to *is a man mortal?*

Alec now searches his memory for *mortal* stored as a predicate term. It's important to note that the *mortal* that replaced *die* was a header, but Alec is now searching for it as a predicate term. He finds it listed as such under *human.* When he looks and finds that *man* doesn't match *human,* he will replace *mortal* with the header *human* and then look for *human* as a predicate term. When he finds it under *man,* he will again retrieve the original subject, *man,* and find that he does indeed have a direct match. Because the train of thought was uninterrupted, Alec will answer *yes, a man will die.*

The algorithm for Alec's thinking, then, becomes a fairly simple search-and-replace procedure. It becomes slightly more complicated when Alec can't find a direct path between predicate term and subject on the first attempt. Then he has to start crossing off the tail end of a bad search to insure that he doesn't end up back there when he searches again. He will continue crossing off the tail end of a bad search until he eventually finds the right track to follow, or has no tracks left.

Actually, Alec's own thinking is more complex than this because he allows us to assign a subject and predicate term as equal, and because he allows negative statements.

Program 1: Smart Alec

Please refer to the "MLX" article in this issue before entering the following program.

```
0801:0A 08 08 00 9E 32 30 36 6D
0809:31 00 00 00 A9 E2 85 03 98
0811:A9 CC 85 04 20 33 0C A9 A9
0819:00 A8 AA 91 05 C8 D0 FB AA
0821:E6 06 E8 10 F6 85 45 85 22
0829:4B 85 4C 85 4D 78 A9 36 F7
0831:85 01 58 A9 FA A0 08 20 74
0839:38 09 E6 45 20 4C 09 20 3D
0841:C5 09 A5 2C F0 14 20 46 4C
0849:0D A5 34 F0 0A A5 4C D0 2F
0851:09 20 7B 0D 4C 5B 08 20 2E
0859:CD 11 20 0C 15 4C 3B 08 B1
0861:64 14 45 56 45 52 59 20 FC
0869:00 41 20 00 41 4E 20 00 51
0871:54 48 45 20 00 41 4C 4C 52
0879:20 00 4E 4F 54 20 41 20 1E
0881:00 4E 4F 54 20 41 4E 20 17
0889:00 4E 4F 54 20 54 48 45 84
0891:20 00 4E 4F 54 20 41 4C 62
0899:4C 20 00 4E 4F 54 20 00 C8
08A1:49 53 20 54 48 45 20 53 5F
08A9:41 4D 45 20 41 53 20 00 EF
08B1:3D 20 00 49 53 20 00 57 6F
08B9:41 53 20 00 57 49 4C 4C 08
08C1:20 42 45 20 00 57 45 52 57
08C9:45 20 00 41 4D 20 00 41 C4
08D1:52 45 20 00 48 41 53 20 6E
08D9:42 45 45 4E 20 00 42 45 B4
08E1:20 00 57 49 4C 4C 20 00 55
08E9:44 4F 45 53 20 00 44 4F A6
08F1:20 00 57 4F 55 4C 44 20 76
08F9:00 0E 93 11 05 20 20 20 1A
0901:D3 CD C1 D2 D4 20 C1 CC 4D
0909:C5 C3 0D 20 C3 CF CD D0 5C
0911:D5 D4 C5 21 20 D0 55 42 3F
0919:4C 2E 0D 11 11 90 C9 27 15
0921:4D 20 52 45 41 44 59 2E 7C
0929:2E 2E 0D 0D 00 90 CF CB FD
0931:05 0D 00 A9 2E A0 09 8D 37
0939:41 09 8C 42 09 A0 00 B9 68
0941:FF FF F0 06 20 D2 FF C8 E6
0949:D0 F5 60 A9 01 8D 86 02 35
0951:A9 3E 20 D2 FF A9 00 85 25
0959:2C 8D A7 02 20 A6 09 C9 71
0961:0D F0 37 C9 14 D0 0C A4 5A
0969:2C F0 F1 20 D2 FF C6 2C 5E
0971:4C 5D 09 C9 20 90 E5 C9 97
0979:80 90 0C C9 95 90 DD C9 82
0981:9B 90 04 C9 A1 90 D5 A4 42
0989:2C C0 55 90 03 4C 5D 09 A2
0991:99 A7 02 20 D2 FF E6 2C 2D
0999:D0 C2 20 D2 FF A9 00 A4 41
09A1:2C 99 A7 02 60 A9 00 85 74
09A9:CC 86 2B 20 E4 FF AA F0 98
09B1:FA A2 02 86 CD A6 CF D0 0C
09B9:FC E6 CC A6 2B 60 A9 0D 43
09C1:20 D2 FF 60 A9 2D 85 FB A7
09C9:A9 0A 85 FC A2 00 A5 2C 40
09D1:D0 19 A0 00 8C 86 02 B1 DA
09D9:FB F0 06 20 D2 FF C8 D0 E1
09E1:F6 20 BF 09 C8 E8 E0 0A B5
09E9:90 ED 60 A0 00 B1 FB F0 85
09F1:24 D9 A7 02 D0 07 C8 C4 9A
09F9:2C 90 F2 F0 F0 C8 B1 FB BD
0A01:D0 FB C8 18 98 65 FB 85 EE
0A09:FB A9 00 65 FC 85 FC E8 BC
0A11:E0 0C 90 D7 60 8A 0A AA 14
0A19:BD 75 0A 8D 26 0A BD 76 CE
0A21:0A 8D 27 0A 20 FF FF A9 CD
0A29:00 85 2C 60 52 45 41 44 98
0A31:00 4C 4F 41 44 00 53 41 60
0A39:56 45 00 45 58 50 4C 41 FB
0A41:49 4E 00 57 48 59 00 44 EE
0A49:55 4D 50 00 44 49 53 43 96
0A51:55 53 53 00 41 4C 57 41 7A
0A59:59 53 00 44 4F 4E 27 54 89
0A61:00 42 59 45 00 41 52 45 74
0A69:20 59 4F 55 20 48 55 4E 3E
0A71:47 52 59 00 34 0B EA 0A 96
```

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0A79:09 0B 28 0B 28 0B C1 0B 86
0A81:3C 0C 3F 0D 3B 0D 93 0B AF
0A89:8B 0A A9 92 A0 0A 4C 38 42
0A91:09 90 4F 46 20 43 4F 55 9E
0A99:52 53 45 0D 00 A9 A5 A0 B7
0AA1:0A 4C 38 09 90 50 4C 45 09
0AA9:41 53 45 20 52 45 50 48 6E
0AB1:52 41 53 45 2E 05 0D 00 9D
0AB9:A0 03 A2 00 C8 B9 A7 02 B1
0AC1:C9 20 F0 F8 84 2C C8 E8 BF
0AC9:B9 A7 02 D0 F9 8A 48 18 94
0AD1:A9 A7 65 2C AA A9 02 69 7D
0AD9:00 A8 68 20 BD FF A9 02 6A
0AE1:A0 00 AE 03 08 20 BA FF 82
0AE9:60 20 B9 0A A9 00 A2 EC 8D
0AF1:A0 15 20 D5 FF AD ED 15 A4
0AF9:85 03 AD EE 15 85 04 A9 A6
0B01:00 85 45 85 4C 4C A4 0B 61
0B09:A5 03 8D ED 15 A5 04 8D 18
0B11:EE 15 20 B9 0A A9 EC 85 D9
0B19:FB A9 15 85 FC A2 E3 A0 6D
0B21:CC A9 FB 20 D8 FF 60 A5 B6
0B29:4D F0 07 E6 4B 20 13 0E 80
0B31:C6 4B 60 20 B9 0A 20 C0 82
0B39:FF A2 02 20 C6 FF 20 CF 80
0B41:FF 20 CF FF 20 CF FF 20 B9
0B49:CF FF F0 3B 20 CF FF 20 79
0B51:CF FF A5 90 D0 31 20 CF 68
0B59:FF F0 E9 C9 22 D0 F7 A0 6A
0B61:00 20 CF FF F0 0D C9 22 EA
0B69:F0 06 99 A7 02 C8 D0 F1 ED
0B71:20 CF FF A9 00 99 A7 02 DD
0B79:84 2C A9 A7 A0 02 20 38 12
0B81:09 20 CD 11 4C 45 0B 20 9C
0B89:CC FF A9 02 20 C3 FF 4C B7
0B91:A4 0B A9 AC A0 0B 20 38 66
0B99:09 20 A6 09 C9 59 D0 03 F9
0BA1:4C E2 FC A9 B7 A0 0B 20 47
0BA9:38 09 60 90 CD 55 53 54 F1
0BB1:20 C9 3F 05 20 00 90 D4 79
0BB9:48 41 4E 4B 53 21 0D 00 FB
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0BC9:36 20 BD FF A9 04 A0 07 60
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0BD9:A2 04 20 C9 FF 20 BF 09 EB
0BE1:A5 05 85 07 A5 06 85 08 85
0BE9:4C F7 0B A0 00 B1 07 F0 55
0BF1:31 A9 20 20 D2 FF A0 00 E8
0BF9:B1 07 85 42 C8 B1 07 85 20
0C01:FB C8 B1 07 85 FC A0 00 51
0C09:B1 FB 20 D2 FF C8 C4 42 19
0C11:90 F6 20 BF 09 18 A5 07 2A
0C19:69 05 85 07 90 CD E6 08 D9
0C21:D0 C9 20 FB 0F A5 36 F0 44
0C29:B7 20 CC FF A9 04 20 C3 20
0C31:FF 60 A9 F1 85 05 A9 15 5E
0C39:85 06 60 A0 00 A2 08 84 CA
0C41:33 BD A7 02 99 34 03 C9 E4
0C49:00 F0 04 E8 C8 D0 F2 84 A0
0C51:42 85 36 85 38 20 33 0C BF
0C59:A5 05 85 07 A5 06 85 08 FE
0C61:A0 00 B1 05 C5 42 D0 39 62
0C69:C8 B1 05 85 FB C8 B1 05 B6
0C71:85 FC A0 00 B1 FB D9 34 05
0C79:03 D0 26 C8 C4 42 90 F4 DD
0C81:18 A5 07 69 05 85 07 90 63
0C89:02 E6 08 A0 00 B1 07 F0 2D
0C91:08 85 43 20 0C 0D 4C 81 28
0C99:0C 20 FB 0F A5 36 F0 B8 D0
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0CA9:90 02 E6 08 A0 00 B1 07 57
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0CB9:C8 B1 07 85 FB C8 B1 07 49
0CC1:85 FC A0 00 B1 FB D9 34 55
0CC9:03 D0 D6 C8 C4 42 90 F4 44
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0CD9:20 FB 0F A5 36 D0 03 4C 84
0CE1:59 0C A5 33 D0 07 A9 EF 77
0CE9:A0 0C 20 38 09 60 90 C9 91
0CF1:20 4B 4E 4F 57 20 4E 4F D2
0CF9:54 48 49 4E 47 20 41 42 DB
0D01:4F 55 54 20 54 48 41 54 3F
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0D11:B1 07 85 FD C8 B1 07 85 F6
0D19:FE C8 B1 07 85 2E C8 B1 B3
0D21:07 85 2D A0 00 B1 FD 99 2C
0D29:66 03 C8 C4 43 90 F6 A9 90
0D31:00 99 66 03 20 0A 0F C6 BC
0D39:4B 60 A9 00 F0 02 A9 01 2A
0D41:85 4B 4C 34 09 A9 A1 85 75
0D49:FB A9 08 85 FC A2 00 86 1E
0D51:34 A0 00 B1 FB F0 20 D9 86
0D59:A7 02 D0 03 C8 D0 F4 C8 4E
0D61:B1 FB D0 FB C8 98 18 65 6B
0D69:FB 85 FB A9 00 65 FC 85 12
0D71:FC E8 E0 0E D0 DB 60 E6 DE
0D79:34 60 A9 01 85 4D 20 C1 6E
0D81:13 85 2F 20 6F 12 85 30 6D
0D89:A2 00 BD A7 02 C9 20 F0 8F
0D91:06 9D 34 03 E8 D0 F3 A9 E8
0D99:00 9D 34 03 86 42 E8 A0 81
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0DA9:04 E8 C8 D0 F4 20 6F 12 3F
0DB1:85 31 A2 00 BD A7 02 F0 B0
0DB9:0A C9 3F F0 06 9D 66 03 B8
0DC1:E8 D0 F1 86 43 A9 00 9D 89
0DC9:66 03 85 44 85 3E 85 46 43
0DD1:85 38 85 33 85 47 85 36 2B
0DD9:85 4A 20 33 0C A0 00 B1 15
0DE1:05 C5 42 D0 23 C8 B1 05 E9
0DE9:85 48 C8 B1 05 85 49 A0 7E
0DF1:00 B1 48 D9 34 03 D0 10 7E
0DF9:C8 C4 42 90 F4 A5 05 85 C8
0E01:48 A5 06 85 49 4C 13 0E 73
0E09:20 FB 0F A5 36 F0 CE 4C CF
0E11:E7 0C 20 76 11 20 50 0F 48
0E19:20 BD 0F A5 35 F0 19 20 B0
0E21:0A 0F 20 72 10 A5 32 D0 7D
0E29:EF 20 C7 10 A5 35 D0 18 FA
0E31:E6 4A 20 ED 10 4C 19 0E 28
0E39:A5 37 D0 03 4C C6 0E 20 F9
0E41:FE 0E 20 65 0F 4C 19 0E A4
0E49:A9 FB A0 0E 20 38 09 A5 C7
0E51:46 F0 2E C9 02 B0 E8 A5 79
0E59:47 D0 12 A5 4A F0 0E A0 BC
0E61:00 A9 FF 91 05 A9 14 20 18
0E69:D2 FF 4C 40 0E A5 31 F0 D6
0E71:04 C9 0A D0 04 A9 0A D0 FB
0E79:03 18 69 04 85 31 4C 96 AA
0E81:0E A5 31 C9 06 90 07 A5 F6
0E89:2D 85 31 4C 96 0E A9 CD 96
0E91:A0 0E 20 38 09 20 65 0F AB
0E99:A5 30 20 26 11 A9 34 A0 33
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0EA9:FF A5 2F 20 4D 11 A5 31 42
0EB1:20 26 11 A9 66 A0 03 20 FF
0EB9:38 09 A9 2E 20 D2 FF 20 B8
0EC1:BF 09 4C 8F 11 A9 D3 A0 F9
0EC9:0E 4C 93 0E D9 45 53 2C 0A
0ED1:20 00 90 3E C9 20 44 4F 9A
0ED9:4E 27 54 20 4B 4E 4F 57 FC
0EE1:20 49 46 0D 00 90 2E 2E C6
0EE9:2E 50 41 54 48 20 41 42 26
0EF1:41 4E 44 4F 4E 45 44 05 D4
0EF9:0D 00 90 3E 00 A5 4B F0 B0
0F01:07 A9 E6 A0 0E 20 38 09 5E
0F09:60 A5 4B F0 41 A0 00 B1 77
0F11:05 85 41 C8 B1 05 85 FB 70
0F19:C8 B1 05 85 FC C8 C8 B1 4F
0F21:05 20 26 11 A0 00 B1 FB 04
0F29:20 D2 FF C8 C4 41 90 F6 DB
0F31:A9 20 20 D2 FF A5 2E 20 70
0F39:4D 11 A5 2D 20 26 11 A9 2F
0F41:66 A0 03 20 38 09 A9 2E 84
0F49:20 D2 FF 20 BF 09 60 A0 B1
0F51:00 B9 66 03 99 98 03 C8 D8
0F59:C4 43 90 F5 A9 00 99 98 35
0F61:03 85 37 60 A2 00 A0 00 A5
0F69:E4 3E B0 12 BD F6 CD 85 AB
0F71:FB BD F6 CE 85 FC BD F6 5B
0F79:CC 91 FB E8 D0 EA 84 44 EF
0F81:84 3E 84 37 84 46 84 33 EE
0F89:84 47 84 4A B9 98 03 99 C0
0F91:66 03 AA F0 03 C8 D0 F4 D9
0F99:84 43 A5 3C 85 05 A5 3D 0C
0FA1:85 06 A0 00 A9 FF 91 05 8D
0FA9:B1 48 10 0F A5 42 91 48 47
0FB1:A5 48 85 05 A5 49 85 06 19
0FB9:20 AC 10 60 20 33 0C A0 A1
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0FC9:05 C9 FF F0 19 A5 05 85 DA
0FD1:07 A5 06 85 08 18 A5 07 E8
0FD9:69 05 85 07 90 02 E6 08 71
0FE1:A0 00 B1 07 D0 08 20 FB D9
0FE9:0F A5 36 F0 E0 60 C5 43 26
0FF1:D0 E3 20 1C 10 A5 35 F0 A9
0FF9:DC 60 18 A5 05 6D 61 08 A4
1001:85 05 90 02 E6 06 E6 38 AC
1009:A5 38 CD EC 15 90 03 E6 6A
1011:36 60 A0 00 B1 05 C9 FF AD
1019:F0 E0 60 C8 B1 07 85 FB 33
1021:C8 B1 07 85 FC A0 00 B9 6F
1029:66 03 D1 FB D0 42 C8 C4 1D
1031:43 D0 F4 E6 35 E6 37 A0 88
1039:03 B1 07 85 2E AA F0 06 84
1041:E0 03 B0 02 E6 33 C8 B1 10
1049:07 85 2D C9 06 90 19 A5 DA
1051:46 F0 13 8A F0 10 C9 03 3A
1059:B0 0C A5 33 29 01 D0 06 B1
1061:A9 00 85 33 F0 02 E6 46 DD
1069:A5 05 85 3C A5 06 85 3D 9F
1071:60 A5 44 D0 12 A5 2E F0 35
1079:06 C9 03 B0 02 E6 47 A5 5A
1081:2D C9 06 90 02 E6 47 A0 4F
1089:00 84 32 B1 05 C5 44 D0 C4
1091:34 C8 B1 05 85 FB C8 B1 E3
1099:05 85 FC A0 00 B1 FB D9 DF
10A1:CA 03 D0 21 C8 C4 44 90 86
10A9:F4 E6 32 A0 00 B1 05 A6 C5
10B1:3E 9D F6 CC A9 FF 91 05 79
10B9:A5 05 9D F6 CD A5 06 9D BF
10C1:F6 CE E8 86 3E 60 A0 00 4B
10C9:84 35 B1 05 C5 42 F0 01 1A
10D1:60 C8 B1 05 85 FB C8 B1 3A
10D9:05 85 FC A0 00 B9 34 03 D9
10E1:D1 FB D0 07 C8 C4 42 D0 23
10E9:F4 E6 35 60 A0 00 B9 66 C9
10F1:03 99 CA 03 C8 C4 43 90 F3
10F9:F5 84 44 A9 00 99 CA 03 58
1101:A8 B1 05 85 43 C8 B1 05 82
1109:85 FB C8 B1 05 85 FC A0 F9
1111:00 B1 FB 99 66 03 C8 C4 4E
1119:43 90 F6 A9 00 99 66 03 B0
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1129:A9 63 85 FD A9 08 85 FE 01
1131:A0 FF CA F0 07 C8 B1 FD C8
1139:D0 FB F0 F6 C8 18 98 65 8D
1141:FD AA A9 00 65 FE A8 8A 45
1149:20 38 09 60 AA F0 FC A9 6D
1151:A1 85 FD A9 08 85 FE A0 F4
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1161:FB F0 F6 A9 00 85 38 85 43
1169:36 85 FB 85 3F A9 E0 85 C7
1171:FC 20 33 0C 60 20 64 11 9E
1179:A0 00 B1 05 A4 3F 91 FB B3
1181:E6 3F D0 02 E6 FC 20 B5 42
1189:11 A5 36 F0 EB 60 20 64 F8
1191:11 78 A9 34 85 01 A4 3F 8B
1199:B1 FB A0 00 91 05 E6 3F 55
11A1:D0 02 E6 FC 20 B5 11 A5 F8
11A9:36 F0 EB A9 36 85 01 58 5D
11B1:EE 86 02 60 18 A5 05 6D 02
11B9:61 08 85 05 90 02 E6 06 EF
11C1:E6 38 A5 38 CD EC 15 90 7A
11C9:02 E6 36 60 AD EC 15 C9 88
11D1:F5 90 08 EE 20 D0 C9 FF DA
11D9:90 01 60 A9 00 85 45 85 51
11E1:33 20 6F 12 85 2D 20 46 1C
11E9:12 F0 0C 20 B4 12 20 C1 C4
11F1:13 85 2E C9 00 D0 04 20 CC
11F9:9E 0A 60 20 6F 12 85 2D F7
1201:20 0E 14 EE EF 15 D0 03 A2
1209:EE F0 15 20 34 09 A5 33 C9
1211:D0 01 60 A6 42 A4 43 86 06
1219:43 84 42 E4 42 B0 02 A6 16
1221:42 BD 34 03 48 BD A7 02 17
1229:9D 34 03 68 9D A7 02 CA 6A
1231:10 EF A5 2D 48 A0 04 B1 5F
1239:05 85 2D 20 B4 12 68 85 2D
1241:2D 20 0E 14 60 A2 00 BD 52
1249:A7 02 F0 21 C9 20 F0 06 A8
1251:9D 34 03 E8 D0 F1 86 42 DD
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1259:A9 00 9D 34 03 A8 E8 BD 93
1261:A7 02 99 A7 02 F0 04 E8 4C
1269:C8 D0 F4 A9 01 60 A9 63 9F
1271:85 FB A9 08 85 FC A2 01 73
1279:A0 00 B1 FB F0 23 D9 A7 53
1281:02 D0 03 C8 D0 F4 C8 B1 65
1289:FB D0 FB C8 98 18 65 FB D7
1291:85 FB A9 00 65 FC 85 FC D3
1299:E8 E0 0B D0 DB A2 00 A0 E2
12A1:00 8A 48 A2 00 B9 A7 02 D3
12A9:9D A7 02 F0 04 C8 E8 D0 BB
12B1:F4 68 60 20 33 0C A9 00 95
12B9:85 38 85 35 85 36 20 C7 BF
12C1:10 A5 35 D0 18 20 FB 0F 53
12C9:A5 36 F0 F2 20 0D 13 18 0F
12D1:A5 05 69 05 85 07 A5 06 21
12D9:69 00 85 08 60 A2 00 A5 17
12E1:05 85 07 A5 06 85 08 EC 68
12E9:62 08 B0 12 18 A5 07 69 47
12F1:05 85 07 90 02 E6 08 A0 40
12F9:00 B1 07 D0 EA 60 18 A5 27
1301:05 69 05 85 07 A5 06 69 41
1309:00 85 08 60 20 33 0C A2 20
1311:00 EC EC 15 F0 0F 18 A5 FA
1319:05 6D 61 08 85 05 90 02 2D
1321:E6 06 E8 D0 EC EE EC 15 78
1329:A2 34 A0 03 A5 42 20 4D B5
1331:13 A0 00 A5 42 91 05 C8 8E
1339:A5 03 91 05 C8 A5 04 91 EB
1341:05 C8 A9 00 91 05 C8 A5 29
1349:2D 91 05 60 86 FB 84 FC 3B
1351:85 3F A9 F1 85 FD A9 15 EA
1359:85 FE A5 FE C9 3C B0 49 90
1361:A0 00 B1 FD C5 3F D0 34 EE
1369:C8 B1 FD 85 F7 C8 B1 FD BC
1371:85 F8 A0 00 B1 FB D1 F7 C5
1379:D0 22 C8 C4 3F 90 F5 A0 BE
1381:00 A5 3F 91 05 C8 A5 F7 A0
1389:91 05 C8 A5 F8 91 05 C8 0E
1391:A9 00 91 05 C8 A5 2D 91 D7
1399:05 68 68 60 18 A5 FD 69 2C
13A1:05 85 FD 90 B5 E6 FE D0 8C
13A9:B1 38 A5 03 E5 3F 85 03 D5
13B1:B0 02 C6 04 A0 00 B1 FB 2E
13B9:91 03 C8 C4 3F 90 F7 60 5B
13C1:A9 A1 85 FB A9 08 85 FC 0B
13C9:A2 01 A0 00 B1 FB F0 23 18
13D1:D9 A7 02 D0 03 C8 D0 F4 ED
13D9:C8 B1 FB D0 FB C8 98 18 A9
13E1:65 FB 85 FB A9 00 65 FC 3F
13E9:85 FC E8 E0 0F D0 DB A2 53
13F1:00 A0 00 8A 48 A2 00 B9 6F
13F9:A7 02 9D A7 02 F0 04 C8 47
1401:E8 D0 F4 68 F0 06 C9 03 2D
1409:B0 02 E6 33 60 A0 FF C8 68
1411:B9 A7 02 F0 09 C9 2E D0 EB
1419:F6 ?A9 00 99 A7 02 AA A5 0
1421:05 85 FD A5 06 85 FE EC 78
1429:62 08 B0 42 E8 18 A5 FD AF
1431:69 05 85 FD 90 02 E6 FE 39
1439:A0 FF C8 B9 A7 02 D0 FA 48
1441:84 43 A0 00 B1 FD F0 26 1E
1449:C5 43 D0 DB C8 B1 FD 85 8B
1451:FB C8 B1 FD 85 FC A0 00 21
1459:B1 FB D9 A7 02 D0 C8 C8 BC
1461:C4 43 90 F4 A9 01 A0 15 C5
1469:20 38 09 68 68 60 A0 FF 5D
1471:C8 B9 A7 02 D0 FA 84 43 40
1479:A9 F1 85 F9 A9 15 85 FA EA
1481:A5 FA C9 3C B0 48 A0 00 20
1489:B1 F9 C5 43 D0 33 C8 B1 8C
1491:F9 85 F7 C8 B1 F9 85 F8 1D
1499:A0 00 B9 A7 02 D1 F7 D0 DB
14A1:20 C8 C4 43 90 F4 A0 00 72
14A9:A5 43 91 07 C8 A5 F7 91 76
14B1:07 C8 A5 F8 91 07 C8 A5 B3
14B9:2E 91 07 C8 A5 2D 91 07 D6
14C1:60 18 A5 F9 69 05 85 F9 D8
14C9:90 B6 E6 FA D0 B2 38 A5 DB
14D1:03 E5 43 85 03 B0 02 C6 5B
14D9:04 A0 00 B9 A7 02 F0 05 F3
14E1:91 03 C8 D0 F6 A0 00 A5 99
14E9:43 91 07 C8 A5 03 91 07 E8
14F1:C8 A5 04 91 07 C8 A5 2E 56
14F9:91 07 C8 A5 2D 91 07 60 3E
1501:90 C9 20 4B 4E 4F 57 2E 2B
1509:05 0D 00 A6 45 F0 30 AD 5F
1511:F0 15 10 0A A5 45 10 36 34
1519:A9 7B A0 15 D0 59 C9 5A 36
1521:90 06 A5 45 10 28 46 45 11
1529:C9 30 90 08 A5 45 C9 10 BC
1531:90 1C B0 1B AA F0 18 A5 61
1539:45 C9 07 90 11 B0 10 86 54
1541:4C E6 40 A5 40 C9 0A 90 7B
1549:05 86 40 20 A4 0B 60 A5 59
1551:45 10 08 E6 4C A9 C8 A0 CC
1559:15 D0 1C C9 20 90 06 A9 5B
1561:B8 A0 15 D0 12 C9 0C 90 20
1569:06 A9 9A A0 15 D0 08 C9 24
1571:06 90 DB A9 7B A0 15 4C AD
1579:38 09 90 C9 27 4D 20 47 A6
1581:45 54 54 49 4E 47 20 41 93
1589:20 4C 49 54 54 4C 45 20 C3
1591:48 55 4E 47 52 59 2E 0D D4
1599:00 90 C9 27 4D 20 48 55 64
15A1:4E 47 52 59 2E 20 D0 4C 84
15A9:45 41 53 45 20 46 45 45 6F
15B1:44 20 4D 45 2E 0D 00 90 3A
15B9:C9 27 4D 20 53 54 41 52 FE
15C1:56 49 4E 47 21 0D 00 90 75
15C9:D3 4F 52 52 59 2E 20 C9 AE
15D1:27 4D 20 54 4F 4F 20 48 6C
15D9:55 4E 47 52 59 20 54 4F 93
15E1:20 54 48 49 4E 4B 2E 2E F8
15E9:2E 0D 00 00 00 00 00 00 6E
```

Program 2: Sample Statement File

For instructions on entering this program, please refer to "COMPUTE!'s Guide to Typing In Programs" elsewhere in this issue.

```
BB 100 REM ** SMART ALEC STATE
       MENT FILE
QE 101 REM ** COPYRIGHT 1987
CR 102 REM ** COMPUTE! PUBLICA
       TIONS, INC.
KK 103 REM ** ALL RIGHTS RESER
       VED.
FS 105 REM{8 SPACES}MAN
MX 110 "A MAN IS A HUMAN
JD 120 "A MAN IS ALIVE
HH 130 "A MAN IS AN ANIMAL
SD 140 "A MAN IS A MALE
QC 150 "A MAN IS A MAMMAL
SG 160 "A MAMMAL DOES HAVE HAI
       R
KM 170 REM{8 SPACES}WOMAN
HK 180 "A WOMAN IS A FEMALE
HR 190 "MALE IS THE SAME AS NO
       T FEMALE
GG 200 REM{8 SPACES}MORTAL
FJ 210 "A MORTAL WILL DIE
HP 220 "A MORTAL DOES THINK
FC 230 "A MORTAL DOES EXIST
BR 240 REM{8 SPACES}HUMAN
ER 250 "A HUMAN IS MORTAL
ER 260 "A HUMAN IS A WORKER
PM 270 REM{8 SPACES}ALIVE
BP 280 "ALIVE IS THE SAME AS N
       OT DEAD
RQ 290 "ALIVE IS GOOD
JP 300 REM
RS 310 REM{2 SPACES}SUGGESTED
       {SPACE}QUESTIONS
AR 320 REM
EG 330 REM{2 SPACES}WILL A MAN
        DIE
CM 340 REM{2 SPACES}IS A MAN A
        WOMAN
FD 350 REM{2 SPACES}IS A MAN G
       OOD
DA 360 REM{2 SPACES}DOES A MAN
        HAVE HAIR
PB 370 REM{2 SPACES}IS A MAN A
        WORKER
```

QuickChange
Easy Color Setting For The IBM PC/PCjr

Paul Carlson

Customize the colors of your text screens with this handy program that allows you to easily change the border, background, and foreground colors at any time—without losing the information on your screen. For DOS versions 2.0 and higher. A color display is required.

"QuickChange" lets you choose the colors for your text screen. You'll be suprised at how refreshing—and sometimes much more readable—it can be to work with a new set of colors.

QuickChange is a terminate-and-stay-resident program (TSR) that runs silently in the background, waiting for you to call it. When summoned, it lets you quickly enter new foreground, background, and border colors.

You may already be familiar with the two most common ways to change screen colors. The first is to load the ANSI.SYS driver while including the color-setting escape sequences in the DOS prompt, using the PROMPT command. The problem with this approach is that, once set, the colors are difficult to change. The other common approach is to change screen colors with a machine language program that scrolls the entire screen up 25 lines, filling each line with the desired color attribute bytes. Unfortunately, this method clears the screen. QuickChange avoids these problems, changing the colors of the entire screen without clearing it.

Type in and save the BASIC program listed below. It creates a machine language program called SETCOLOR.COM, so be sure you don't use that name when you save the BASIC program itself. Once the SETCOLOR.COM file is created, you won't need the BASIC program again except to create new copies of SETCOLOR.COM.

To begin using QuickChange, make sure the SETCOLOR.COM file is on the disk in the current drive, or—if using a hard disk—make sure it's in a directory included in the DOS search path, and then simply type SETCOLOR at a DOS prompt. Like many TSR programs, after QuickChange is run, it waits to be activated by a specific combination of keypresses. As listed, Alt-C activates QuickChange. If another of your programs already uses this combination, choose another combination for this program. Use the following table to select the new key combination. Replace the value 46 in line 30 with the number corresponding to your choice, then run the program again to create a new copy of SETCOLOR.COM.

Alt-A	30	Alt-N	49
Alt-B	48	Alt-O	24
Alt-C	46	Alt-P	25
Alt-D	32	Alt-Q	16
Alt-E	18	Alt-R	19
Alt-F	33	Alt-S	31
Alt-G	34	Alt-T	20
Alt-H	35	Alt-U	22
Alt-I	23	Alt-V	47
Alt-J	36	Alt-W	17
Alt-K	37	Alt-X	45
Alt-L	38	Alt-Y	21
Alt-M	50	Alt-Z	44

A Custom Screen

Run QuickChange each time the computer is turned on or reset. If you have an AUTOEXEC.BAT file on your system disk, you may want to add a line with the command SETCOLOR. With this command in the AUTOEXEC file, QuickChange will run automatically each time you boot your computer. (Note: This requires that you have a copy of SETCOLOR.COM on your boot disk or in the same hard disk subdirectory as the DOS system files.)

Anytime you wish to change colors, press Alt-C (or whatever other combination you selected). A window appears on the screen containing a menu of the items BORDER, BACKGROUND, and FOREGROUND, with the first item highlighted. You can move the highlight bar to any of the three items using the cursor keys. You can step through all the available colors for the highlighted item by using the cursor right key. This makes it easy to select a pleasing combination. After you're satisfied with your color selections, press the Esc key to remove the window.

This program works in either 40- or 80-column color text mode. If your display is in any other mode, pressing the Alt-key combination has no effect.

If your DOS prompt includes color-setting escape sequences, they should be removed; otherwise, the prompt will regularly destroy your color choices. For instance, the ANSI.SYS program is often loaded along with DOS. Check your boot disk for a file named CONFIG.SYS. If that file exists and contains the line DEVICE=ANSI.SYS, then the program is being loaded. The foreground and background colors set by ANSI.SYS, when DOS boots, will take precedence over the colors chosen with QuickChange. To prevent this from happening, use a text

editor or word processor to remove the DEVICE=ANSI.SYS line from the CONFIG.SYS file. If the CONFIG.SYS file isn't needed for some other purpose, you can delete it from your DOS disk altogether, but you should check carefully before taking this step.

Some application programs may select their own color combinations. Within such programs, QuickChange has no lasting effect. One example is the BASIC interpreter. Although you can use QuickChange to change the screen colors while using the BASIC, any output from BASIC will be printed in white characters on a black background.

QuickChange

For instructions on entering these programs, please refer to "COMPUTE!'s Guide to Typing In Programs" elsewhere in this issue.

```
GK 1 ' Program to create SETCOLO
     R.COM
OA 2 'COPYRIGHT 1987 COMPUTE! PU
     BLICATIONS, INC.
OC 3 'ALL RIGHTS RESERVED.
KK 4 CLS:PRINT "COPYRIGHT 1987":
     PRINT "COMPUTE! PUBLICATION
     S, INC.":PRINT "ALL RIGHTS
     RESERVED."
KD 5 FOR ZZ=1 TO 1500:NEXT:CLS
OO 6 PRINT "CREATING SETCOLOR.CO
     M ..... PLEASE WAIT."
NC 10 OPEN "SETCOLOR.COM" FOR OU
     TPUT AS 1
PO 20 PRINT#1,CHR$(&HE9);CHR$(&H
     32);CHR$(&H4);
CJ 30 PRINT#1,CHR$(46);
AB 40 FOR N=1 TO 146:PRINT#1,CHR
     $(Ø);:NEXT
PP 50 T=Ø:FOR J=1 TO 963:READ A$
     :N=VAL("&H"+A$)
FD 60 T=T+N:PRINT#1,CHR$(N);:NEX
     T:CLOSE 1
OE 70 IF T=88099! THEN PRINT"SET
     COLOR.COM SUCCESSFULLY CRE
     ATED!":END
NE 80 DATA Ø0,Ø0,Ø0,Ø0,Ø0,Ø0,C9,
     Ø7,CD,Ø7
LP 90 DATA CD,Ø7,CD,Ø7,CD,Ø7,CD,
     Ø7,CD,Ø7
MD 100 DATA CD,Ø7,CD,Ø7,CD,Ø7,CD
     ,Ø7,CD,Ø7
KE 110 DATA CD,Ø7,BB,Ø7,BA,Ø7,20
     ,Ø7,42,Ø7
NC 120 DATA 4F,Ø7,52,Ø7,44,Ø7,45
     ,Ø7,52,Ø7
IP 130 DATA 20,Ø7,20,Ø7,20,Ø7,20
     ,Ø7,20,Ø7
NG 140 DATA BA,Ø7,BA,Ø7,20,Ø7,42
     ,Ø7,41,Ø7
LL 150 DATA 43,Ø7,4B,Ø7,47,Ø7,52
     ,Ø7,4F,Ø7
GK 160 DATA 55,Ø7,4E,Ø7,44,Ø7,20
     ,Ø7,BA,Ø7
QK 170 DATA BA,Ø7,20,Ø7,46,Ø7,4F
     ,Ø7,52,Ø7
KG 180 DATA 45,Ø7,47,Ø7,52,Ø7,4F
     ,Ø7,55,Ø7
PB 190 DATA 4E,Ø7,44,Ø7,20,Ø7,BA
     ,Ø7,C8,Ø7
ME 200 DATA CD,Ø7,CD,Ø7,CD,Ø7,CD
     .Ø7.CD,Ø7
MG 210 DATA CD,Ø7,CD,Ø7,CD,Ø7,CD
     ,Ø7,CD,Ø7
BH 220 DATA CD,Ø7,CD,Ø7,BC,Ø7,Ø0
     ,Ø0,Ø0,Ø0
BD 230 DATA 2E,8Ø,3E,Ø4,Ø1,Ø0,75
     ,22,FB,5Ø
EK 240 DATA 53,51,52,56,57,1E,Ø6
     ,E4,6Ø,2E
BC 250 DATA 3A,Ø6,Ø3,Ø1,75,Ø8,B4
     ,Ø2,CD,16
DK 260 DATA A8,Ø8,75,ØD,Ø7,1F,5F
     ,5E,5A,59
OK 270 DATA 5B,58,2E,FF,2E,28,Ø2
     ,E8,C4,Ø2
QJ 280 DATA ØE,1F,ØE,Ø7,B4,ØF,CD
     ,1Ø,3C,Ø1
HI 290 DATA 74,ØD,3C,Ø3,74,Ø9,Ø7
     ,1F,5F,5E
KE 300 DATA 5A,59,5B,58,CF,A2,Ø5
     ,Ø1,C6,Ø6
OA 310 DATA 9A,Ø1,Ø1,C6,Ø6,9B,Ø1
     ,Ø1,C6,Ø6
PF 320 DATA 95,Ø1,Ø0,C6,Ø6,96,Ø1
     ,Ø0,C6,Ø6
GJ 330 DATA 97,Ø1,Ø0,88,3E,Ø6,Ø1
     ,C6,Ø6,Ø4
QJ 340 DATA Ø1,Ø1,B4,Ø3,CD,1Ø,89
     ,ØE,Ø7,Ø1
BP 350 DATA B4,Ø1,E8,51,Ø2,E8,1E
     ,Ø1,E8,96
BM 360 DATA Ø1,E8,DE,Ø1,E8,5D,Ø2
     ,B4,Ø0,CD
KA 370 DATA 16,3C,1B,75,Ø3,E9,95
     ,Ø0,8Ø,FC
MA 380 DATA 48,75,1Ø,8Ø,3E,9A,Ø1
     ,Ø1,74,E9
QL 390 DATA FE,ØE,9A,Ø1,E8,BD,Ø1
     ,EB,E0,8Ø
AC 400 DATA FC,5Ø,75,1Ø,8Ø,3E,9A
     ,Ø1,Ø3,74
DE 410 DATA D4,FE,Ø6,9A,Ø1,E8,A8
     ,Ø1,EB,CB
DE 420 DATA 8Ø,FC,4D,75,C6,8Ø,3E
     ,9A,Ø1,Ø1
CB 430 DATA 75,1C,FE,Ø6,95,Ø1,8Ø
     ,26,95,Ø1
PO 440 DATA Ø7,E8,F8,Ø1,B8,Ø0,ØB
     ,B7,Ø0,8A
GG 450 DATA 1E,95,Ø1,CD,1Ø,E8,Ø2
     ,Ø2,EB,A3
GE 460 DATA 8Ø,3E,9A,Ø1,Ø2,75,2Ø
     ,FE,Ø6,96
OP 470 DATA Ø1,8Ø,26,96,Ø1,Ø7,8A
     ,16,96,Ø1
LH 480 DATA B1,Ø4,D2,E2,88,16,99
     ,Ø1,C6,Ø6
MH 490 DATA 98,Ø1,8F,E8,38,Ø0,E9
     ,7C,FF,FE
HL 500 DATA Ø6,97,Ø1,8Ø,26,97,Ø1
     ,ØF,8A,16
QO 510 DATA 97,Ø1,88,16,99,Ø1,C6
     ,Ø6,98,Ø1
CJ 520 DATA FØ,E8,1C,Ø0,E9,6Ø,FF
     ,E8,A2,Ø1
LE 530 DATA E8,BE,Ø0,E8,B4,Ø1,B4
     ,Ø1,8B,ØE
NI 540 DATA Ø7,Ø1,CD,1Ø,C6,Ø6,Ø4
     ,Ø1,Ø0,E9
PI 550 DATA Ø0,FF,E8,89,Ø1,Ø6,B8
     ,Ø0,B8,8E
HM 560 DATA C0,B9,D0,Ø7,B8,Ø0,1Ø
     ,8Ø,3E,Ø5
QN 570 DATA Ø1,Ø3,74,Ø6,B9,E8,Ø3
     ,B8,Ø0,Ø5
LP 580 DATA 8A,1E,Ø6,Ø1,32,FF,F7
     ,E3,8B,F8
MM 590 DATA 47,8A,36,98,Ø1,8A,16
     ,99,Ø1,26
FJ 600 DATA 8A,Ø5,22,C6,ØA,C2,26
     ,88,Ø5,47
EB 610 DATA 47,E2,F2,Ø7,8D,3E,Ø9
     ,Ø1,47,B9
MI 620 DATA 46,Ø0,8A,Ø5.22,C6,ØA
     ,C2,88,Ø5
HP 630 DATA 47,47,E2,F4,E8,82,Ø0
     ,E8,CA,Ø0
DN 640 DATA E8,49,Ø1,C3,Ø6,ØE,Ø7
     ,BE,82,Ø6
FE 650 DATA B8,Ø0,1Ø,8Ø,3E,Ø5,Ø1
     ,Ø3,74,Ø6
QP 660 DATA BE,3A,Ø3,B8,Ø0,Ø5,8A
     ,1E,Ø6,Ø1
DH 670 DATA 32,FF,F7,E3,Ø3,FØ,8D
     ,3E,Ø9,Ø1
MJ 680 DATA 1E,B8,Ø0,B8,8E,D8,E8
     ,Ø3,Ø0,1F
IL 690 DATA Ø7,C3,BB,Ø5,Ø0,B8,84
     ,Ø0,2E,8Ø
KO 700 DATA 3E,Ø5,Ø1,Ø3,74,Ø3,B8
     ,34,Ø0,B9
LH 710 DATA 1C,Ø0,F3,A4,Ø3,FØ,4B
     ,83,FB,Ø0
CL 720 DATA 75,F3,C3,Ø6,8D,36,Ø9
     ,Ø1,BF,82
KM 730 DATA Ø6,B8,Ø0,1Ø,8Ø,3E,Ø5
     ,Ø1,Ø3,74
OM 740 DATA Ø6,BF,3A,Ø3,B8,Ø0,Ø5
     ,8A,1E,Ø6
CK 750 DATA Ø1,32,FF,F7,E3,Ø3,F8
     ,B8,Ø0,B8
AF 760 DATA 8E,C0,E8,2F,Ø0,Ø7,C3
     ,Ø6,8D,36
JK 770 DATA 9C,Ø1,BF,82,Ø6,B8,Ø0
     ,1Ø,8Ø,3E
BH 780 DATA Ø5,Ø1,Ø3,74,Ø6,BF,3A
     ,Ø3,B8,Ø0
FM 790 DATA Ø5,8A,1E,Ø6,Ø1,32,FF
     ,F7,E3,Ø3
KB 800 DATA F8,B8,Ø0,B8,8E,C0,E8
     ,Ø3,Ø0,Ø7
FB 810 DATA C3,C3,BB,Ø5,Ø0,B8,84
     ,Ø0,8Ø,3E
KM 820 DATA Ø5,Ø1,Ø3,74,Ø3,B8,34
     ,Ø0,B9,1C
LK 830 DATA Ø0,F3,A4,Ø3,F8,4B,83
     ,FB,Ø0,75
FA 840 DATA F3,C3,E8,67,Ø0,Ø6,B8
     ,Ø0,B8,8E
MG 850 DATA C0,BF,87,Ø6,B8,Ø0,1Ø
     ,8Ø,3E,Ø5
ND 860 DATA Ø1,Ø3,74,Ø6,BF,3F,Ø3
     ,B8,Ø0,Ø5
JD 870 DATA 8A,1E,Ø6,Ø1,32,FF,F7
     ,E3,Ø3,F8
MI 880 DATA 8B,F7,8A,ØE,9B,Ø1,BB
     ,A0,Ø0,8Ø
BD 890 DATA 3E,Ø5,Ø1,Ø3,74,Ø3,BB
     ,5Ø,Ø0,Ø3
IH 900 DATA FB,E2,FC,B0,Ø7,B9,Ø0A
     .Ø0,26.88
DG 910 DATA Ø5,47,47,E2,F9,8B,FE
     ,8A,ØE,9A
GJ 920 DATA Ø1,Ø3,FB,E2,FC,B0,70
     ,B9,Ø0A,Ø0
OJ 930 DATA 26,88,Ø5,47,47,E2,F9
     ,A0,9A,Ø1
EE 940 DATA A2,9B,Ø1,Ø7,E8,19,Ø0
     ,C3,BA,DA
EH 950 DATA Ø3,EC,A8,Ø8,74,FB,83
     ,EA,Ø2,B0
GG 960 DATA 25,8Ø,3E,Ø5,Ø1,Ø3,74
     ,Ø2,FE,C8
NL 970 DATA EE,C3,B0,29,8Ø,3E,Ø5
     ,Ø1,Ø3,74
FF 980 DATA Ø2,FE,C8,BA,D8,Ø3,EE
     ,C3,E4,61
GC 990 DATA 8A,E0,0C,80,E6,61,8A
     ,C4,E6,61
JD 1000 DATA FA,B0,20,E6,20,FB,C
     3,B9,07,06
CO 1010 DATA B4,01,CD,10,B4,35,B
     0,09,CD,21
BF 1020 DATA 89,1E,28,02,8C,06,2
     A,02,B4,25
JP 1030 DATA B0,09,8D,16,2C,02,C
     D,21,BA,36
HD 1040 DATA 05,CD,27
```

Atari BASIC Search And Display

Bruce Fenster

Quickly search through a BASIC program for any string of characters with this short routine for Atari 400/800/XL/XE computers.

It's easy to lose track of where you used a certain variable or referenced a certain line number when you write BASIC programs. By helping you to find all references to any string of characters in your programs, "Atari BASIC Search and Display" will make you a more effective programmer.

Suppose you are modifying a program. You want to delete or change a line number, but you are not sure if the line is referenced by other statements. With Search and Display, all you simply need to do is search for the line number in question. All statements that reference the line (including GOTOs, GOSUBs, and RESTOREs) are displayed. You can then make any required changes right on the screen.

Because Atari BASIC is so heavily tokenized (keywords, variables, and numbers are all coded into *tokens*—they are not stored as ASCII characters), searches are not easy to program. This routine uses machine language to rapidly scan a BASIC program in memory.

Program Creation

Using the Atari Proofreader program found elsewhere in this issue, type in the program and save a copy to disk or tape. Be sure that you save a copy *before* you try to run it—the program modifies itself the first time it is run, moving a machine language routine from DATA statements into a string. Now load the program and type RUN. The resulting program is the one that you will be using to search BASIC programs. To make it easy to merge this program with the programs you will be searching, LIST Search and Display to disk or tape with a statement of the form LIST "D:SEARCH" or (for tape users) LIST"C:".

Using The Routine

Here are the steps necessary to use Search and Display:

- Load the BASIC program to be searched into memory.
- Use an ENTER command to retrieve the final version of the Search and Display routine from disk or tape. This brings it into memory without disturbing the BASIC program.
- To activate the routine, type GOTO 32700 and press RETURN.

You are prompted to enter a string of characters or to press RETURN for a menu. For now, just press RETURN. You'll see a menu at the bottom of the screen. There are three options:

1. Press START to run the routine. This returns to the search string prompt.
2. Press SELECT to quit. This returns to the Atari screen editor. Statements that were found by a search will be on the screen for you to examine or change.
3. Press OPTION to erase the Search and Display routine from memory. Use this prior to saving your BASIC program. If you forget, the routine will be appended to your program.

As a test, press START, then enter any string of characters that you know to be contained within your BASIC program (the maximum size of the search string is 20 characters). Press RETURN. Near the bottom of the screen, you'll notice program statements flashing by (this is your BASIC program being scanned). All lines which contain a matching string will be displayed at the top of the screen. When the entire program has been searched, the menu reappears.

You should be aware that the search is case sensitive. For example, if you specify *ENTER* as your search string, the program won't find occurrences of *Enter* or *enter* if those appear in the program. This is especially important to remember when searching for text in PRINT statements.

You can terminate a search at any time by pressing the space bar. The menu will reappear without disturbing any statements that are displayed. You can temporarily halt a search by pressing CONTROL-1. Press CONTROL-1 again to resume the search.

As the screen fills with statements, they will begin scrolling off the top to make room for those near the bottom. This presents a minor problem if you intended to make changes. The best way to deal with this situation is to let the routine run to completion, then press SELECT and change the statements that are still on the screen. Next,

reactivate the routine by typing GOTO 32700 and do the search again. When the missing statements appear on the screen, press space to terminate the search.

Routine Logic

One of the problems in writing this routine developed because BASIC statements are stored in memory as tokens. This is why many similar utilities display only various components of tokenized statements, but not strings of characters. For example, some utilities let you search for the string PRINT or the string A, but not the string PRINT A.

When I wrote this routine, I decided to let the BASIC interpreter do the most difficult work. When you LIST statements on the screen, BASIC untokenizes each one before displaying it. The Search and Display routine then must simply scan the resulting line of ASCII characters. Here's how it works: A statement is displayed at the bottom of the screen (lines 32708–32710). Then, a machine language routine is called to search for the string (line 32711). It scans the bottom of screen memory where the statement was listed. If the string is found, it returns to BASIC with a value of 1, otherwise it returns with a value of 0. If the value returned is a 1, the statement is listed to the upper portion of the screen (lines 32712–32716). The process begins again with the next statement. When line number 32700 is encountered, the routine goes to line 32717 to display the menu.

Technical Notes

The Atari forced read mode (similar to the dynamic keyboard technique used by other computers) is used by the erase option. It is also used when creating the final version of this routine (converting the DATA statements to a string). In effect, the computer pushes its own RETURN key.

The machine language routine does not check the line number of each program line when testing for matches. This enables you to search for line references without having the line itself listed in the search. If the line refers to itself (as in 100 GOTO 100) and you search for the line number, it *will* be listed.

When you press SELECT (to quit), you'll notice the screen is cleared and then repainted with any statements that were found. This is not wasted effort. The Atari logical line bitmap (locations 690–693) is destroyed by the search and this corrects it.

Atari BASIC Search And Display

For instructions on entering this program, please refer to "COMPUTE!'s Guide to Typing In Programs" elsewhere in this issue.

```
JO 10 GRAPHICS 0:POSITION 2,
      2:? "32701 ML$(LEN(ML$
      )+1)=";CHR$(34);
BC 11 FOR I=1 TO 87:READ X:?
       CHR$(X);:NEXT I:? CHR
      $(34)
KH 12 ? "32702 ML$(LEN(ML$)+
      1)=";CHR$(34);
IA 13 FOR I=88 TO 174:READ X
      :? CHR$(X);:NEXT I:? C
      HR$(34)
PN 14 FOR I=10 TO 14:? I:NEX
      T I:FOR I=32725 TO 327
      31:? I:NEXT I:? "POKE
      842,12":POKE 842,13:PO
      SITION 2,0:STOP
LK 32699 REM COPYRIGHT 1987
         COMPUTE! PUBLICATIO
         NS, INC.  ALL RIGHT
         S RESERVED.
NM 32700 CLR :DIM S$(20),ML$
         (174),CP(20),LN(20)
CE 32701 RESTORE 32725
AM 32702 FOR I=1 TO 174:READ
          B:ML$(I,I)=CHR$(B)
         :NEXT I
GN 32703 STMTAB=PEEK(136)+PE
         EK(137)*256:X=0:X1=
         1:SWT=0:LN(1)=0:GRA
         PHICS 0
AH 32704 ? "{CLEAR}COPYRIGHT
          1987":? "COMPUTE!
         PUBLICATIONS, INC."
         :? "ALL RIGHTS RESE
         RVED":? "{DOWN}Pres
         s SPACE to stop sea
         rch"
CO 32705 ? :? "ENTER STRING:
          (Press RETURN for
         menu)":INPUT S$:POK
         E 16,112:POKE 53774
         ,112:POKE 752,1
OD 32706 ? CHR$(125):IF LEN(
         S$)=0 THEN LINE=PEE
         K(STMTAB)+PEEK(STMT
         AB+1)*256:GOTO 3271
         7
PI 32707 POKE 82,0
PM 32708 LINE=PEEK(STMTAB)+P
         EEK(STMTAB+1)*256:I
         F LINE=32700 OR PEE
         K(764)=33 THEN POKE
          764,255:GOTO 32717
KB 32709 STMTAB=STMTAB+PEEK(
         STMTAB+2)
NH 32710 POSITION 2,18:LIST
         LINE
GJ 32711 INSTR=USR(ADR(ML$),
         ADR(S$),LEN(S$),SWT
         ):SWT=1
LO 32712 IF INSTR=0 THEN 327
         08
PH 32713 POKE 82,2
KJ 32714 IF X<16 THEN POSITI
         ON 2,X:LIST LINE:CP
         (X1)=PEEK(84)-X-1:L
         N(X1)=LINE:X=PEEK(8
         4)-1:X1=X1+1:GOTO 3
         2707
LP 32715 FOR I=1 TO CP(1):PO
         SITION 2,1:? CHR$(1
         56):NEXT I
LL 32716 X=X-CP(1):X1=X1-1:F
         OR I=1 TO X1:CP(I)=
         CP(I+1):LN(I)=LN(I+
         1):NEXT I:GOTO 3271
         4
CF 32717 POSITION 2,21:? "ST
         ART=Run  SELECT=Qui
         t  OPTION=Erase":PO
         KE 53279,8:POKE 82,
         2
DA 32718 POKE 764,255:K=PEEK
         (53279):IF K=6 THEN
          ? CHR$(125):GOTO 3
         2703
MB 32719 IF K=5 AND X=0 THEN
          GRAPHICS 0:CLR :EN
         D
HE 32720 IF K=5 THEN GRAPHIC
         S 0:FOR I=1 TO X1-1
         :LIST LN(I):POKE 84
         ,PEEK(84)-1:NEXT I:
         POKE 84,PEEK(84)+1:
         CLR :END
LK 32721 IF K<>3 THEN 32718
IB 32722 GRAPHICS 0:POSITION
          2,2:FOR I=32700 TO
          32712:? I:NEXT I:?
          "GOTO 32724"
BL 32723 POKE 842,13:POSITIO
         N 2,0:STOP
NA 32724 POKE 842,12:GRAPHIC
         S 0:POSITION 2,2:FO
         R I=32713 TO 32724:
         ? I:NEXT I:? "POKE
         842,12":CLR :GOTO 3
         2723
EL 32725 DATA 216,104,104,13
         3,207,104,133,206,1
         04,104,133,208,104,
         104,208,57,166,208,
         177,206,201,32,176,
         11,24
DF 32726 DATA 105,64,145,206
         ,200,202,208,241,24
         0,25,201,96,176,5,5
         6,233,32,16,239,201
         ,128,176,2,144,233
MN 32727 DATA 201,160,176,2,
         144,224,201,224,144
         ,235,24,169,248,101
         ,88,133,203,169,2,1
         01,89,133,204,165,2
         03
HN 32728 DATA 72,165,204,72,
         160,0,177,203,230,2
         03,208,2,230,204,20
         1,0,208,244,169,124
         ,133,205,132,212,13
         2
JG 32729 DATA 213,177,203,20
         9,206,240,12,198,20
         5,240,32,230,203,20
         8,242,230,204,208,2
         38,166,208,198,208,
         240,13
DL 32730 DATA 200,177,203,20
         9,206,240,245,134,2
         08,160,0,240,225,16
         9,1,133,212,234,104
         ,133,204,104,133,20
         3,160
EK 32731 DATA 0,169,0,145,20
         3,200,192,124,208,2
         49,9,15,9,240,141,1
         78,2,141,179,2,141,
         180,2,96
```

Audio Recorder For Apple II

Wing Shum

Add digitally recorded sound and music to your programs with this fascinating program for your Apple II, II+, or Apple IIe computer. A cassette player and disk drive are required.

Digital music is a revolution. Ever since Thomas Edison invented the first phonograph, sound has been stored in analog form. But recently, new media have been invented and computer memories have grown large enough to store sound in a more accurate way—as a series of numbers. Digital recording and mastering make the music you buy sound better, especially if you have a digital compact disc (CD) player or the even newer digital audio tape (DAT) player. You may not know it, but your Apple can record and play back digital music. Although the sound quality leaves something to be desired (CD players use 16 bits of resolution; the Apple uses only 1—so the sound quality of a CD player will be 65,536 times better than that possible with your computer), it may be just what you need to add a blood-curdling scream or a rousing cheer to your latest game.

"Audio Recorder" makes digital recording and playback easy. The sound comes through the cassette port into your computer. When you're ready, the sound can be played back through the built-in speaker or saved to a disk for later use.

How does digital recording work on an Apple II? The sound source—a cassette player, for example—is connected to the cassette input port of your computer. A machine language program continuously monitors memory location 49248. The seventh bit of this memory location varies between 0 and 1 as the signal level at the cassette input port changes. The changing status of this bit is recorded in memory. Once the sound data is in memory, it can be manipulated or saved to disk. Later, the recorded sound is played back by toggling the bit in memory location 49200 that controls the speaker.

Note: Only the Apple II, II+, and IIe models have a cassette port, so those are the only ones which can record sounds with this program. However, the program can be used on any Apple II, including the IIc and IIGS, to play back recorded sounds saved on disk.

Typing It In

Audio Recorder is written in machine language, so it must be entered using the Apple version of the "MLX" machine language entry program, found elsewhere in this issue. Be sure you read and understand the instructions for using MLX before you begin entering data. When you run MLX, you'll be asked for a starting address and an ending address for the data you'll be entering. For Audio Recorder, use the following values:

```
STARTING ADDRESS?   0300
ENDING ADDRESS?     036C
```

Once you've typed in all the data, be sure to save a copy before leaving MLX.

You are now ready to record a song or a sound effect. Look at the back of the main board of your computer. Next to the video connector are two jacks labeled CASSETTE IN and OUT (the IIe has icons instead of words). Plug one end of a cable into the CASSETTE IN jack (for the IIe, the one with the arrow pointing away from the cassette icon) and the other into the external speaker or earphone jack of the tape recorder or other sound source. If you are using a tape player, insert a tape with music or sound effects into the player. Type BLOAD RECORDER (substitute whatever name you used for the Audio Recorder program). For the best possible quality, adjust the controls of your sound source so that it is near, but not at, its maximum volume. At the Applesoft] prompt, type CALL 768, but don't press RETURN yet. Start your sound source; for example, if you are using a tape player, press the PLAY button. When you get to the sound that you want to record, press the Apple's RETURN key. When all the memory available for storing sounds has been filled you'll see the flashing cursor again. To play back your sound, type CALL 823. If you are dissatisfied with the results, try recording the sound again.

When you are ready to save a sound to disk, follow this procedure. If you are using DOS 3.3, first type POKE 43364,255. ProDOS users should not use this POKE. To save the song in either DOS, type:

BSAVE *filename*,**A$800,L$8E00**

To play back a song that has been saved to disk, type BLOAD RECORDER (if Audio Recorder is not already in memory); then BLOAD your song. At an Applesoft] prompt, type CALL 823 to play it back.

The recording may not always sound clear. If you are unhappy with the results, try changing the volume control of the sound source. For best results, use the highest quality equipment to which you have access. Another way to alter the quality of the recording is to change the sampling rate—the time between checks of the cassette port, or between bits being played back on the speaker. Fast sampling rates allow for more accurate recording or reproduction. But taking the samples faster means that memory will be filled more quickly, so less can be recorded. Conversely, slow sampling rates increase the length of the recording but diminish its quality. When choosing sampling rates, you must strike a balance between quality and length.

Audio Recorder provides separate sampling rates for recording and playback, so you can record at one speed and play back at another. The recording speed is controlled by the value in location 784 ($310) and the playback speed, by the value in 839 ($347). The default value for both of these locations is 4, which allows 40 seconds of sound to be saved. Changing the delay values to 1 gives the highest sampling rate, and hence the highest sound quality. However, at that rate only 15 seconds of sound can be recorded.

The following line would change the sampling rate to obtain the best sound:

```
DF=1 : POKE 784,DF : POKE 839,DF
```

Feel free to experiment with other values for DF.

A Personalized Message

Here's one example of the many uses that you can find for Audio Recorder: Put your voice on a disk as a greeting card and then send it to a friend who has any Apple II–series computer. To make your personalized greeting disk, type the following commands with a word processor and save it as an ASCII text file with the name BIRTHDAY. (Check your manual to find out if your word processor can save files as straight ASCII text.)

```
BLOAD GREETING
BLOAD RECORDER
TEXT:HOME:VTAB 3:HTAB 2:PRINT
  "Dear friend,"
VTAB 12:HTAB 13:PRINT "HAPPY
  BIRTHDAY !"
VTAB 21:HTAB 30:PRINT "Yours,":
  HTAB 30:PRINT "your name"
CALL 823
CALL 976
```

Assuming that you have created a recording of your voice and saved it with the name GREETING, this series of commands will display a greeting card screen as your voice plays through the Apple speaker. To make the contents of the file execute automatically when they boot their computer, write a program like this and save it as your HELLO or STARTUP program:

```
10 PRINT CHR$(4);"EXEC BIRTHDAY"
```

About The Program

Audio Recorder consumes a lot of memory space—from 2048 ($800) to 38400 ($9600). Any BASIC program or any data stored in this area will be overwritten when sound data is recorded or loaded. Therefore, you must be sure that any important data in this area is saved before you run Recorder. The starting and ending address of the sound sample can be changed to make shorter samples or to relocate the sample data to memory locations that are otherwise unused—just the thing for a game sound effect.

Locations 769 ($301) and 829 ($33D) should both contain the page number where you would like the recording to start. Locations 819 ($333) and 872 ($368) should contain the page number where you want the recording to end. A page is a 256-byte block of memory; you can convert an address to a page number by dividing by 256. For example, location 2048 ($0800) corresponds to page number 8. Since only the high byte of the starting and ending address can be changed, the sound sample storage area must begin at an address which is an exact page boundary. The default starting page number is 8, for address 2048 ($0800). The default ending page number is 150, for location 38400 ($9600).

To create a version of Audio Recorder which uses different addresses for sound data, BLOAD a copy of the original version and then POKE the new page numbers into the addresses given above. Finally, save a copy of the modified version with a statement of the form

```
BSAVE filename,A$300,L$6C
```

You should take care not to overwrite your original copy of Audio Recorder. Save the modified copy with a different filename, or on a different disk.

Audio Recorder

For instructions on entering this program, please refer to the "Apple MLX" article elsewhere in this issue.

```
0300: A0 08 8C 28 03 A2 00 8E 9D
0308: 27 03 86 FF A0 08 48 A9 92
0310: 04 20 A8 FC 18 AD 60 C0 FD
0318: 45 FF 10 05 45 FF 85 FF 48
0320: 38 68 2A 88 D0 E8 9D 00 8F
0328: 08 E8 D0 E0 EE 28 03 AD 60
0330: 28 03 C9 96 D0 D6 60 A2 F2
0338: 00 8E 5C 03 A0 08 8C 5D 39
0340: 03 D0 18 A0 08 48 A9 04 C1
0348: 20 A8 FC 68 0A EA 90 05 D0
0350: 8D 30 C0 B0 00 EA EA EA B8
0358: 88 D0 EA BD 00 08 E8 D0 D2
0360: E2 EE 5D 03 AD 5D 03 C9 22
0368: 96 D0 D8 60 00 01 00 00 13
```

Amiga SuperMenus

Rick Du Chateau

Add new capabilities to Amiga Basic's MENU command with this powerful extension. Requires version 1.2 of Amiga Basic.

Amiga Basic may be the most powerful BASIC interpreter available. However, while it does a reasonable job of providing access to the system software built into the Amiga, Amiga Basic doesn't support the system software as completely as compiled languages like C, Pascal, and Modula II.

As an example, consider Amiga Basic's MENU command. With it, you can create custom menus and menu items, enable or disable the items, and place a checkmark next to a menu item. But this is only a small fraction of the menu features and capabilities provided by Intuition. (Intuition is the portion of the Amiga operating system that controls the user interface—the windows, menus, and alert boxes.) Amiga Basic's MENU command doesn't provide for submenus, command keys, alternate ways of highlighting a selected menu, and the ability to turn a checkmark on or off while excluding the other choices. For an example of how complex and useful menus can be, load *Deluxe Paint II* and wander through the menus and submenus.

Fortunately, the designers of Amiga Basic provided for these and future features by making Amiga Basic an extensible language through the use of subprograms and the LIBRARY command. By using LIBRARY, the Amiga Basic programmer has access to the multitude of the Amiga's operating system routines. And subprograms can actually add new commands to Amiga Basic.

"Amiga SuperMenus" illustrates the usefulness of subprograms by adding several menu-related commands to Amiga Basic. These new commands are INITIALIZE, SMENU, SUBMENU, and SMENUOFF. Adding SuperMenus to your own programs will give you access to the full power of the Amiga's menu system, and enable you to create more professional-looking programs. A short demonstration program is included that utilizes most of Supermenu's features.

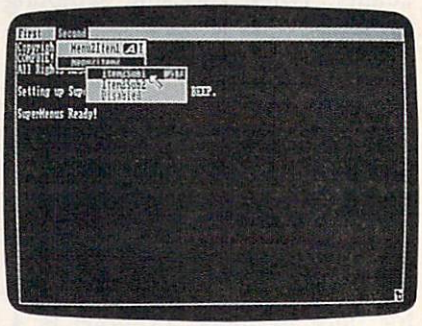
Getting Started

Type in and save Program 1. This is the SuperMenus routine. You will want to be able to merge this routine into programs you write yourself, so you must save the program in ASCII (text) format. This is accomplished by adding ,*A* to the end of the SAVE command:

```
SAVE "SuperMenus",A
```

To learn how to use the routine, type in and save a copy of Program 2, SuperMenus.Demo. Now go to the BASIC command window and type LOAD "SuperMenus.Demo" and then type MERGE "SuperMenus" to add the SuperMenus routine to the demonstration program. Note that Program 2 will not work unless you merge SuperMenus with it. If you failed to save Program 1 as an ASCII file, you'll see the error message *Bad file mode* when you give the MERGE command.

Run the resulting program. After a few seconds, you'll hear a beep and see the message *Super-*



Add new power to Amiga Basic's menu handling with this clever utility.

Available Flags

You may select as many of these flags as you like:

check%	puts a checkmark to the left of the item or subitem.
text%	indicates that the item or subitem consists of text as opposed to a graphic image.
command%	uses this flag if this item or subitem is to have a command-key associated with it.
toggle%	uses this flag in conjunction with check% to toggle the checkmark on or off with selection.
enabled%	indicates the item or subitem is enabled as opposed to ghosted (off).

You must select one and only one of the following highlighting flags:

comp%	inverts the colors of an item or subitem during selection.
box%	draws a box around the item or subitem during selection.
selectimage%	uses a defined alternate image during selection.
none%	indicates no highlighting.

Menus Ready! Use the menu select button (the right mouse button) to view the various SuperMenu features. The demonstration will print any selections you make (when the right button is released). Select *Quit* to exit the program.

Follow these steps to incorporate SuperMenus into your own programs:

- After loading your Amiga Basic program, type MERGE "SuperMenus".
- Add the following lines to the beginning of your program:

```
DECLARE FUNCTION
  AllocMem&( ) LIBRARY
INITIALIZE
```

See the demonstration program for an example of how this is done.

- Follow the format described below to create a menu.
- Call the SUBITEM subprogram to test for a subitem selection (returned in variable called SubNum%).
- At the end of your program call the SMENUOFF subprogram.
- Save your program.
- Before running your program, be sure the files *exec.bmap* and *graphics.bmap* are in either your current directory or the Libs directory. These files can be found in the BasicDemos drawer on the Extras disk for version 1.2 of Amiga DOS.

The Commands

The first new command, INITIALIZE, should be used only once before the SMENU command. This subprogram initializes all of the variables used by SuperMenus and loads the necessary libraries from disk.

The SMENU command is the heart of SuperMenus. It is similar to Amiga Basic's MENU command. The format is

SMENU (*Menu%, Item%, SubMenu%, Flags%, MExclude&, CommandKey$, Text$, SelecText$*)

The items in italics in the SMENU command have the following meanings:

- *Menu%* is the menu position, in the range 1–10 (as in Amiga Basic MENU).
- *Item%* is the item position, in the range 1–19 (as in Amiga Basic MENU).
- *SubItem%* is the subitem position (no limit).
- *Flags%* is one or more of the flags listed in the table of flags.
- *MExclude&* is used in conjunction with the check% and toggle% flags in the table of flags. Choosing from Item1& through Item31& will exclude these items from selection when this item is active. For example, if you have a set of menu items 1, 2, and 3, and if you set MExclude& = Item2& + Item3& for the first menu item, then when item 1 is selected (and checkmarked), Intuition will erase any checkmarks on items 2 and 3. See the Amiga technical manuals for additional information.
- *CommandKey$* is an alphanumeric character to be used with the right Amiga key to select this item.
- *Text$* is the text to be used for this item.
- *SelecText$* is the text to be substituted for Text$ when this item is selected if you use the selectimage% highlighting flag.

Amiga Basic's MENU(0) and MENU(1) functions return the values of the selected menu and menu item respectively. So, in order to check for a selected subitem, a new command—SUBITEM—had to be added. SUBITEM returns a selected subitem number in the variable SubNum%.

The final new command, SMENUOFF, should be used at the end of your program to free up the memory used by Supermenus.

Program 1: Amiga Supermenus

For instructions on entering these programs, please refer to "COMPUTE!'s Guide to Typing In Programs" elsewhere in this issue.

```
' SuperMenus
' Copyright 1987 COMPUTE! Public
ations, Inc.
' All Rights Reserved.
start:
Initial:
SUB INITIALIZE  STATIC
DEFLNG a-z
SHARED check%,text%,command%,tog
gLe%,enabLed%
SHARED image%,comp%,box%,none%
SHARED item1,item2,item3,item4,i
tem5,item6,item7,item8,item9,ite
m10
SHARED item11,item12,item13,item
14,item15,item16,item17,item18,i
tem19,item20
SHARED item21,item22,item23,item
24,item25,item26,item27,item28,i
tem29,item30,item31
LIBRARY "exec.library"
LIBRARY "graphics.library"
'Flag Definitions
check%= 1
text%= 2
command%= 4
toggLe%= 8
enabLed%= 16
seLectimage%= 0
comp%= 64
box%= 128
none%= 192
'Mutual Exclude Flags
item1&= 1
item2&= 2
item3&= 2 ^ 2
item4&= 2 ^ 3
item5&= 2 ^ 4
item6&= 2 ^ 5
item7&= 2 ^ 6
item8&= 2 ^ 7
item9&= 2 ^ 8
item10&= 2 ^ 9
item11&= 2 ^ 10
item12&= 2 ^ 11
item13&= 2 ^ 12
item14&= 2 ^ 13
item15&= 2 ^ 14
item16&= 2 ^ 15
item17&= 2 ^ 16
item18&= 2 ^ 17
item19&= 2 ^ 18
item20&= 2 ^ 19
item21&= 2 ^ 20
item22&= 2 ^ 21
item23&= 2 ^ 22
item24&= 2 ^ 23
item25&= 2 ^ 24
item26&= 2 ^ 25
item27&= 2 ^ 26
```

```
item28&= 2 ^ 27
item29&= 2 ^ 28
item30&= 2 ^ 29
item31&= 2 ^ 30
'
END SUB
'
SMenus:
'
SUB SMENU(xpos%,ypos%,spos%,fLags%,mexcLude&,Key$,titLe$,titLe2$) STATIC
'
SHARED Address&
'
DEFLNG a-z
'
IF spos%=0 THEN
'
IF (fLags% AND 16) THEN active%= 1 ELSE active%= 0
MENU xpos%,ypos%,active%,titLe$
'
staLL=TIMER:WHILE TIMER < (staLL + 1):WEND  'Give AmigaBasic time to SetMenuStrip
'
GOTO SetKey
END IF
'
SetSPos:
'
Address= PEEKL(WINDOW(7) + 28)
IF xpos% >1 THEN CALL FindAddress(xpos%)
MenuAdd= Address
'
TextAttr=ALLocMem(12&,65539&)
CALL AskFont(WINDOW(8),TextAttr)
'
height%=PEEKW(TextAttr + 4)  'Find the height of current font.
'
titLe$= titLe$ + CHR$(0)
wide%= LEN(titLe$) * 10
titLe= SADD(titLe$)
'
Intuit= ALLocMem(20,65539&)
IF Intuit= 0 THEN PRINT "No Memory!!":STOP
'
POKE Intuit + 1, 1  'Set BackPen to color register 1
'
POKE Intuit + 2, 1  'Set DrawMode
POKEL Intuit + 12, titLe
'
subitem= ALLocMem(34,65539&)
IF subitem= 0 THEN PRINT "No Memory!!":STOP
'
POKEW subitem + 4,50  'Start the subitem 50 pixels to the right of the Menu
POKEW subitem + 6,height% * spos%  'Figure the top position
POKEW subitem + 8,wide%
POKEW subitem + 10,height%
POKEW subitem + 12,82
POKEL subitem + 18,Intuit
'
Address= PEEKL(MenuAdd + 18)
IF ypos% >1 THEN CALL FindAddress(ypos%)
ItemAdd= Address
'
IF spos% = 1 THEN Address= ItemAdd + 28:GOTO SkipIt
'
Address= PEEKL(ItemAdd + 28)
'
'
IF spos% > 2 THEN
CALL FindAddress(spos% -1)
END IF
'
SkipIt:
'
POKEL Address,subitem
'
CALL FreeMem(TextAttr,12)
'
SetKey:
'
Address= PEEKL(WINDOW(7) + 28)
'
IF xpos% > 1 THEN CALL FindAddress(xpos%)
'
Address= PEEKL(Address + 18)
IF ypos% > 1 THEN CALL FindAddress(ypos%)
'
IF spos% > 0 THEN
Address= PEEKL(Address + 28)
IF spos%= 1 THEN PokeKey
'
CALL FindAddress(spos%)
END IF
'
PokeKey:
'
POKEW Address + 12,fLags%  'Set the Flags
POKEL Address + 14,mexcLude&
IF Key$ <> "" THEN POKE Address + 26,ASC(Key$)  'Poke in the Key
'
'
IF titLe2$ <> "" THEN
'
titLe2$= titLe2$ + CHR$(0)
wide%= LEN(titLe2$) * 10
titLe= SADD(titLe2$)
'
Intuit= ALLocMem(20,65539&)
IF Intuit= 0 THEN PRINT "No Memory!!":STOP
'
POKE Intuit + 1, 1  'Set BackPen to color register 1
'
POKE Intuit + 2, 1  'Set DrawMode
POKEL Intuit + 12, titLe
POKEL Address + 22, Intuit
'
END IF
'
OutaHere:
END SUB
'
SUB FindAddress(Position%) STATIC
SHARED Address
'
FOR counter%= 1 TO (Position% -1)
Address= PEEKL(Address)
NEXT
END SUB
'
TurnSmenuOff:
'
SUB SMENUOFF STATIC
'
MenuAdd= PEEKL(WINDOW(7) + 28)
'
Again:
IF MenuAdd= 0 THEN ALLDone
GOSUB ItemAddress
'
MenuAddress:
MenuAdd= PEEKL(MenuAdd)
GOTO Again
'
ItemAddress:
IF PEEKL(MenuAdd + 18) = 0 THEN OutOfItems
'
ItemAdd= PEEKL(MenuAdd + 18)
IF PEEKL(ItemAdd + 22) > 0 AND PEEKL(ItemAdd + 22) <> PEEKL(ItemAdd + 22) THEN
Intuit= PEEKL(ItemAdd + 22)
CALL FreeMem(Intuit,20)  'Free Select IntuiText
END IF
'
KeepLooking:
'
GOSUB LookForSub
ItemAdd= PEEKL(ItemAdd)
IF ItemAdd > 0 THEN KeepLooking
OutOfItems:
RETURN
'
LookForSub:
IF PEEKL(ItemAdd + 28) = 0 THEN OutOfSubs
Address= PEEKL(ItemAdd + 28)
'
CLearMem:
NextAddress= PEEKL(Address)
Intuit= PEEKL(Address + 18)
CALL FreeMem(Intuit,20)  'Free Intuitext
'
IF PEEKL(Address + 22) > 0 AND PEEKL(Address + 22) <> PEEKL(Address + 18) THEN
Intuit= PEEKL(Address + 22)
CALL FreeMem(Intuit,20)  'Free Select IntuiText
END IF
'
CALL FreeMem(Address,34)  'Free Item Structure
'
Address= NextAddress
IF Address > 0 THEN CLearMem
'
OutOfSubs:
RETURN
'
ALLDone:
'
LIBRARY CLOSE
MENU RESET
END SUB
'
CheckSmenus:
'
SUB SUBMENU STATIC
DEFLNG a-z
SHARED SubNum%
intuitmessage= PEEKL(WINDOW(7) + 94)
menucode= intuitmessage + 24
SubNum%= (PEEKW(menucode)/ (2^11) AND 31) + 1
IF SubNum%= 32 THEN SubNum%= 0  'No Sub if all bits "on"
'
END SUB
'
```

Program 2: Amiga Supermenus Demo

```
'SuperMenu Demo
'Copyright 1987 COMPUTE! Publications, Inc.
'All Rights Reserved.
'
DECLARE FUNCTION ALLocMem&() LIBRARY
ON ERROR GOTO HandLeErrors
INITIALIZE
PRINT "Copyright 1987":PRINT"COMPUTE! Publications, Inc."
PRINT "All Rights Reserved."
PRINT
PRINT "Setting up SuperMenus, wait for the BEEP."
'
```

```
MExcLude&=0     ←
FLags%= text% + enabLed% + comp%
←
SMENU 1,0,0,FLags%,MExcLude&,"",
"First",""←
SMENU 2,0,0,FLags%,MExcLude&,"",
"Second",""←
SMENU 3,0,0,0,MExcLude&,"","","
'Blank out menus 3 and 4←
SMENU 4,0,0,0,MExcLude&,"","","
←
FLags%= text%  + enabLed% + comp
%←
SMENU 1,1,0,FLags%,MExcLude&,"",
"ItemA",""←
SMENU 1,2,0,FLags%,MExcLude&,"",
"ItemB",""←
FLags%= text% + enabLed% + box%
+ command%←
SMENU 1,3,0,FLags%,MExcLude&,"Q"
,"Quit     ",""←
←
MExcLude&= item2&←
FLags%= text% + enabLed%  + togg
Le%  + check% + seLectimage%←
SMENU 1,1,1,FLags%,MExcLude&,"",
"   SubIteml     ","   Alternate"
←
MExcLude&= item1&←
FLags%= text% + enabLed% + comp%
+ toggLe%  + check%←
SMENU 1,1,2,FLags%,MExcLude&,"",
"   SubItem2",""←
MExcLude&= 0←
FLags%= text% + enabLed% + toggL
e% + check% + comp% + command%←
SMENU 2,1,0,FLags%,MExcLude&,"T"
,"   Menu2Iteml     ",""←
MExcLude&= 0←
FLags%= text% + enabLed% + comp%
←
SMENU 2,2,0,FLags%,MExcLude&,"",
"   Menu2Item2     ",""←
MExcLude&= item2&←
FLags%= text% + enabLed% + toggL
e% + check% + command% + comp%←
SMENU 2,2,1,FLags%,MExcLude&,"A"
,"   Item2Subl     ",""←
MExcLude&= item1&←
FLags%= text% + enabLed% + toggL
e% + check% + box%←
SMENU 2,2,2,FLags%,MExcLude&,"",
"   Item2Sub2     ",""←
MExcLude&= item1& + item2&←
FLags%= text% ←
SMENU 2,2,3,FLags%,MExcLude&,"",
"   Disabled",""←
BEEP←
PRINT←
PRINT "SuperMenus Ready!"←
←
CheckMenus:←
MenuNum%= MENU(0)←
IF MenuNum%= 0 THEN CheckMenus←
←
ItemNum%= MENU(1)←
SUBMENU←
PRINT "MenuNum= ";MenuNum%,"Item
Num= ";ItemNum%,"SubNum= ";SubNu
m%←
IF MenuNum%= 1 AND ItemNum% = 3
THEN CALL SMENUOFF:END←
GOTO CheckMenus←
←
HandLeErrors:←
←
IF ERR= 53 THEN←
PRINT "You must have the files '
exec.bmap' and 'graphics.bmap'"←
PRINT "in either your current or
Libs directory."←
PRINT "These files can be found
in the BasicDemos drawer of the
Extras 1.2 disk."←
END IF←
END←                              ©
```

Atari XL/XE Hidden RAM

Ronald R. Lambert

Don't let the hidden RAM in your computer go to waste. Instead, use it to store text, machine language programs, graphics data, or help screens. For the 800XL, 65XE, 130XE, and for the 600XL with memory expanded to 64K.

Have you ever needed just a little more RAM? Perhaps you have a custom character set that you would like to store away for a more convenient time. Or you may have a series of help screens that you'd like to use without tying up the normal RAM in the computer. Or maybe you have a whole collection of machine language programs that you would like to be able to use. If you own an Atari 130XE, you have an extra 64K of RAM that you may be using as a ramdisk. You may not realize it, but there is an additional 8K of RAM available "under" the BASIC ROMs. This extra RAM can be found in any Atari XL or XE model (excluding the 1200XL) with 64K or more of memory. You can use this technique only when you are using the BASIC ROMs inside your computer. It will not work if you have a BASIC cartridge plugged into the cartridge port.

Normally, BASIC programmers can't make use of the RAM at memory locations 40960–49151. This is because the ROM containing the BASIC interpreter itself resides at these locations. But RAM is still there—hidden, but ready to be used by an enterprising programmer.

To use this 8K block of RAM, you must switch the BASIC ROM out of the computer's memory map, and switch in the alternate block of RAM. Location 54017 controls whether ROM or RAM is seen at addresses 40960–49151. That location contains the value 253 when BASIC ROM is selected, and 255 when RAM is selected.

In BASIC, you might be inclined to try to accomplish the switch using a statement like POKE 54017,255. But there is one obvious problem in using a POKE to switch from ROM to RAM. When the BASIC ROM is switched out, the computer (which has been executing the BASIC interpreter, a machine language program) tries to execute whatever is in the RAM under BASIC. Since there is no intelligible machine language program here, the computer crashes. The only way to recover is to press SYSTEM RESET (which, among other things, turns BASIC ROM back on). This makes it impossible to usefully turn off BASIC from within BASIC.

Fortunately, turning the BASIC

ROM off with machine language causes no problems, and machine language can be executed from BASIC with the USR function. Even if you don't know machine language, you can use the program presented here to copy information to and from the hidden area of RAM.

Using The Program

Type in the program and save a copy to tape or disk. Because the program requires accurate typing, be sure to use "The Automatic Proofreader" program found elsewhere in this issue.

Use this program as a model for your own programs. In lines 10–30, the program POKEs the machine language program held in the DATA statements (lines 100–180) into memory starting at location 1536. This machine language program has two entry points. X=USR(1536) copies the contents of a section of normal memory into the hidden RAM beneath the BASIC ROMs. X=USR(1543) does the opposite, copying the contents of a section of the hidden memory into normal memory.

Before you call one of these routines, you must first set up two zero-page memory locations. This is done in lines 300–310 and 330–340 of the sample program. Locations 203–204 hold the number of bytes to be transferred to or from hidden RAM. Remember that no more than 8192 bytes can be transferred. Locations 205–206 hold the address of the first byte in normal memory to be copied into hidden RAM, or the address of the first byte in normal memory into which the contents of hidden RAM is to be copied.

If you are moving information back and forth between a string and hidden memory, as in the example program, be sure that the string is large enough to hold the data. Otherwise, you may crash your computer.

Atari XL/XE Hidden RAM

For instructions on entering this program, please refer to "COMPUTE!'s Guide to Typing In Programs" elsewhere in this issue.

```
OC 5 REM COPYRIGHT 1987 COM.
     UTE! PUBLICATIONS, INC.
      ALL RIGHTS RESERVED.
FD 8 PRINT "{CLEAR}Copyright
     1987":PRINT "COMPUTE!
     Publications, Inc.":PRI
     NT "All Rights Reserved
     .":PRINT :PRINT
BB 10 FOR T=1536 TO 1604
MA 15 READ NUM:CHECK=CHECK+N
     UM
AB 20 POKE T,NUM
CA 30 NEXT T:IF CHECK<>10239
      THEN PRINT "ERROR IN
     DATA. PLEASE CHECK TYP
     ING."
DP 100 DATA 104,169,205,160,
     207,208,5,104
AP 110 DATA 160,205,169,207,
     141,34,6,140
LH 120 DATA 36,6,169,255,141
     ,1,211,169
EB 130 DATA 0,133,207,169,16
     0,133,208,160
EP 140 DATA 0,177,205,145,20
     7,198,203,165
EI 150 DATA 203,201,255,208,
     2,198,204,165
OF 160 DATA 203,5,204,208,6,
     169,253,141
AO 170 DATA 1,211,96,200,208
     ,227,230,206
JL 180 DATA 230,208,76,33,6
IH 200 DIM A$(50)
JF 210 A$="This is a sample
     string."
LL 300 LA=LEN(A$):H=INT(LA/2
     56):L=LA-H*256:POKE 2
     03,L:POKE 204,H
KA 310 AD=ADR(A$):H=INT(AD/2
     56):L=AD-H*256:POKE 2
     05,L:POKE 206,H
CN 320 A=USR(1536)
FJ 325 A$(50)="*":PRINT "A$
     HAS BEEN STORED UNDER
      BASIC ROMS.  A$ HAS
     BEEN CHANGED."
LO 330 LA=LEN(A$):H=INT(LA/2
     56):L=LA-H*256:POKE 2
     03,L:POKE 204,H
KD 340 AD=ADR(A$):H=INT(AD/2
     56):L=AD-H*256:POKE 2
     05,L:POKE 206,H
CO 350 A=USR(1543)
NC 360 PRINT "A$ HAS BEEN RE
     COVERED.":PRINT A$(1,
     24)                    ©
```

Amiga And 64 Ramdisk Files

Jim Butterfield, Associate Editor

Learn about the powerful technique of using ramdisk files on both the Amiga and the 64. Sample programs are included for both machines. The 1764 RAM Expansion Module and RAMDOS *software are required for the 64.*

When most people think of data files, they think of collections of information stored on magnetic media—disk or tape. But files may also be stored, at least temporarily, in the computer's RAM (Random Access Memory). Special software can allow the computer to simulate the actions of a physical disk drive using a portion of memory for storage. Because the memory storage behaves just like a physical disk, it's frequently referred to as a *ramdisk.* This article explains simple sequential ramdisk file techniques for both the Amiga and Commodore 64.

The Amiga's operating system has built-in support for ramdisks. If you have a Commodore 64, you must also have a 1764 RAM Expansion Module to use the ramdisk techniques discussed here. The module provides the extra RAM to hold the files. Additionally, the *RAMDOS* program supplied with 1764 must be installed in the computer's memory. See your *1764 User's Guide* for information on connecting and using the RAM Expansion Module.

Temporary Files

Many programs create temporary files. Such a file often contains partially processed data—the program has worked through the data concerned, but cannot finish the job until it has completed another pass through the data.

As an example, consider a program which collects a series of examination scores for a class of students. Among other things, its job is to print each student's performance compared with the class average. The program can't print the comparison at the time it receives each student's score—it can't know the average score until all the grades have been entered. One solution is to use a temporary file to store the scores as they come in.

Another classic data processing task that benefits from temporary files is assembling a machine language program. The assembler program can do part of its work as it reads the source code, but it can't finish the job until all the source code has been read. The assembler can create a partially processed temporary file. Then, on the next pass through the data, it can read back this file and fill in any missing information.

In cases like these, the use of a ramdisk can dramatically improve program performance. Files held in a ramdisk can be retrieved much more quickly than files on a disk in a mechanical drive—even a high-speed hard disk drive. For a ramdisk, the computer need only read data from memory—something it can do with blinding speed. Reading data from disk, on the other hand, involves a number of mechanical tasks in addition to the electronic communications. Before the first byte can be read, the drive must start the disk spinning, determine the position of the file on the disk surface, move the read/write head to the proper track, and wait for the first sector of the file to spin by.

Since the ramdisk is so much faster, you may wonder why it isn't used exclusively for program storage. The answer is that ramdisks have one very significant shortcoming: Since all the information is stored in memory, everything in a ramdisk is lost whenever the computer is turned off, even if the power interruption is accidental or only momentary. For this reason, ramdisks are generally used only for temporary files containing information that needs to be retrieved quickly, but could be reconstructed easily, if lost. Physical drives are still the best choice for permanent file storage.

The sample programs at the end of this article illustrate the use of ramdisk files in a routine to calculate prime numbers. Type in the

version for your computer and save it to disk. Program 1 is for the Commodore 64, and Program 2 is for the Amiga.

Prime Numbers

One definition of a prime number is one which is not evenly divisible by any lower prime number, assuming that the first prime number is 2. This kind of definition is known as *recursive.* The series of prime numbers begins like this: 2, 3, 5, 7, 11, 13, 17, and so on. A more technical definition of a prime number is a number that is divisible only by 1 and itself. The number 1 is included in the prime series when we use this definition.

The example programs use the recursive definition to generate prime numbers. We begin with 2. For all following integers, the program tries dividing all previous primes it has found into the current value. If none of them divide evenly, the new value is added to the list of primes. To speed up the routine, the range of trial divisors is restricted to those less than or equal to the square root of the number being tested.

As each prime number is found, it is placed in a temporary file called PRIMES. For the first prime, 2, the file must be opened for writing. Subsequent numbers are tacked onto the end of the file by opening it for appending.

The performance of the routine could be further enhanced by examining only odd numbers. All even numbers other than 2 are divisible by 2, and hence cannot be prime. (In the 64 version, add STEP 2 to the FOR-NEXT statement in line 200. In the Amiga version, change the statement **p=p+1** to **p=p+2**, and insert **p=3** just before the WHILE statement.)

Getting Started

With the Commodore 64 and the 1764 RAM Expansion Module, you must install a program to support the use of the module's memory as a ramdisk. The required program, *RAMDOS,* is supplied on a disk that comes with the module. As part of the *RAMDOS* installation process, you'll be asked which device number to assign to the ramdisk. The primary floppy disk drive is always drive 8. Unless you already have a second floppy disk drive, device number 9 is a good choice for the ramdisk. Program 1 assumes the ramdisk has this device number. If you assign some other number, you'll need to change the 9 in line 120 to match the value you specified.

The Amiga includes built-in support for ramdisks; however, to conserve memory, the operating system does not normally set up a ramdisk when the system is booted. Instead, it waits until you first request access to a ramdisk, then allocates the memory at that time. In Amiga Basic, you can establish a ramdisk file simply by specifying the device name *ram:* along with the filename. Program 2, for example, uses the name *ram:primes* for the data file it creates.

Saving Your Work

The Commodore 64 has no built-in provision for copying files from ramdisk to a physical disk. If you want to transfer the data file created by the example program, PRIMES, to permanent disk storage, you must write a program to do the job. Here's one way to make the copy (as in Program 1, this example assumes that the ramdisk is set up as device 9):

```
100 OPEN 9,9,9,"PRIMES,S,R"
110 OPEN 8,8,8,"PRIMES,S,W"
120 GET#9,X$
130 S=ST
140 PRINT#8,X$;
150 IF S=0 GOTO 120
160 CLOSE 8
170 CLOSE 9
```

If you start BASIC from the Amiga Workbench, you'll find a *ramdisk* icon on the screen when you return there after running Program 2. Double click, and you'll see an icon for a file named *primes.* This is the temporary file containing the prime number values. If you wish to keep this file, you must copy the program to a physical disk. Drag the primes icon onto the icon of the disk or drawer where you want it to go.

If you're using the Amiga's CLI (Command Line Interpreter) instead of the Workbench, typing INFO will show you there's a ramdisk mounted. Use DIR RAM: or LIST RAM: to see its contents. To move the primes file to a more permanent place, use the COPY command. If you want the data file's icon to be visible on the Workbench, you must also copy the associated primes.info file.

On the Amiga, if you write a file with the same name as an existing file, the old file is scrapped and replaced by the new one. In the same situation, the 64 would refuse your request—you must scratch the old file before you can write a new one with the same name. Attempting to use an existing name will result in a FILE EXISTS error message (badly spelled in the current version of *RAMDOS*).

The syntax for scratching Commodore 64 ramdisk files is exactly the same as that used for physical disk files. To remove the PRIMES data file, type the following lines in direct mode:

```
OPEN 15,9,15
PRINT#15,"S0:PRIMES"
CLOSE 15
```

Without RAM

Programs 1 and 2 also work with a regular disk drive. For the sake of comparison, you might want to run the programs in this manner. For the 64 version (Program 1), change the 9 in the OPEN statement in line 120 to an 8. For the Amiga version (Program 2), change the device name in the OPEN statement from **ram:** to **df0:**. You'll see the brakes go on as your program slows to the speed of the mechanical disk unit.

That's why using a ramdisk is so easy. No new or special programming techniques are required—and it sure speeds things up.

For instructions on entering these programs, please refer to "COMPUTE!'s Guide to Typing In Programs" elsewhere in this issue.

Program 1: Ramdisk Example—64 Version

```
FM 70 REM COPYRIGHT 1987 COMPU
      TE! PUBLICATIONS, INC.
      {2 SPACES}ALL RIGHTS RES
      ERVED.
XE 80 PRINT"COPYRIGHT 1987":PR
      INT"COMPUTE! PUBLICATION
      S, INC."
GJ 90 PRINT"ALL RIGHTS RESERVE
      D."
FM 100 P=2:OPEN 15,9,15
FP 110 INPUT "PRIMES TO WHAT V
      ALUE";V
XX 120 OPEN 1,9,2,"PRIMES,S,W"
      :GOSUB 2000
QK 130 GOSUB 1000
BD 140 CLOSE 1
GA 200 FOR P=3 TO V
MF 210 F=0
MG 220 Q=SQR(P)
BR 230 OPEN 1,9,2,"PRIMES,S,R"
```

```
DQ 240 INPUT#1,D
QR 250 F=(P-D*INT(P/D)=0)
MC 260 IF D<Q AND NOT F AND ST
       =0 GOTO 240
MQ 270 CLOSE 1
PQ 280 IF F GOTO 320
AA 290 OPEN 1,9,2,"PRIMES,S,A"
HC 300 GOSUB 1000
XS 310 CLOSE 1
XR 320 NEXT P
CA 330 CLOSE 15
HP 340 END
PF 1000 PRINT#1,P
JS 1010 L=L+1
FR 1020 PRINT RIGHT$("
        {2 SPACES}"+STR$(P),4)
        ;
GG 1030 IF L>8 THEN L=0:PRINT
DA 1040 RETURN
FF 2000 INPUT#15,E,E$,E1,E2
AD 2010 IF E THEN PRINT E$:STO
        P
BX 2020 RETURN
```

Program 2: Ramdisk Example—Amiga Version

```
' Copyright 1987 COMPUTE! Public
ations, Inc.
' All Rights Reserved.
' PRIMES PROGRAM
' DEMONSTRATES FILES TO RAM:
PRINT "Copyright 1987":PRINT "CO
MPUTE! Publications, Inc."
PRINT "All Rights Reserved.":FOR
t=1 TO 10000:NEXT
CLS
p=2
INPUT "Primes to what value";v
OPEN "ram:primes" FOR OUTPUT AS
1
GOSUB putprime
CLOSE #1
WHILE p<v
p=p+1
flag=0
d=0
q=SQR(p)
OPEN "ram:primes" FOR INPUT AS 1
WHILE NOT EOF(1) AND d<q AND NOT
flag
INPUT #1,d
flag=(p MOD d = 0)
WEND
CLOSE #1
IF NOT flag THEN
OPEN "ram:primes" FOR APPEND AS
1
GOSUB putprime
CLOSE #1
END IF
WEND
END
putprime:
PRINT #1,p
LIN=LIN+1
PRINT USING " #####";p;
IF LIN>9 THEN LIN=0:PRINT
RETURN
```


Applesoft Line Lister

Bruce E. Howell, D.D.S.

If you find yourself wading through a difficult-to-decipher BASIC program listing, take the time to type in this short and very useful utility which unravels even the most complex program lines. The program works with any Apple II-series computer.

It's understandable that programmers want to write programs that are as fast and compact as possible. In BASIC programming, it is common to place several statements on a single line, separating each with a colon. Unfortunately, this can lead to dense programs that can be difficult to debug. "Applesoft Line Lister" alleviates this problem. It's a short and simple machine language program that makes any Applesoft BASIC program listing easier to read and understand.

Instead of completely rewriting BASIC's LIST routine, Line Lister simply intercepts the output from the routine and reformats it. Programs are still stored in their most compact form, but, when they are listed, each statement is placed on its own line for maximum readability.

Typing It In

Applesoft Line Lister is a short machine language program. To create it, type in and save a copy of the BASIC listing found below. Since the BASIC program creates a machine language file named LISTER, *do not* use that name for the BASIC program itself. To create a copy of the Line Lister machine language program, load the BASIC program, insert the disk on which you want a copy of Line Lister, and type RUN. The machine language program, LISTER, is saved to the disk. Once the Line Lister program is created, you won't need the BASIC program again except to make additional copies of Line Lister.

When you're ready to use Line Lister, type one of the following lines, depending on the version of DOS that you are using.

For DOS:

```
BRUN LISTER
```

For ProDOS:

```
-LISTER
```

This loads and installs—but does not activate—the machine language routine. To enable the new listing mode, type **&**.

Here's how a sample BASIC program line is listed by Applesoft's built-in routine:

```
100 PRINT : PRINT : FOR A = 100
    TO 1 STEP - 1:B = B + 1: NEXT
```

Line Lister displays this instead:

```
100  PRINT
:    PRINT
:    FOR A = 100 TO 1 STEP - 1
:    B = B + 1
:    NEXT
```

Line Lister works best in 80-column mode or on a printer. Long

display lengths insure that the entire statement fits on a single line. In the case of a very long statement, such as a long PRINT command or a complex formula, the output will wrap around to the next output line.

To turn off the enhanced listing mode, type PR#0 (or PR#3 if you're using 80 columns) or press Ctrl-Reset. Be sure to turn off Line Lister before changing a line or entering a new one. ProDOS users should also turn off Line Lister before requesting a disk catalog. The program can be restarted simply by typing & again.

How It Works

When executed, Line Lister sets up the ampersand vector to point to the enhanced listing routine. That routine works by intercepting characters on their way to the output device (such as the video display or printer), deleting or inserting spaces and new lines as required. Since the output routine vector is in different locations for DOS 3.3 and ProDOS, it is necessary to determine which operating system is in effect.

If ProDOS was booted, a group of file-manipulating subroutines called the *Machine Language Interface* will be found in memory beginning at location $BF00, so a machine language JMP instruction ($4C) at that location indicates that ProDOS is being used. Within ProDOS, location $BE30 (known as VECOUT) contains the address of the current output device. Line Lister first saves the current contents of the output vector so that it can send characters to the correct output device. Next, it stores the address of its own listing routine in the vector, rerouting all output through the new routine.

If no JMP instruction is found in the test location, Line Lister assumes that DOS 3.3 is being used. The output vector for DOS 3.3 is called CSW and is found at location $36. Line Lister changes the vector address as for ProDOS, then jumps through the vector at $3EA to update the DOS output routines.

In either case, control is then returned to Applesoft. Now, all characters sent to the current output device will be processed by Line Lister.

One of the program's jobs is to keep track of whether or not characters being output are enclosed in quotation marks. When a quotation mark (") is detected, the program passes the characters through, unformatted, until the next quotation mark is found, or until the end of the line is reached. This prevents Line Lister's special formatting from affecting text within quotation marks, such as the text of PRINT statements.

The program's most important task is to scan the outgoing text for colons. If the character to be printed is a colon, and if it's now within quotation marks, the program sends a carriage return character followed by a colon and several blank spaces.

For other characters, the program checks to see if the current and previous characters are spaces. If both are spaces not enclosed in quotation marks, then the program moves on without sending the last space. This causes superfluous spaces outside of quotation marks to be discarded.

Applesoft Line Lister

For instructions on entering this program, please refer to "COMPUTE!'s Guide to Typing In Programs" elsewhere in this issue.

```
73 5 REM COPYRIGHT 1987 COMPUTE!
     PUBLICATIONS, INC. ALL RIG
     HTS RESERVED.
6D 6 HOME : PRINT "COPYRIGHT 198
     7": PRINT "COMPUTE! PUBLICA
     TIONS, INC.": PRINT "ALL RI
     GHTS RESERVED."
42 7 FOR X = 1 TO 1500: NEXT
D1 10 C = 0: FOR I = 768 TO 897
A5 20 READ A: POKE I,A:C = C + A
A6 30 NEXT
78 40 IF C < > 15288 THEN PRINT
     "BAD DATA": END
15 50 PRINT CHR$ (4)"BSAVE LISTE
     R,A$300,L$81"
F1 60 END
AF 100 DATA 169,76,141,245,3,169
     ,16,141,246,3,169
EE 110 DATA 3,141,247,3,96,173,0
     ,191,201,76,240
86 120 DATA 23,173,83,170,141,12
     5,3,173,84,170,141
27 130 DATA 126,3,169,69,133,54,
     169,3,133,55,76
53 140 DATA 234,3,173,48,190,141
     ,125,3,173,49,190
A5 150 DATA 141,126,3,169,69,141
     ,48,190,169,3,141
B8 160 DATA 49,190,96,201,162,20
     8,10,173,127,3,73
6D 170 DATA 255,141,127,3,169,16
     2,44,127,3,48,33
28 180 DATA 201,186,208,20,32,14
     2,253,169,186,32,124
5B 190 DATA 3,162,3,169,160,32,1
     24,3,202,208,248
08 200 DATA 240,9,201,160,208,5,
     205,128,3,240,203
D1 210 DATA 141,128,3,76,255,255
     ,0,0,3
```

©

64+

Barry L. Camp

The new commands that this utility adds to the 64 make editing and programming much more enjoyable. "64+" alters the operating system itself to create a new working environment.

"64+" is a full-scale enhancement to the 64's operating system. It works by copying the entire contents of the BASIC and Kernal ROMs into the underlying RAM and then making modifications to add new features.

64+ consists largely of new CHR$ and keyboard commands that perform useful functions. Other capabilities include a more useful USR function, preprogrammed function keys, disk drive defaults, and a numeric keypad.

Typing It In

Since 64+ is a machine language program, you will need to type it in using "MLX," the machine language entry program found elsewhere in this issue. Be sure you are familiar with MLX before you begin typing in 64+. When MLX asks for starting and ending addresses, respond with the following:

Starting address: 0801
Ending address: 0C40

Type in the data, and be sure to save a copy before leaving MLX.

Although 64+ is written in machine language, it loads and runs just like a BASIC program. To get started, load 64+ and type RUN. You will notice some changes immediately. The lowercase character set is switched in and the screen colors change. These visual cues also appear every time you press RUN/STOP–RESTORE. This different visual appearance serves as a reminder that that you are operating under 64+. Try out the new commands and keystrokes provided by 64+. The accompanying quick-reference table and keyboard map are all you need to begin experimenting.

Most of the new commands can be used in three ways. First, you can use them in immediate mode by typing the proper combination of keys (especially helpful when you are editing a BASIC program). Second, you can use the CHR$ function in a PRINT statement to print the corresponding character code for the command. For example, PRINT CHR$(7) will ring a bell in 64+. Finally, you can type the key combinations within quotes in PRINT statements. In quote mode, the commands appear as reverse letters. The quick-reference table has all the information you need to use the commands in any of the three ways mentioned.

New Characters

One of the most powerful features of 64+ is the addition of 15 new characters. These can be accessed by the CHR$ function or typed directly from the keyboard. Machine language programmers can use Kernal routines to access these new characters.

Here is a description of the characters which may not be self-explanatory. To find the corresponding keystroke and the character that appears when you use the command within a string, refer to the quick-reference table and the keyboard map.

Tab
This is a version of the comma delimeter used in PRINT statements. PRINT "Hello","there" and PRINT "Hello there" both have the same effect. Press the STOP key for this character. In immediate mode, the STOP key tabs the cursor.

Line home
This moves the cursor back to the beginning of the current logical line. For example, when editing a BASIC line, hold CTRL and press the back-arrow key to place the cursor on the first digit of the line number.

Partial screen clear
Clears everything below the current cursor position.

Partial line clear
Clears from the cursor position to the end of the current logical line. This is especially powerful for editing BASIC lines. Depending on how the cursor is positioned, it is possible either to trim unwanted or unneeded statements off the end of a line (like REM or STOP statements), or to delete the entire line by erasing all but the line number (and then press RETURN).

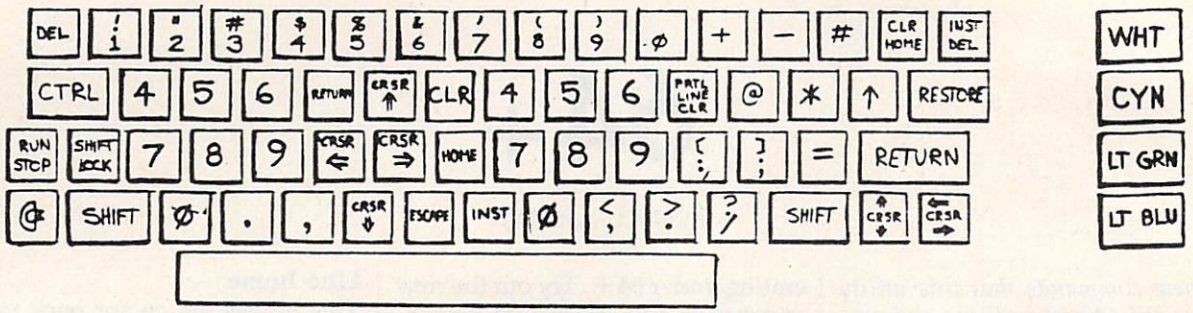
Delete
This is similar to the normal delete except that instead of pulling part of a line back over the unwanted characters to the left, the cursor remains stationary, and unwanted characters are pulled into the cursor from the right. Use the CTRL or Commodore key in conjunction with the INST/DEL key for this "black hole" delete.

Repeating-key control
If you want all keys to repeat, use CHR$(22). If you don't want any to repeat, use CHR$(23). The default is CHR$(24), which corresponds to the setting of a normal 64—only the cursor keys.

Set color RAM
This sets every location on the screen to the current cursor color.

Escape
This may prove to be the most useful of the new characters. It cancels insert, reverse, and quote modes. It also resets the default key-repeat values and resets the SID chip registers to their default values.

Keyboard Map



Additional function-key characters
Normally there are eight function keys: f1, f3, f5, and f7 are unshifted, while f2, f4, f6, and f8 are obtained in conjunction with the the SHIFT key. 64+ adds four more function keys (f9–f12), which are entered by pressing the Commodore key in conjunction with the function keys.

Other Features

In addition to the new characters, these features are also part of 64+:

- Freeze. Whenever the SHIFT-LOCK key is engaged, the screen stops scrolling, effectively freezing it. This is handy for examining listings or anything else that is too large to fit on one screen. To continue normal scrolling, release the key.
- Four preprogrammed function keys. By holding down CTRL and pressing one of the function keys, the corresponding one of the following four BASIC keywords is automatically printed to the screen: DATA (f1), LIST (f3), RUN (f5), SYS (f7).
- Disk drive defaults. Device 8 is now the default device for LOAD, SAVE, and VERIFY. It is no longer necessary to add ,8 to the command for disk loads and saves. (However, it is now necessary to add ,1 to the SAVE, LOAD, or VERIFY command when using tape.) Note also that SHIFT-RUN/STOP has also been altered to facilitate the new device change. That key combination will now load and run the first program on the disk.
- End-of-line warning system. When you are near the end of an 80-character logical line, 64+ notifies you with a tone. This is especially useful when entering large amounts of data while looking away from the screen.
- Audible error messages. A bell-like tone sounds whenever an error occurs in a BASIC program. This is intended for those times when you are unable to see error messages (when programming with a graphics screen, for example).
- Numeric keypads for quick data entry. The keyboard map shows a special keyboard configuration, accessible by holding down the Commodore key and pressing CTRL. Notice that a # appears under the cursor. This is to let you know that the keyboard is in *numeric mode* (which affects unshifted keys only). Now you have one-touch access to important control characters, 4 of the 16 available colors (for text), and the new numeric keypads. Notice that the left group of numbers is in a different order than the right. This allows you a choice between the telephone- and calculator-style keypad formats. When you are ready to exit numeric mode, just press Commodore-CTRL again. This time a \ will appear, and the keyboard will be back to normal.

A Useful USR

Machine language programmers will appreciate the new application of the rarely used USR function. It can now be used to find the values of system vectors. To use it, simply pass the address holding the low byte of the vector. For example,

```
NMI = USR(65530):PRINT NMI
```

would return the value 65091, the starting address of the NMI routine. Calculating available memory is also a breeze, with this short formula:

```
MEM = USR(51)-USR(49)
```

This example subtracts the values of the vectors that point to the top and bottom of available memory.

Memory Conflicts

Be careful when writing programs

Quick Reference Table

Description	Character Code	Keyboard Access	Appears As
Tab	3	RUN/STOP	reverse c
Line Home	6	CTRL-1 or Commodore-1	reverse f
Bell (Tone)	7	CTRL-G	reverse g
Partial Screen Clear	11	CTRL-CLR/HOME or Commodore-CLR/HOME	reverse k
Partial Line Clear	16	CTRL-RETURN or Commodore-RETURN	reverse p
Delete	21	CTRL-INST/DEL or Commodore-INST/DEL	none
All Repeat	22	CTRL-+	reverse v
No Repeat	23	CTRL-−	reverse w
Default Repeat	24	CTRL-£	reverse x
Set Color RAM	26	CTRL-Z or Commodore-0	reverse z
Escape	27	SHIFT-=, CTRL-=, or Commodore-=	none
f9	128	Commodore-f1	reverse —
f10	130	Commodore-f3	reverse b
f11	132	Commodore-f5	reverse d
f12	143	Commodore-f7	reverse o

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that use POKE statements, because BASIC and the Kernal are now in RAM. Also, 64+ uses location 787 ($0313) for various flags, as well as locations 51617–52223 ($C9A1–$CBFF). Stay away from these areas of memory to avoid a crash. One commonly used utility that works with no conflicts is the *DOS Wedge*, which resides in memory immediately following the locations used by 64+.

64+ will probably not work with your favorite word processor. Word processors are generally self-contained machine language programs that provide their own special editing functions and other features. For instance, *SpeedScript* and 64+ will not work together.

64+

Please refer to the "MLX" article elsewhere in this issue before entering the following program.

```
0801:1F 08 00 FA 8F 20 12 20 93
0809:36 34 2B 20 42 59 20 42 A2
0811:41 52 52 59 20 4C 2E 20 E4
0819:43 41 4D 50 20 00 37 08 41
0821:40 FA 9E C2 28 34 33 29 B1
0829:AA C2 28 34 34 29 AC 32 59
0831:35 36 AA 35 36 00 00 00 C3
0839:78 A2 FF 9A A5 01 09 03 1E
0841:85 01 A0 00 A9 BF 84 58 16
0849:85 59 84 5A 85 5B A2 20 A7
0851:20 EC A3 A9 FF 85 59 85 0A
0859:5B A2 20 20 EC A3 A2 00 01
0861:8E DA EC A2 06 8E 3C EC 07
0869:8E D9 EC E8 E8 8E DA E1 7C
0871:8E 2D E7 E8 E8 8E 3D EA 86
0879:E8 8E 36 EC 8E AB EC A2 D6
0881:10 8E 04 EC 8E 79 EC E8 A9
0889:E8 8E C5 FD A2 15 8E FB CC
0891:EB 8E 03 EC 8E 78 EC E8 83
0899:8E A0 EC 8E D1 EC E8 8E 42
08A1:A3 EC E8 8E A8 EC E8 E8 78
08A9:8E E5 EB 8E 26 EC E8 8E 26
08B1:F7 EB 8E 38 EC 8E AD EC F7
08B9:A2 20 8E FC E8 8E 07 EB 40
08C1:8E 68 FD 8E 6B FD 8E C4 11
08C9:FD E8 E8 8E E9 EC A2 2A 8B
08D1:8E 77 EB 8E EA EC A2 3F FC
08D9:8E 86 E7 A2 4C 8E 2C E7 D6
08E1:8E 85 E7 8E 44 EB A2 80 18
08E9:8E 07 EC E8 E8 8E 08 EC AD
08F1:E8 E8 8E 23 E5 8E 09 EC 1D
08F9:A2 8F 8E 06 EC A2 A1 8E 35
0901:C7 E3 A2 C1 8E FD E8 8E 2D
0909:69 FD A2 C6 8E 6C FD A2 D4
0911:C9 8E C9 E3 8E CC E5 8E 25
0919:09 EB 8E 46 EB 8E 6A FD 4D
0921:8E 6D FD E8 8E 2E E7 8E AF
0929:87 E7 E8 8E 28 E5 8E 78 6D
0931:EB 8E C6 FD A2 CF 8E E8 EF
0939:EC A2 D7 8E 08 EB A2 E0 64
0941:8E 45 EB A2 E3 8E 87 FD F9
0949:E8 8E FE E8 E8 8E D6 FD 0F
0951:A2 EA 8E CB E5 8E 2F E7 AD
0959:8E 30 E7 8E 88 E7 8E 89 2F
0961:E7 8E 8A E7 8E 0A EB A6 F5
0969:2C E8 E8 E8 18 A5 2B 69 8E
0971:C1 85 5A 90 01 E8 86 5B 2E
0979:A9 A1 85 58 A9 CB 85 59 DF
0981:A2 03 A0 5F 20 EC A3 18 C3
0989:A5 5A 69 5F 85 5A A5 5B 64
099i:69 03 85 5B A0 1D B1 5A B6
0999:99 B5 E4 88 C0 0B D0 F6 D5
09A1:B1 5A 99 9D E4 88 10 F8 92
09A9:A9 07 8D 6F A3 A8 88 B9 85
09B1:69 A3 99 68 A3 88 D0 F7 F3
09B9:A5 01 29 FD 85 01 4C F2 9F
09C1:FC A5 15 48 A5 14 48 20 11
09C9:F7 B7 A0 00 B1 14 85 63 26
09D1:C8 B1 14 85 62 68 85 14 63
09D9:68 85 15 A2 90 38 4C 49 95
09E1:BC A9 03 85 C2 60 E6 C2 9D
09E9:A5 C2 C9 A0 90 08 68 68 A0
09F1:A9 FD 48 A9 87 48 60 F0 0B
09F9:06 C9 11 F0 02 C9 15 60 74
0A01:8D 00 DC AC 8D 02 8C 8E 5E
0A09:02 60 20 16 E7 AD 13 03 BA
0A11:A4 D3 C0 4A 90 0C 29 01 31
0A19:D0 0D EE 13 03 A9 07 4C 01
0A21:16 E7 29 FE 8D 13 03 60 6E
0A29:D0 03 4C 91 E8 C9 15 D0 72
0A31:13 98 D0 02 E6 D6 C4 D5 21
0A39:F0 22 A5 D8 F0 02 C6 D8 86
0A41:C8 4C 50 E7 C9 1B F0 03 F4
0A49:4C 31 E7 20 12 CB A9 00 E1
0A51:85 C7 85 D4 85 D8 8D 91 54
0A59:02 8D 8A 02 4C A8 E6 C9 DF
0A61:03 D0 10 38 98 E9 0A B0 E1
0A69:FC 49 FF 65 D3 85 D3 A8 A9
0A71:4C 96 E7 C9 06 D0 09 C0 31
0A79:28 90 02 C6 D6 4C A6 E7 8F
0A81:C9 07 D0 31 78 20 1A CB AD
0A89:A9 1E 8D 01 D4 A9 F2 8D 7C
0A91:06 D4 A9 21 8D 04 D4 A2 ED
0A99:7F 20 B3 EE CA D0 FA 20 8A
0AA1:9F FF A9 20 8D 04 D4 A2 85
0AA9:37 20 B3 EE CA D0 FA 8E E4
0AB1:04 D4 4C A8 E6 C9 10 F0 80
0AB9:2C C9 0B D0 3F A6 D6 E8 EF
0AC1:B5 D9 30 01 E8 E0 19 10 4A
0AC9:0B B5 D9 09 80 95 D9 20 CA
0AD1:FF E9 30 F0 38 A5 D3 E9 5F
0AD9:28 10 02 69 28 85 D3 A8 84
0AE1:A6 D6 20 F0 E9 20 24 EA 15
0AE9:E6 D5 AE 86 02 A9 20 20 3C
0AF1:1E EA C8 C4 D5 90 F6 C6 DA
0AF9:D5 4C A8 E6 C9 16 90 0E 65
0B01:C9 19 B0 0A AA BD D5 CA BB
0B09:4C 39 CA 80 40 00 C9 1A A4
0B11:D0 17 AD 86 02 A2 FA 9D A1
0B19:FF D7 9D F9 D8 9D F3 D9 77
0B21:9D ED DA CA D0 F1 4C A8 19
0B29:E6 C9 12 D0 02 85 C7 4C 76
0B31:8B E7 AD 13 03 29 7F 8D 37
0B39:13 03 A0 17 A9 00 99 00 9F
0B41:D4 88 10 FA A9 0F 8D 18 52
0B49:D4 60 AD 8D 02 C9 04 D0 80
0B51:0E A4 CB C4 C5 F0 08 C0 20
0B59:03 90 04 C0 07 90 03 4C 6E
0B61:E0 EA B9 6A CB CD 89 02 2B
0B69:90 03 AD 89 02 AA 98 0A CC
0B71:A8 B9 6B CB 85 B0 B9 6C 43
0B79:CB 85 B1 8A A8 88 B1 B0 31
0B81:99 77 02 88 10 F8 86 C6 43
0B89:A2 FF 4C 26 EB 03 04 04 54
0B91:03 79 CB 7C CB 80 CB EC AD
0B99:EC 53 59 53 44 41 54 41 6C
0BA1:4C 49 53 54 AD 8D 02 F0 78
0BA9:21 C9 06 D0 05 CD 8E 02 0F
0BB1:D0 03 4C 4B EB AD 13 03 6E
0BB9:49 80 8D 13 03 30 03 A9 FF
0BC1:9C 2C A9 A3 AE 86 02 20 54
0BC9:1C EA 2C 13 03 30 05 A2 E4
0BD1:00 4C 6C EB A9 BF 85 F5 94
0BD9:A9 CB 85 F6 4C E0 EA 14 A7
0BE1:0D 1D 9A 05 9F 99 11 33 22
0BE9:35 37 34 30 38 36 01 35 C3
0BF1:0D 39 36 2C 9D 91 2E 37 2D
0BF9:93 1D 38 1B 13 34 11 39 9E
0C01:35 31 30 30 32 36 94 2B C7
0C09:10 33 2D 2E 3A 40 2C 23 CC
0C11:2A 3B 13 01 3D 5E 2F 31 72
0C19:14 04 32 20 02 34 03 FF 6B
0C21:2B 20 49 4E 53 54 41 4C 9F
0C29:4C 45 44 21 CE A5 02 78 DC
0C31:A9 FD 8D 00 DC AD 01 DC CB
0C39:C9 7F F0 F9 58 60 00 00 18
```

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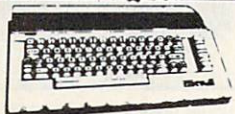

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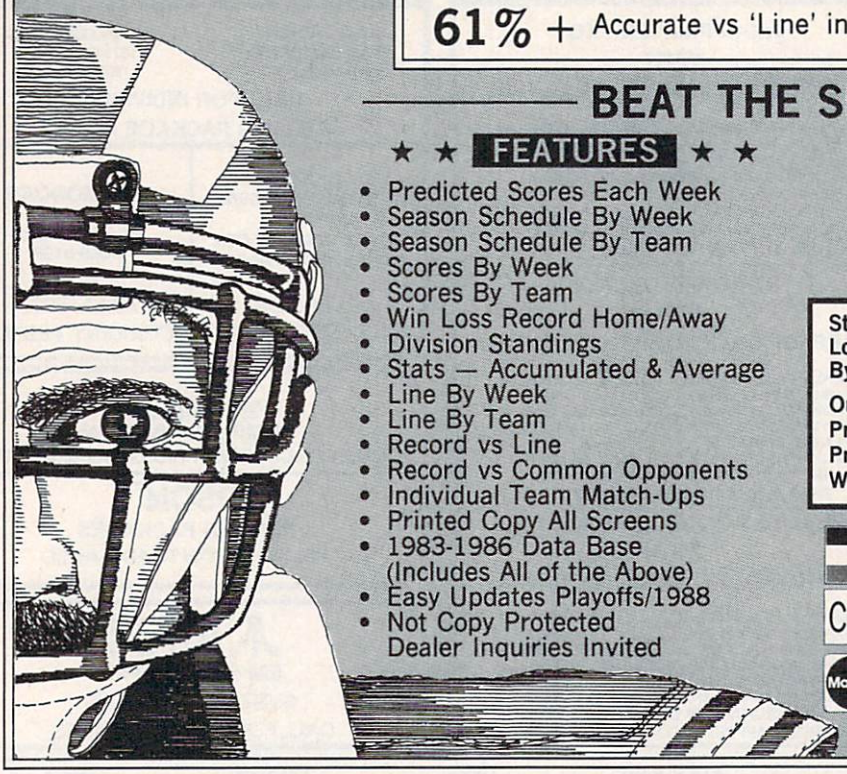

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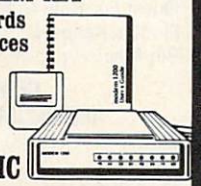

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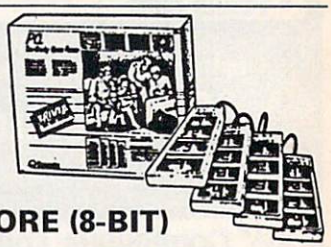

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COMPUTE!'s Guide To Typing In Programs

Computers are precise—type the program *exactly* as listed, including necessary punctuation and symbols, except for special characters noted below. We have provided a special listing convention as well as a program to check your typing—"The Automatic Proofreader."

Programs for the IBM, TI-99/4A, and Atari ST models should be typed exactly as listed; no special characters are used. Programs for Commodore, Apple, and Atari 400/800/XL/XE computers may contain some hard-to-read special characters, so we have a listing system that indicates these control characters. You will find these Commodore and Atari characters in curly braces; *do not type the braces.* For example, {CLEAR} or {CLR} instructs you to insert the symbol which clears the screen on the Atari or Commodore machines. A complete list of these symbols is shown in the tables below. For Commodore, Apple, and Atari, a single symbol by itself within curly braces is usually a control key or graphics key. If you see {A}, hold down the CONTROL key and press A. This will produce a reverse video character on the Commodore (in quote mode), a graphics character on the Atari, and an invisible control character on the Apple.

Graphics characters entered with the Commodore logo key are enclosed in a special bracket: [<A>]. In this case, you would hold down the Commodore logo key as you type A. Our Commodore listings are in uppercase, so shifted symbols are underlined. A graphics heart symbol (SHIFT-S) would be listed as S. One exception is {SHIFT-SPACE}. When you see this, hold down SHIFT and press the space bar. If a number precedes a symbol, such as {5 RIGHT}, {6 S}, or [<8 Q>], you would enter five cursor rights, six shifted S's, or eight Commodore-Q's. On the Atari, inverse characters (white on black) should be entered with the inverse video

Atari 400/800/XL/XE

When you see	Type	See	
{CLEAR}	ESC SHIFT <		Clear Screen
{UP}	ESC CTRL -		Cursor Up
{DOWN}	ESC CTRL =		Cursor Down
{LEFT}	ESC CTRL +		Cursor Left
{RIGHT}	ESC CTRL *		Cursor Right
{BACK S}	ESC DELETE		Backspace
{DELETE}	ESC CTRL DELETE		Delete character
{INSERT}	ESC CTRL INSERT		Insert character
{DEL LINE}	ESC SHIFT DELETE		Delete line
{INS LINE}	ESC SHIFT INSERT		Insert line
{TAB}	ESC TAB		TAB key
{CLR TAB}	ESC CTRL TAB		Clear tab
{SET TAB}	ESC SHIFT TAB		Set tab stop
{BELL}	ESC CTRL 2		Ring buzzer
{ESC}	ESC ESC		ESCape key

Commodore PET/CBM/VIC/64/128/16/+4

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	
{PUR}	CTRL 5	
{GRN}	CTRL 6	
{BLU}	CTRL 7	
{YEL}	CTRL 8	

When You Read:	Press:	See:
[<1>]	COMMODORE 1	
[<2>]	COMMODORE 2	
[<3>]	COMMODORE 3	
[<4>]	COMMODORE 4	
[<5>]	COMMODORE 5	
[<6>]	COMMODORE 6	
[<7>]	COMMODORE 7	
[<8>]	COMMODORE 8	
{ F1 }	f1	
{ F2 }	SHIFT f1	
{ F3 }	f3	
{ F4 }	SHIFT f3	
{ F5 }	f5	
{ F6 }	SHIFT f5	
{ F7 }	f7	
{ F8 }	SHIFT f7	
←		

key (Atari logo key on 400/800 models).

Whenever more than two spaces appear in a row, they are listed in a special format. For example, {6 SPACES} means press the space bar six times. Our Commodore listings never leave a single space at the end of a line, instead moving it to the next printed line as {SPACE}.

Amiga program listings contain only one special character, the left arrow (←) symbol. This character marks the end of each program line. Wherever you see a left arrow, press RETURN or move the cursor off the line to enter that line into memory. Don't try to type in the left arrow symbol; it's there only as a marker to indicate where each program line ends.

The Automatic Proofreader

Type in the appropriate program listed below, then save it for future use. The Commodore Proofreader works on the Commodore 128, 64, Plus/4, 16, and VIC-20. Don't omit any lines, even if they contain unfamiliar commands or you think they don't apply to your computer. When you run the program, it installs a machine language program in memory and erases its BASIC portion automatically (so be sure to save several copies before running the program for the first time). If you're using a Commodore 128, Plus/4 or 16, do *not* use any GRAPHIC commands while the Proofreader is active. You should disable the Commodore Proofreader before running any other program. To do this, either turn the computer off and on or enter SYS 64738 (for the 64), SYS 65341 (128), SYS 64802 (VIC-20), or SYS 65526 (Plus/4 or 16). To reenable the Proofreader, reload the program and run it as usual. Unlike the original VIC/64 Proofreader, this version works the same with disk or tape.

On the Atari, run the Proofreader to activate it (the Proofreader remains active in memory as a machine language program); you must then enter NEW to erase the BASIC loader. Pressing SYSTEM RESET deactivates the Atari Proofreader; enter PRINT USR(1536) to reenable it.

The Apple Proofreader erases the BASIC portion of itself after you run it, leaving only the machine language portion in memory. It works with either DOS 3.3 or ProDOS. Disable the Apple Proofreader by pressing CTRL-RESET before running another BASIC program.

The IBM Proofreader is a BASIC program that simulates the IBM BASIC line editor, letting you enter, edit, list, save, and load programs that you type. Type RUN to activate. Be sure to leave Caps Lock on, except when typing lowercase characters.

Once the Proofreader is active, try typing in a line. As soon as you press RETURN, either a hexadecimal number (on the Apple) or a pair of letters (on the Commodore, Atari, or IBM) appears. The number or pair of letters is called a *checksum*.

Compare the value displayed on the screen by the Proofreader with the checksum printed in the program listing in the magazine. The checksum is given to the left of each line number. Just type in the program a line at a time (without the printed checksum), press RETURN or Enter, and compare the checksums. If they match, go on to the next line. If not, check your typing; you've made a mistake. Because of the checksum method used, do not type abbreviations, such as ? for PRINT. On the Atari and Apple Proofreaders, spaces are not counted as part of the checksum, so be sure you type the right number of spaces between quote marks. The Atari Proofreader does not check to see that you've typed the characters in the right order, so if characters are transposed, the checksum still matches the listing. The Commodore Proofreader catches transposition errors and ignores spaces unless they're enclosed in quotation marks. The IBM Proofreader detects errors in spacing and transposition.

IBM Proofreader Commands

Since the IBM Proofreader replaces the computer's normal BASIC line editor, it has to include many of the direct-mode IBM BASIC commands. The syntax is identical to IBM BASIC. Commands simulated are LIST, LLIST, NEW, FILES, SAVE, and LOAD. When listing your program, press any key (except Ctrl-Break) to stop the listing. If you enter NEW, the Proofreader prompts you to press Y to be especially sure you mean yes.

Two new commands are BASIC and CHECK. BASIC exits the Proofreader back to IBM BASIC, leaving the Proofreader in memory. CHECK works just like LIST, but shows the checksums along with the listing. After you have typed in a program, save it to disk. Then exit the Proofreader with the BASIC command, and load the program as usual (this replaces the Proofreader in memory). You can now run the program, but you may want to resave it to disk. This will shorten it on disk and make it load faster, but it can no longer be edited with the Proofreader. If you want to convert an existing BASIC program to Proofreader format, save it to disk with SAVE "*filename*",A.

Program 1: Atari Proofreader

By Charles Brannon

```
100 GRAPHICS 0
110 FOR I=1536 TO 1700:REA
    D A:POKE I,A:CK=CK+A:N
    EXT I
120 IF CK<>19072 THEN ? "E
    rror in DATA Statement
    s.  Check Typing.":END

130 A=USR(1536)
140 ? :? "Automatic Proofr
    eader Now Activated."
150 END
160 DATA 104,160,0,185,26,
    3,201,69,240,7
170 DATA 200,200,192,34,20
    8,243,96,200,169,74
180 DATA 153,26,3,200,169,
    6,153,26,3,162
190 DATA 0,189,0,228,157,7
    4,6,232,224,16
200 DATA 208,245,169,93,14
    1,78,6,169,6,141
210 DATA 79,6,24,173,4,228
    ,105,1,141,95
220 DATA 6,173,5,228,105,0
    ,141,96,6,169
230 DATA 0,133,203,96,247,
    238,125,241,93,6
240 DATA 244,241,115,241,1
    24,241,76,205,238
250 DATA 0,0,0,0,0,32,62,2
    46,8,201
260 DATA 155,240,13,201,32
    ,240,7,72,24,101
270 DATA 203,133,203,104,4
    0,96,72,152,72,138
280 DATA 72,160,0,169,128,
    145,88,200,192,40
290 DATA 208,249,165,203,7
    4,74,74,74,24,105
300 DATA 161,160,3,145,88,
    165,203,41,15,24
310 DATA 105,161,200,145,8
    8,169,0,133,203,104
320 DATA 170,104,168,104,4
    0,96
```

Program 2: IBM Proofreader

By Charles Brannon

```
10 'Automatic Proofreader Vers
   ion 3.0 (Lines 205,206 adde
   d/190 deleted/470,490 chang
   ed from V2.0)
100 DIM L$(500),LNUM(500):COLO
    R 0,7,7:KEY OFF:CLS:MAX=0:
    LNUM(0)=65536!
110 ON ERROR GOTO 120:KEY 15,C
    HR$(4)+CHR$(70):ON KEY(15)
     GOSUB 640:KEY (15) ON:GOT
    O 130
120 RESUME 130
130 DEF SEG=&H40:W=PEEK(&H4A)
140 ON ERROR GOTO 650:PRINT:PR
    INT"Proofreader Ready."
150 LINE INPUT L$:Y=CSRLIN-INT
    (LEN(L$)/W)-1:LOCATE Y,1
160 DEF SEG=0:POKE 1050,30:POK
    E 1052,34:POKE 1054,0:POKE
     1055,79:POKE 1056,13:POKE
     1057,28:LINE INPUT L$:DEF
     SEG:IF L$="" THEN 150
170 IF LEFT$(L$,1)=" " THEN L$
    =MID$(L$,2):GOTO 170
```

```
180 IF VAL(LEFT$(L$,2))=0 AND
    MID$(L$,3,1)=" " THEN L$=M
    ID$(L$,4)
200 IF ASC(L$)>57 THEN 260 'no
     line number, therefore co
    mmand
205 BL=INSTR(L$," "):IF BL=0 T
    HEN BL$=L$:GOTO 206 ELSE B
    L$=LEFT$(L$,BL-1)
206 LNUM=VAL(BL$):TEXT$=MID$(L
    $,LEN(STR$(LNUM))+1)
210 IF TEXT$="" THEN GOSUB 540
    :IF LNUM=LNUM(P) THEN GOSU
    B 560:GOTO 150 ELSE 150
220 CKSUM=0:FOR I=1 TO LEN(L$)
    :CKSUM=(CKSUM+ASC(MID$(L$,
    I))*I) AND 255:NEXT:LOCATE
     Y,1:PRINT CHR$(65+CKSUM/1
    6)+CHR$(65+(CKSUM AND 15))
    +" "+L$
230 GOSUB 540:IF LNUM(P)=LNUM
    THEN L$(P)=TEXT$:GOTO 150
    'replace line
240 GOSUB 580:GOTO 150 'insert
     the line
260 TEXT$="":FOR I=1 TO LEN(L$
    ):A=ASC(MID$(L$,I)):TEXT$=
    TEXT$+CHR$(A+32*(A>96 AND
    A<123)):NEXT
270 DELIMITER=INSTR(TEXT$," ")
    :COMMAND$=TEXT$:ARG$="":IF
     DELIMITER THEN COMMAND$=L
    EFT$(TEXT$,DELIMITER-1):AR
    G$=MID$(TEXT$,DELIMITER+1)
     ELSE DELIMITER=INSTR(TEXT
    $,CHR$(34)):IF DELIMITER T
    HEN COMMAND$=LEFT$(TEXT$,D
    ELIMITER-1):ARG$=MID$(TEXT
    $,DELIMITER)
280 IF COMMAND$<>"LIST" THEN 4
    10
290 OPEN "scrn:" FOR OUTPUT AS
     #1
300 IF ARG$="" THEN FIRST=0:P=
    MAX-1:GOTO 340
310 DELIMITER=INSTR(ARG$,"-"):
    IF DELIMITER=0 THEN LNUM=V
    AL(ARG$):GOSUB 540:FIRST=P
    :GOTO 340
320 FIRST=VAL(LEFT$(ARG$,DELIM
    ITER)):LAST=VAL(MID$(ARG$,
    DELIMITER+1))
330 LNUM=FIRST:GOSUB 540:FIRST
    =P:LNUM=LAST:GOSUB 540:IF
    P=0 THEN P=MAX-1
340 FOR X=FIRST TO P:N$=MID$(S
    TR$(LNUM(X)),2)+" "
350 IF CKFLAG=0 THEN A$="":GOT
    O 370
360 CKSUM=0:A$=N$+L$(X):FOR I=
    1 TO LEN(A$):CKSUM=(CKSUM+
    ASC(MID$(A$,I))*I) AND 255
    :NEXT:A$=CHR$(65+CKSUM/16)
    +CHR$(65+(CKSUM AND 15))+"
     "
370 PRINT #1,A$+N$+L$(X)
380 IF INKEY$<>"" THEN X=P
390 NEXT :CLOSE #1:CKFLAG=0
400 GOTO 130
410 IF COMMAND$="LLIST" THEN O
    PEN "lpt1:" FOR OUTPUT AS
    #1:GOTO 300
420 IF COMMAND$="CHECK" THEN C
    KFLAG=1:GOTO 290
430 IF COMMAND$<>"SAVE" THEN 4
    50
440 GOSUB 600:OPEN ARG$ FOR OU
    TPUT AS #1:ARG$="":GOTO 30
    0
450 IF COMMAND$<>"LOAD" THEN 4
    90
460 GOSUB 600:OPEN ARG$ FOR IN
    PUT AS #1:MAX=0:P=0
470 WHILE NOT EOF(1):LINE INPU
    T #1,L$:BL=INSTR(L$," "):B
    L$=LEFT$(L$,BL-1):LNUM(P)=
    VAL(BL$):L$(P)=MID$(L$,LEN
    (STR$(VAL(BL$)))+1):P=P+1:
    WEND
480 MAX=P:CLOSE #1:GOTO 130
490 IF COMMAND$="NEW" THEN INP
    UT "Erase program - Are yo
    u sure";L$:IF LEFT$(L$,1)=
    "y" OR LEFT$(L$,1)="Y" THE
    N MAX=0:LNUM(0)=65536!:GOT
    O 130:ELSE 130
500 IF COMMAND$="BASIC" THEN C
    OLOR 7,0,0:ON ERROR GOTO 0
    :CLS:END
510 IF COMMAND$<>"FILES" THEN
    520
515 IF ARG$="" THEN ARG$="A:"
    ELSE SEL=1:GOSUB 600
517 FILES ARG$:GOTO 130
520 PRINT"Syntax error":GOTO 1
    30
540 P=0:WHILE LNUM>LNUM(P) AND
     P<MAX:P=P+1:WEND:RETURN
560 MAX=MAX-1:FOR X=P TO MAX:L
    NUM(X)=LNUM(X+1):L$(X)=L$(
    X+1):NEXT:RETURN
580 MAX=MAX+1:FOR X=MAX TO P+1
     STEP -1:LNUM(X)=LNUM(X-1)
    :L$(X)=L$(X-1):NEXT:L$(P)=
    TEXT$:LNUM(P)=LNUM:RETURN
600 IF LEFT$(ARG$,1)<>CHR$(34)
     THEN 520 ELSE ARG$=MID$(A
    RG$,2)
610 IF RIGHT$(ARG$,1)=CHR$(34)
     THEN ARG$=LEFT$(ARG$,LEN(
    ARG$)-1)
620 IF SEL=0 AND INSTR(ARG$,".
    ")=0 THEN ARG$=ARG$+".BAS"
630 SEL=0:RETURN
640 CLOSE #1:CKFLAG=0:PRINT"St
    opped.":RETURN 150
650 PRINT "Error #";ERR:RESUME
     150
```

Program 3: Commodore Proofreader

By Philip Nelson, Assistant Editor

```
10 VEC=PEEK(772)+256*PEEK(773)
   :LO=43:HI=44
20 PRINT "AUTOMATIC PROOFREADE
   R FOR ";:IF VEC=42364 THEN
   {SPACE}PRINT "C-64"
30 IF VEC=50556 THEN PRINT "VI
   C-20"
40 IF VEC=35158 THEN GRAPHIC C
   LR: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:POK
   E 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+L
   F,LB:POKE SA+HF,HB:NEXT
110 IF CHK<>22054 THEN PRINT "
   *ERROR* RELOAD PROGRAM AND
   {SPACE}CHECK FINAL LINE":EN
   D
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 (P
   EEK(LO)+256*PEEK(HI))-1,0:N
   EW
160 DATA 120,169,73,141,4,3,16
   9,3,141,5,3
170 DATA 88,96,165,20,133,167,
   165,21,133,168,169
180 DATA 0,141,0,255,162,31,18
   1,199,157,227,3
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 200,185,0,2,240,46,20
   1,34,208,8,72
220 DATA 165,176,73,255,133,17
   6,104,72,201,32,208
230 DATA 7,165,176,208,3,104,2
   08,226,104,166,180
240 DATA 24,165,167,121,0,2,13
   3,167,165,168,105
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 104,74,74,74,74,168,1
   85,211,3,32,210
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
```

Program 4: Apple Proofreader

By Tim Victor, Editorial Programmer

```
10 C = 0: FOR I = 768 TO 768 +
   68: READ A:C = C + A: POKE I
   ,A: NEXT
20 IF C < > 7258 THEN PRINT "ER
   ROR IN PROOFREADER DATA STAT
   EMENTS": END
30 IF PEEK (190 * 256) < > 76 T
   HEN POKE 56,0: POKE 57,3: CA
   LL 1002: GOTO 50
40 PRINT CHR$ (4);"IN#A$300"
50 POKE 34,0: HOME : POKE 34,1:
    VTAB 2: PRINT "PROOFREADER
   INSTALLED"
60 NEW
100 DATA 216,32,27,253,201,141
110 DATA 208,60,138,72,169,0
120 DATA 72,189,255,1,201,160
130 DATA 240,8,104,10,125,255
140 DATA 1,105,0,72,202,208
150 DATA 238,104,170,41,15,9
160 DATA 48,201,58,144,2,233
170 DATA 57,141,1,4,138,74
180 DATA 74,74,74,41,15,9
190 DATA 48,201,58,144,2,233
200 DATA 57,141,0,4,104,170
210 DATA 169,141,96
```

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 machine langauge (ML) programs from COMPUTE!. 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

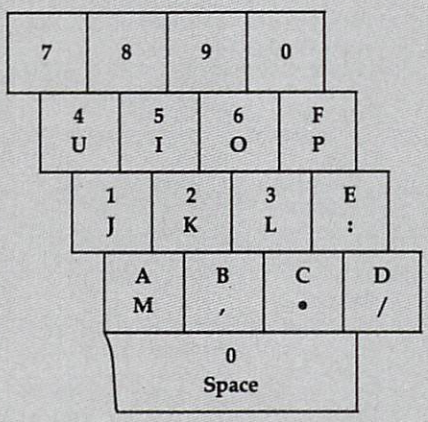
Once you're in Enter mode, MLX prints the address for each program line for you. You then type in all nine numbers on that line, beginning with the first two-digit number after the colon (:). Each line represents eight data bytes and a checksum. Although an MLX-format listing appears similar to the "hex 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, a numeric keypad 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 ensure 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[43";:GOSUB300:SA=A
      D:GOSUB1040:IF F THEN18
      0
GF 190 PRINT"{BLK}{2 SPACES}EN
      DING ADDRESS[43";:GOSUB
      300:EA=AD:GOSUB1030:IF
      {SPACE}F THEN190
KR 200 INPUT"{3 DOWN}{BLK}CLEA
      R WORKSPACE [Y/N][43";A
      $:IF LEFT$(A$,1)<>"Y"TH
      EN220
PG 210 PRINT"{2 DOWN}{BLU}WORK
      ING...";:FORI=BS TO BS+
      EA-SA+7:POKE I,0:NEXT:P
      RINT"DONE"
DR 220 PRINTTAB(10)"{2 DOWN}
      {BLK}{RVS} MLX COMMAND
      {SPACE}MENU {DOWN}[43":
      PRINT T$"{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}[43ARE 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
      [43";: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$,I):GOSUB320:IF
         I<25 THEN GOSUB380:A(I
        /3)=A
PK 570  NEXT:IF A<>CK THEN GOSU
        B1060:PRINT"{BLK}{RVS}
        {SPACE}ERROR: REENTER L
        INE [43]":F=1:GOTO440
HJ 580  GOSUB1080:B=BS+AD-SA:FO
        R I=0 TO 7:POKE B+I,A(I
        ):NEXT
QQ 590  AD=AD+8:IF AD>EA THEN C
        LOSE3:PRINT"{DOWN}{BLU}
        ** END OF ENTRY **{BLK}
        {2 DOWN}":GOTO700
GQ 600  F=0:GOTO440
QA 610  PRINT"{CLR}{DOWN}{RVS}
        {SPACE}DISPLAY DATA ":G
        OSUB400:IF IN$=N$ THEN2
        20
RJ 620  PRINT"{DOWN}{BLU}PRESS:
         {RVS}SPACE{OFF} TO PAU
        SE, {RVS}RETURN{OFF} TO
         BREAK[43]{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
        NAME[43]";IN$:IF IN$=N$
        {SPACE}THEN220
PR 720  F=0:PRINT"{DOWN}{BLK}
        {RVS}T{OFF}APE OR {RVS}
        D{OFF}ISK: [43]";
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$(PEEK(BS+I));:IF ST T
        HEN800
FC 790  NEXT:CLOSE1:CLOSE15:GOT
        O940
GS 800  GOSUB1060:PRINT"{DOWN}
        {BLK}ERROR DURING SAVE:
        [43]":GOSUB860:GOTO220
MA 810  OPEN 1,8,8,IN$+",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}[43]":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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MLX Machine Language Entry Program For Apple

Tim Victor, Editorial Programmer

To make it easier to enter machine language programs into your computer without typos, COMPUTE! is introducing its "MLX" entry program for the Apple II series. It's our best MLX yet. It runs on the II, II+, IIe, and IIc, and with either DOS 3.3 or ProDOS.

A machine language (ML) program is usually listed as a long series of numbers. It's hard to keep your place and even harder to avoid making mistakes as you type in the listing, since an incorrect line looks almost identical to a correct one. To make error-free entry easier, COMPUTE! generally lists ML programs for Commodore and Atari computers in a format designed to be typed in with a utility called "MLX." The MLX program uses a checksum system to catch typing errors almost as soon as they happen.

Apple MLX checks your typing on a line-by-line basis. It won't let you enter invalid characters or let you continue if there's a mistake in a line. It won't even let you enter a line or digit out of sequence. Best of all, you don't have to know anything about machine language to enter ML programs with MLX. Apple MLX makes typing ML programs almost foolproof.

Using Apple MLX

Type in and save some copies of Apple MLX on disk (you'll want to use MLX to enter future ML programs in COMPUTE!). It doesn't matter whether you type it in on a disk formatted for DOS 3.3 or ProDOS. Programs entered with Apple MLX, however, must be saved to a disk formatted with the same operating system as Apple MLX itself.

If you have an Apple IIe or IIc, make sure that the key marked CAPS LOCK is in the down position. Type RUN. You'll be asked for the starting and ending addresses of the ML program. These values vary for each program, so they're given at the beginning of the ML program listing and in the program's accompanying article. Find them and type them in.

The next thing you'll see is a menu asking you to select a function. The first is (E)NTER DATA. If you're just starting to type in a program, pick this. Press the E key, and the program asks for the address where you want to begin entering data. Type the first number in the first line of the program listing if you're just starting, or the line number where you left off if you've already typed in part of a program. Hit the RETURN key and begin entering the data.

Once you're in Enter mode, Apple 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 bytes and a checksum. When you enter a line and hit RETURN, Apple MLX recalculates the checksum from the eight bytes and the address. If you enter more or less than nine numbers, or the checksum doesn't exactly match, Apple MLX erases the line you just entered and prompts you again for the same line.

Invalid Characters Banned

Apple MLX is fairly flexible about how you type in the numbers. You can put extra spaces between numbers or leave the spaces out entirely, compressing a line into 18 keypresses. Be careful not to put a space between two digits in the middle of a number. Apple MLX will read two single-digit numbers instead of one two-digit number (F 6 means F and 6, not F6).

You can't enter an invalid character with Apple MLX. 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), nothing happens. This safeguards against entering extraneous characters. Even better, Apple MLX checks for transposed characters. If you're supposed to type in A0 and instead enter 0A, Apple MLX will catch your mistake.

Apple MLX also checks to make sure you're typing in the right line. The address (the number to the left of the colon) is part of the checksum recalculation. If you accidentally skip a line and try to enter incorrect values, Apple MLX won't let you continue. Just make sure you enter the correct starting address; if you don't, you won't be able to enter any of the following lines. Apple MLX will stop you.

Editing Features

Apple MLX also includes some editing features. The left- and right-arrow keys allow you to back up and go forward on the line that you are entering, so you can retype data. Pressing the CONTROL (CTRL) and D keys at the same time (*delete*) removes the character under the cursor, shortening the line by one character. Pressing CTRL-I (*insert*) puts a space under the cursor and shifts the rest of the line to the right, making the line one character longer. If the cursor is at the right end of the line, neither CTRL-D nor CTRL-I has any effect.

When you've entered the entire listing (up to the ending address that you specified earlier), Apple MLX automatically leaves Enter mode and redisplays the functions menu. If you want to leave Enter mode before then, press the RETURN key when Apple MLX prompts you with a new line address. (For instance, you may want to leave Enter mode to enter a program listing in more than one sitting; see below.)

Display Data

The second menu choice, (D)ISPLAY DATA, examines memory and shows the contents in the same format as the program listing. You can use it to check your work or to see how far you've gotten. When you press D, Apple MLX asks you for a starting address. Type in the address of the first line you want to see and hit RETURN. Apple MLX displays program lines until you press any key or until it reaches the end of the program.

Save And Load

Two more menu selections let you save programs on disk and load them back into the computer. These are (S)AVE FILE and (L)OAD FILE. When you press S or L, Apple MLX asks you for the filename. The first time you save an ML program, the name you assign will be the program's filename on the disk. If you press L and specify a filename that doesn't exist on the disk, you'll see a disk error message.

If you're not sure why a disk error has occurred, check the drive. Make sure there's a formatted disk in the drive and that it was formatted by the same operating system you're using for Apple MLX (ProDOS or DOS 3.3). If you're trying to save a file and see an error message, the disk might be full. Either save the file on another disk or quit Apple MLX (by pressing the Q key), delete an old file or two, then run Apple MLX again. Your typing should still be safe in memory.

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Apple MLX: Machine Language Entry Program

For instructions on entering this program, please refer to "COMPUTE!'s Guide to Typing In Programs" elsewhere in this issue.

```
80 100 N = 9: HOME : NORMAL : PR
       INT "APPLE MLX": POKE 34,
       2: ONERR GOTO 610
CC 110 VTAB 1: HTAB 20: PRINT "S
       TART ADDRESS";: GOSUB 530
       : IF A = 0 THEN PRINT CHR
       $ (7): GOTO 110
8C 120 S = A
E3 130 VTAB 2: HTAB 20: PRINT "E
       ND ADDRESS  ";: GOSUB 530
       : IF S > = A OR A = 0 THE
       N PRINT CHR$ (7): GOTO 13
       0
20 140 E = A
B5 150 PRINT : PRINT "CHOOSE: (E)
       NTER DATA";: HTAB 22: PRI
       NT "(D)ISPLAY DATA": HTAB
        8: PRINT "(L)OAD FILE  (
       S)AVE FILE  (Q)UIT": PRIN
       T
AE 160 GET A$: FOR I = 1 TO 5: I
       F A$ < > MID$ ("EDLSQ",I,
       1) THEN NEXT : GOTO 160
93 170 ON I GOTO 270,220,180,200
       : POKE 34,0: END
AF 180 INPUT "FILENAME: ";A$: IF
        A$ < > "" THEN PRINT CHR
       $ (4);"BLOAD";A$;",A";S
A1 190 GOTO 150
38 200 INPUT "FILENAME: ";A$: IF
        A$ < > "" THEN PRINT CHR
       $ (4);"BSAVE";A$;",A";S;"
       ,L";(E - S) + 1
92 210 GOTO 150
C2 220 GOSUB 590: IF B = 0 THEN
       150
9E 230 FOR B = B TO E STEP 8:L =
        4:A = B: GOSUB 580: PRIN
       T A$;": ";:L = 2
85 240 FOR F = 0 TO 7:V(F + 1) =
        PEEK (B + F): NEXT : GOS
       UB 560:V(9) = C
F2 250 FOR F = 1 TO N:A = V(F):
       GOSUB 580: PRINT A$" ";:
       NEXT : PRINT : IF PEEK (4
       9152) < 128 THEN NEXT
94 260 POKE 49168,0: GOTO 150
CC 270 GOSUB 590: IF B = 0 THEN
       150
48 280 FOR B = B TO E STEP 8
A6 290 HTAB 1:A = B:L = 4: GOSUB
        580: PRINT A$;": ";: CAL
       L 64668:A$ = "":P = 0: GO
       SUB 330: IF L = 0 THEN 15
       0
F9 300 GOSUB 470: IF F < > N THE
       N PRINT CHR$ (7);: GOTO 2
       90
27 310 IF N = 9 THEN GOSUB 560:
       IF C < > V(9) THEN PRINT
       CHR$ (7);: GOTO 290
72 320 FOR F = 1 TO 8: POKE B +
       F - 1,V(F): NEXT : PRINT
       : NEXT : GOTO 150
8E 330 IF LEN (A$) = 33 THEN A$
       = O$:P = O: PRINT CHR$ (7
       );
22 340 L = LEN (A$):O$ = A$:O =
       P:L$ = "": IF P > 0 THEN
       L$ = LEFT$ (A$,P)
E0 350 R$ = "": IF P < L - 1 THE
       N R$ = RIGHT$ (A$,L - P -
        1)
55 360 HTAB 7: PRINT L$;: FLASH
       : IF P < L THEN PRINT MID
       $ (A$,P + 1,1);: NORMAL :
        PRINT R$;
78 370 PRINT " ";: NORMAL
E6 380 K = PEEK (49152): IF K <
       128 THEN 380
C1 390 POKE 49168,0:K = K - 128
5B 400 IF K = 13 THEN HTAB 7: PR
       INT A$;" ";: RETURN
8A 410 IF K = 32 OR K > 47 AND K
        < 58 OR K > 64 AND K < 7
       1 THEN A$ = L$ + CHR$ (K)
        + R$:P = P + 1
C1 420 IF K = 4 THEN A$ = L$ + R
       $
5F 430 IF K = 9 THEN A$ = L$ + "
        " + MID$ (A$,P + 1,1) +
       R$
0A 440 IF K = 8 THEN P = P - (P
       > 0)
93 450 IF K = 21 THEN P = P + (P
       < L)
9D 460 GOTO 330
37 470 F = 1:D = 0: FOR P = 1 TO
        LEN (A$):C$ = MID$ (A$,P
       ,1): IF F > N AND C$ < >
       " " THEN RETURN
BB 480 IF C$ < > " " THEN GOSUB
       520:V(F) = J + 16 * (D =
       1) * V(F):D = D + 1
5F, 490 IF D > 0 AND C$ = " " OR
       D = 2 THEN D = 0:F = F +
       1
08 500 NEXT : IF D = 0 THEN F =
       F - 1
17 510 RETURN
B5 520 J = ASC (C$):J = J - 48 -
        7 * (J > 64): RETURN
AB 530 A = 0: INPUT A$:A$ = LEFT
       $ (A$,4): IF LEN (A$) = 0
        THEN RETURN
6F 540 FOR P = 1 TO LEN (A$):C$
       = MID$ (A$,P,1): IF C$ <
       "0" OR C$ > "9" AND C$ <
       "A" OR C$ > "Z" THEN A =
       0: RETURN
2D 550 GOSUB 520:A = A * 16 + J:
        NEXT : RETURN
28 560 C = INT (B / 256):C = B -
        254 * C - 255 * (C > 127
       ):C = C - 255 * (C > 255)
20 570 FOR F = 1 TO 8:C = C * 2
       - 255 * (C > 127) + V(F):
       C = C - 255 * (C > 255):
       NEXT : RETURN
DA 580 I = FRE (0):A$ = "": FOR
       I = 1 TO L:T = INT (A / 1
       6):A$ = MID$ ("0123456789
       ABCDEF",A - 16 * T + 1,1)
        + A$:A = T: NEXT : RETUR
       N
1F 590 PRINT "FROM ADDRESS ";: G
       OSUB 530: IF S > A OR E <
        A OR A = 0 THEN B = 0: R
       ETURN
0D 600 B = S + 8 * INT ((A - S)
       / 8): RETURN
B6 610 PRINT "DISK ERROR": GOTO
       150
```

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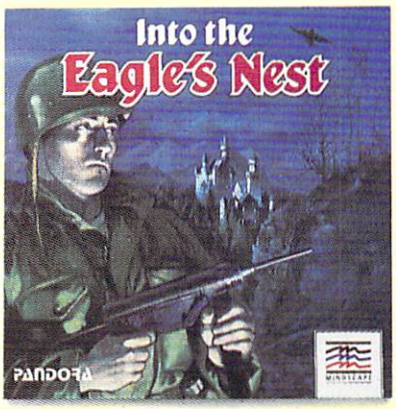

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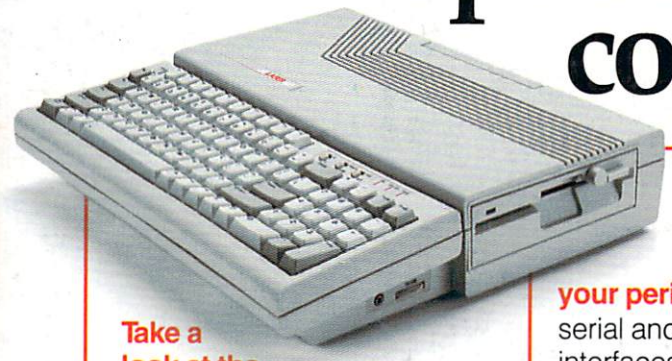

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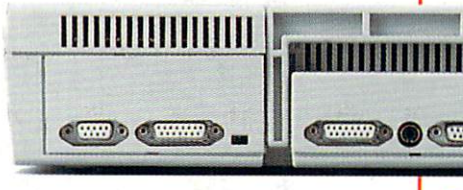

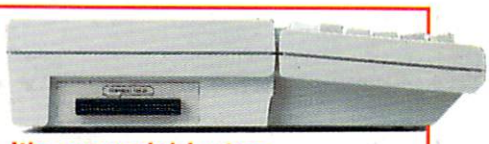

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