WIN
A Dream
Computer System!
See page 69.

Exclusive Interview With Apple's John Sculley

COMPUTE!

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1987
Issue 91
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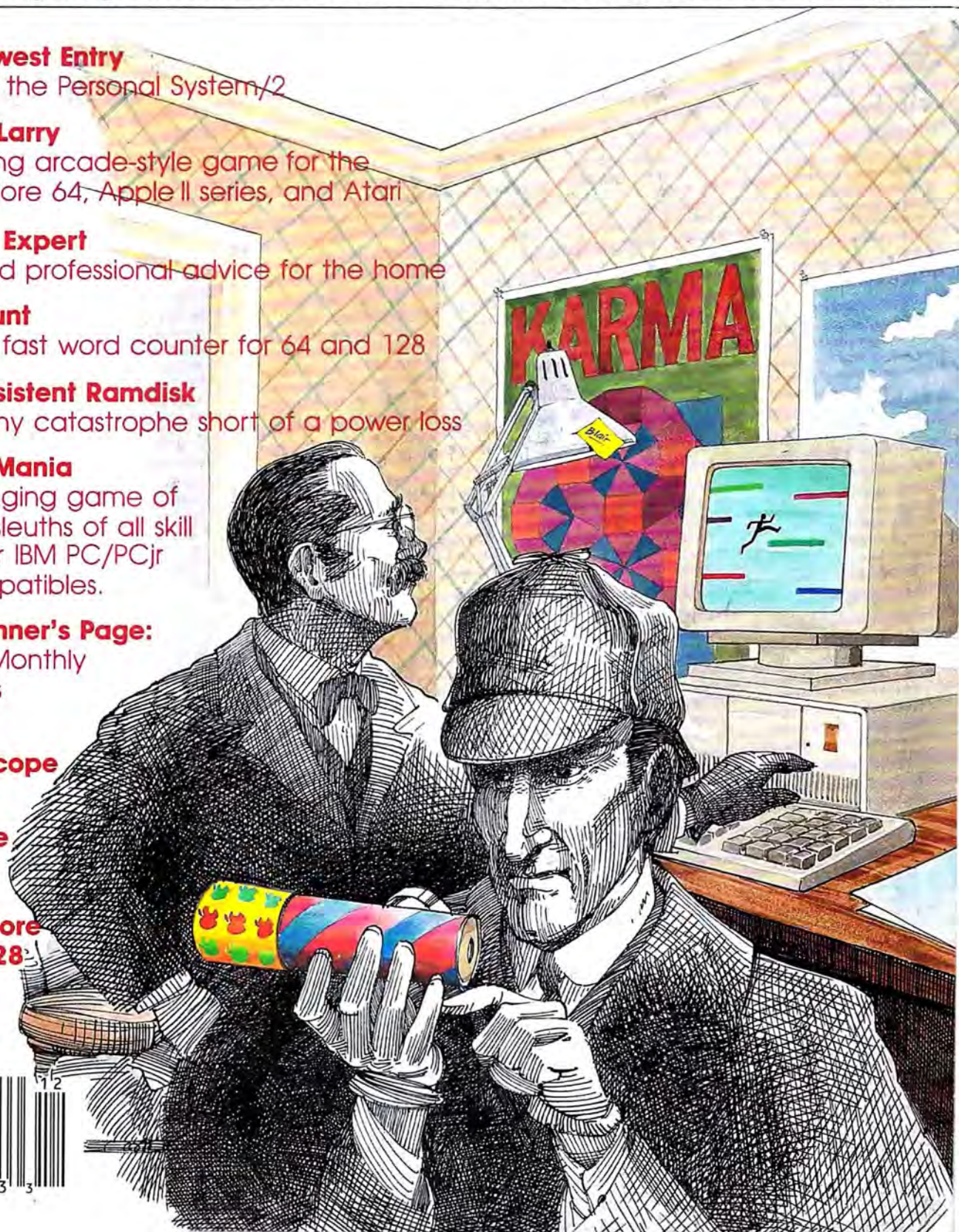

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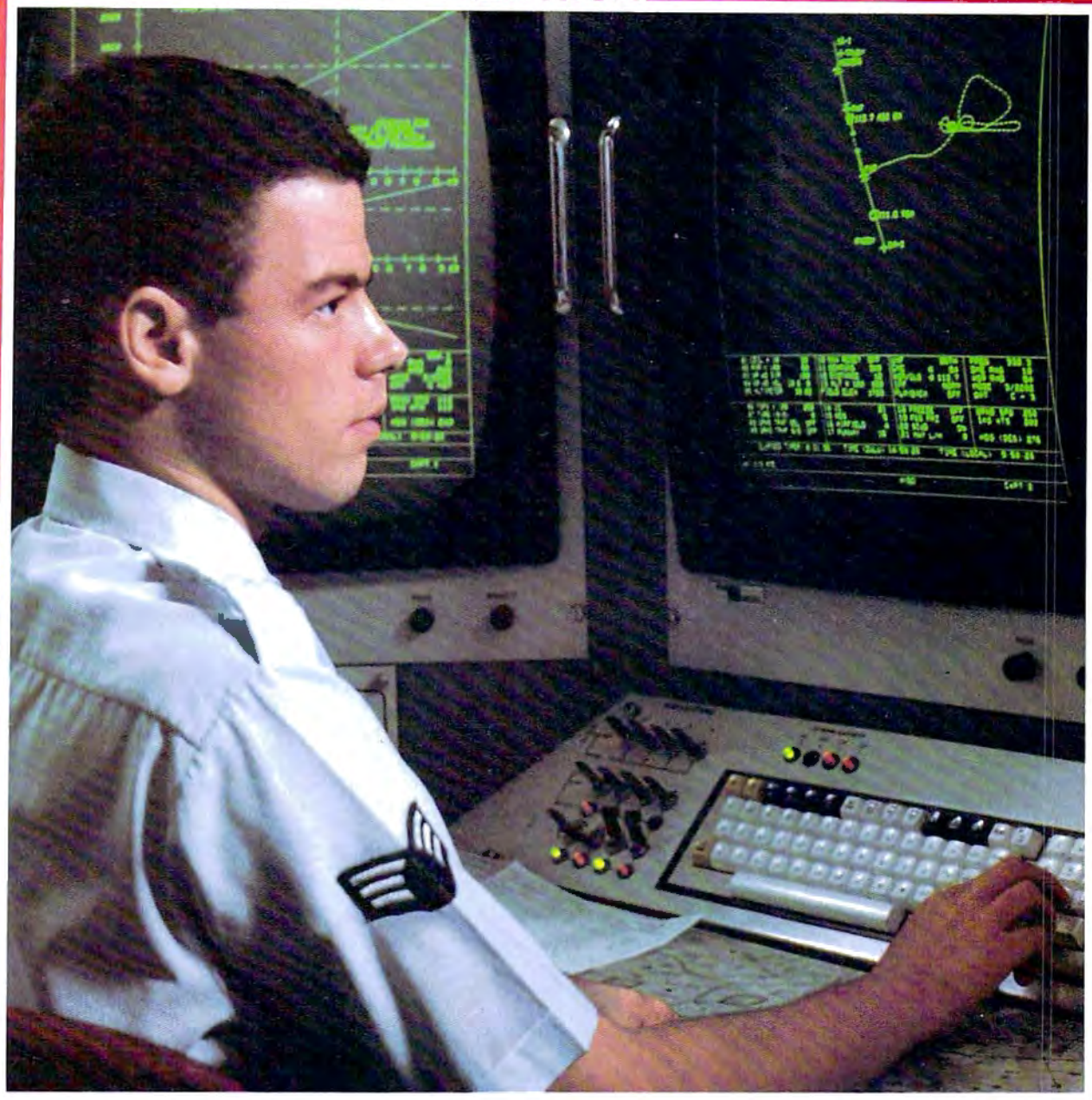

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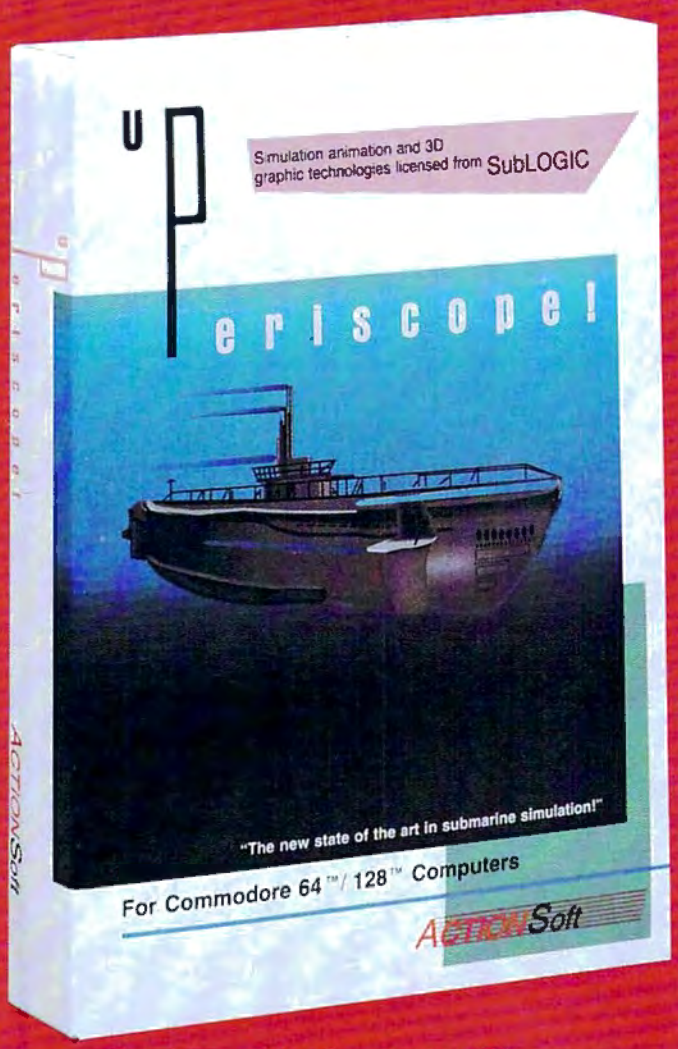

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Split-Screen Views	Yes	No	No	No
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Size of "World"	All U.S. operating areas in Atlantic and Pacific, fully detailed.	Section of Pacific, not all of Japan!	Tiny, imaginary patrol area.	Sections of Atlantic and Pacific Oceans, partial details only.
Time-Date Selection Capability	Yes	No	No	No
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C64 Screens shown. Other computer versions may vary.

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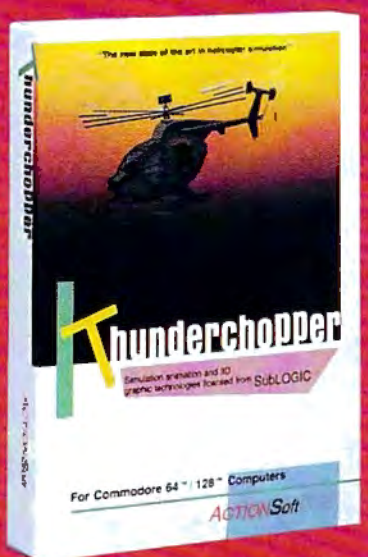

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"I thought my habit was under control, but those guys at Accolade know my weaknesses. Six new titles. Six new ways to experience my wildest fantasies. I told my girlfriend Friday night was off. 'My dog ran away ... uh... and he stole all my money!' She bought it. I bought all the new games.

"Soon all the telltale signs of an Accolade user were there. I played **4th & Inches**, Accolade's action-packed football game. I started wearing a helmet at breakfast. I even sacked the mailman.

"I booted up **Mini-Putt**, the wackiest miniature golf game in the world. The next morning I found myself in golf knickers on the subway. We hit a tunnel and I panicked. I thought I had putted us into Hell's Windmill!

"**Pinball Wizard** turned my computer into a virtual pinball parlor. Not only could I play a bunch of killer pinball games, but I could create them as well. I started answering the phone as 'The Prince Of Pinball.' I bought a cape. I couldn't go to the laundromat 'cause I'd shoved all my quarters in the disk drive.

"**Apollo 18** put me in the spacesuit of an astronaut in a realistic depiction of an actual Apollo moon mission. My neighbor called the cops when I started picking up rocks in his front yard, then stuck a flag in his lawn and claimed his birdbath 'for all mankind.'

"**Test Drive** was no different. It put me behind the wheel of five of the world's most exotic sports cars in a simulation that let me push each car to its limits. The next day I hit a hair-raising 68 mph in my Gremlin and it caught fire.

"Everything came to a head with **The Graphics Studio**, the powerful and easy-to-use paint program. Suddenly, a man who couldn't draw stick figures was transformed into a Michelangelo. I began wearing a little beanie and speaking with a French accent. Some friends stopped by and caught me pasting all of my print-outs on the ceiling.

"So that's my story. My secret lives are all out in the open. My family is trying to rehabilitate me with some other boring recreational software, but it's useless. I still sneak down to the den in the middle of the night for a little 4th & Inches. Hey, once you've played Accolade, you're addicted."

◆

If you know of someone like Arnold P., please feel free to contact us at Accolade. We'll give them details on how to get an "Accolade Addict" T-shirt. Just call 1-800-423-8366. In CA 1-800-732-2212.

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COMPUTE!

DECEMBER 1987
VOLUME 9
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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, **AM** Amiga, **64** Commodore 64, **128** Commodore 128, **PC** IBM PC, **PCjr** IBM PCjr, • General interest

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Editor's Notes

We witnessed a pretty dramatic turnout recently—more than 23,000 people, all of them marching to the tune of the Apple II. The occasion for which they turned out was pretty important—the first Applefest in several years.

The gathering was held in San Francisco, in a spacious convention center filled to bursting with booths and displays showing the very latest in Apple II software, hardware, and peripherals. Best of all, the convention center was filled with *people*, all of them enthusiastic and eager to talk about their computers, their experiences, and the ways in which computing has shaped and will shape their lives.

Part of the excitement flowed from Apple itself. Despite the successful introduction of the IIGS, there had been a subtle sense, on the part of many people, that Apple's heart belonged to the Macintosh. Applefest seemed designed to put those worries to rest. From CEO John Sculley's keynote address (in which he not only reaffirmed Apple's commitment to the II line, but also happily announced an installed base in excess of 200,000 IIGS's) to the show's final moments, the Apple II was center stage—discussed, dissected, displayed—but not dismissed. The audience was predisposed to hear such corporate endorsement of its favorite computer, but that made the endorsement no less welcome.

Applefest itself is solidly reestablished. Next year, there will be two Applefests, one in Boston and one in San Francisco.

Certainly we at COMPUTE! perceive a solid future for the Apple II line. We took the opportunity at our Applefest booth to announce our newest publication, the bimonthly *Apple Applications*. This publication has appeared before in special newsstand-only issues; response to the specials was so strong that we've made it a regular part of our line-up.

During Applefest, we also had the opportunity to interview John Sculley. The result was a wide-ranging discussion that avoided many of the areas too many interviews with Sculley have dwelled upon of late, and touched upon some areas that CEOs usually don't talk about. You'll find that interview in this issue.

For a long weekend, a portion of the computer universe revolved around the Apple II, but the rest of that universe has remained busy. Particularly the world's largest computer manufacturer, IBM. In this issue, we take a look at IBM's newest line, the Personal System/2. While it's no longer true that "wherever Big Blue goes, the rest of computers follow," IBM does exert a large and ongoing effect on microcomputers.

One thing we did note at Applefest was an increased awareness that differences among computers and operating systems matter less and less. Successful software on one system tends to be ported to other systems. Several companies at Applefest were showing add-on boards that allow Apple IIs to run MS-DOS software. Several IBM compatibles and peripherals manufacturers are marketing boards that let clones run Apple software. Business networks are increasingly open to intercommunication among many types of computers.

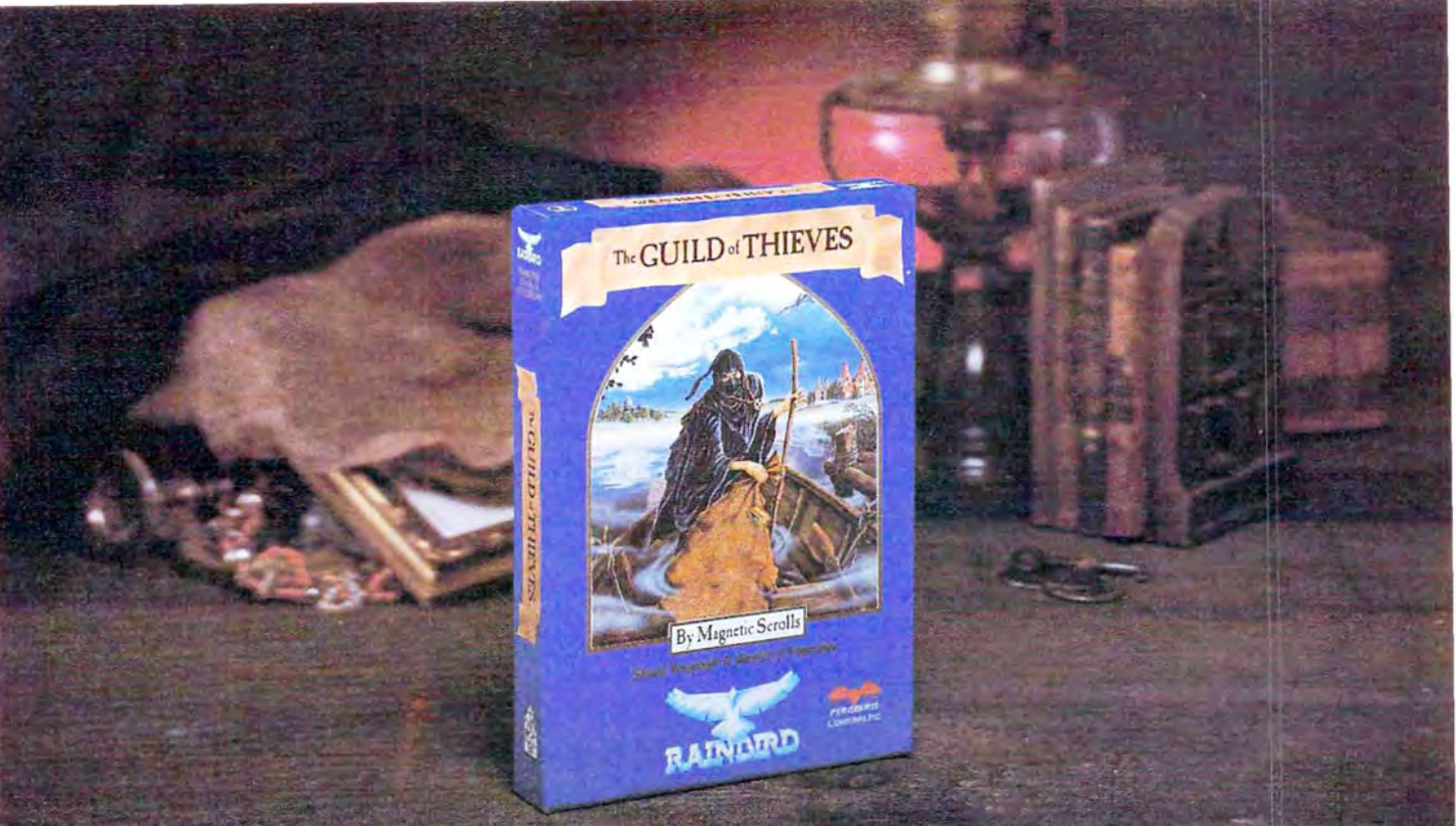
The Apple II owners at the show were, naturally, partisan toward the computer of their choice, but then so are the PC owners we've talked with elsewhere, and the ferociously loyal Commodore owners, and the Amiga, ST, and Macintosh users. It's natural that computer owners identify with their particular model, especially in this brand-specific society.

But there's also an awareness expressed by most of the people we speak with that they are part of something larger than their own brand. We are moving rapidly into an age of trans-brand computing. Users who regularly go online are accustomed to conversing with other users on wholly different computers. They might not be able to swap software, but they can swap ideas and insights, and trade attitudes and opinions. And it's something they're interested in doing.

COMPUTE! is one of the longest lived of the computer magazines, and the only remaining consumer computer publication that takes a cross-brand stance. Our machine-specific publications address issues and applications related to their designated computers. At COMPUTE!, we try to cover the whole field of personal computing. Thus, an interview with John Sculley stands alongside a look at IBM's latest models; our programs are provided in formats for each of the major home computers; framing it all is considered commentary that addresses issues and options touching all of us who enjoy microcomputers and are committed to the future of personal computing.

It's a nice position to be in, and one that we know many of you share. You're aware that *any* personal computer is a tool of such sophistication and power that only governments possessed just a few years ago. The proliferation of *all* personal computers can only help each of us further achieve our personal goals.

Keith Ferrell
Features Editor



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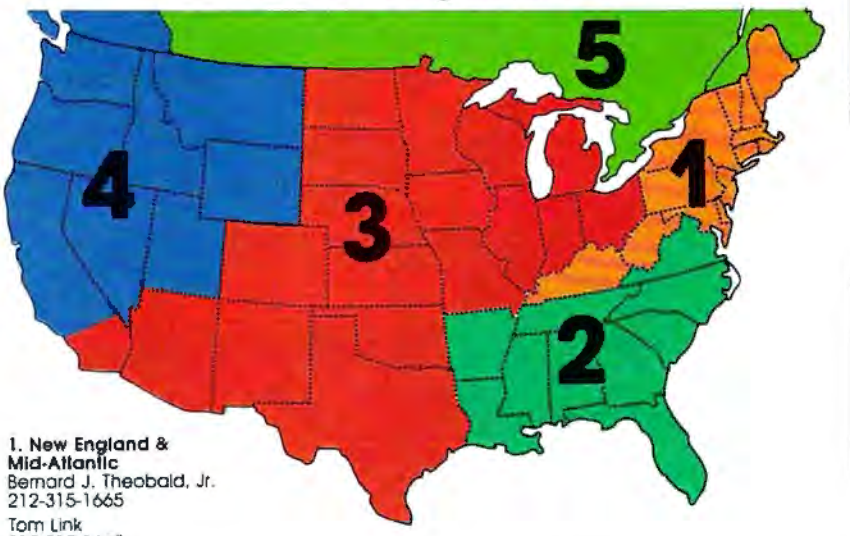

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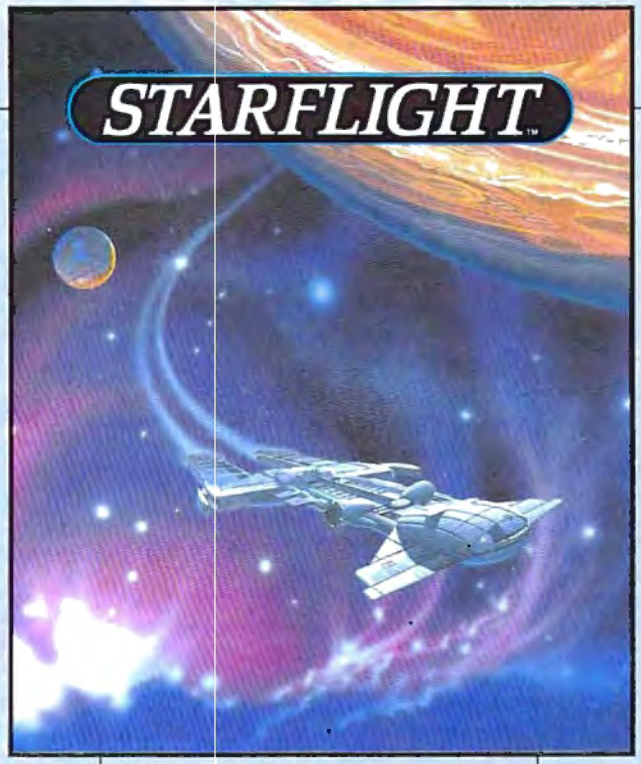

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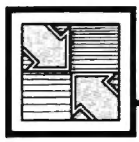

Readers Feedback

The Editors and Readers of COMPUTE!

If you have any questions, comments, or suggestions you would like to see addressed in this column, write to "Readers' Feedback," COMPUTE!, P.O. Box 5406, Greensboro, NC 27403. Due to the volume of mail we receive, we regret that we cannot provide personal answers to technical questions.

My Computer Can't Count

My computer can't seem to count correctly. A program I'm writing in BASIC needs to display a timer adding by tenths. No matter which way I try to do it, I end up with numbers that have long strings of 9s after them. Here's an example program:

```
10 A=0
20 PRINT A:A=A+.1
30 GOTO 20
```

Can you help me with this problem?

Jeremy Zaucha

Try the above program on your computer. The Atari eight-bit series handles it properly, but most other microcomputers (64, Apple II, IBM, Atari ST, and Amiga) have difficulties. The problem occurs when the BASIC interpreter converts your base 10 (decimal) number to base 2 (binary) and back. All math operations are done in binary, while all display is done in decimal. Another way to understand this problem is by trying to add ⅓ to a number. As a decimal number, ⅓ becomes .3333333... where the 3s trail on to infinity. Since you can't include all these 3s in the calculation, your answer won't be totally accurate. Repeated calculations make the cumulative error larger.

Some BASICs have double-precision variables which do a better job for the type of task you are attempting. The Atari eight-bits solve the problem by using binary-coded-decimal (BCD) numbers. This means that Ataris store values as decimal numbers. This is the same approach used by several "business" BASICs for the IBM PC.

Here's one solution to your problem:

```
10 A=0:T=0
20 PRINT A:T=T+1:A=T/10
30 GOTO 20
```

All additions are done with integers. Whenever you want to print the number, divide it by 10.

Simulating An Apple

I am trying to locate a machine language simulator for the Apple II family which I recall having seen about two years ago. The simulator I have in mind breaks each operation into micro-operations, displaying them on the screen as their execution is demonstrated.

My problem is that I've forgotten the name of this program. Can you help me find it?

Charlotte J. Chell

It sounds like you're looking for The Visible Computer: 6502 *for the Apple II series. This product does just what you describe and is an excellent learning tool. You can order the simulator from Software Masters, P.O.Box 3638, Bryan, TX 77805 for $49.95 plus $3 shipping and handling. Software Masters also publishes microprocessor simulators for the Commodore 64 and IBM PC.*

FORTRAN For The 64

I am interested in running FORTRAN on my Commodore 64. To do this I understand I need the CP/M cartridge. Where can I get one?

Randy Boss

When Commodore first introduced the 64, one of its big drawing cards was the fact that CP/M compatibility was promised for the machine. When the CP/M cartridge and software for the 64 finally arrived, many people were disappointed. The 64's CP/M still used 40 columns (most CP/M software requires 80), had a slow disk drive (CP/M uses the disk a lot), was unable to read any standard CP/M disk formats, and the operating system didn't implement the user port—you couldn't use a modem, for example. (We should note that Commodore addressed every one of these complaints in their first-rate implementation of CP/M on the 128.)

Since the 64 couldn't read any of the usual CP/M disk formats and had some limitations, Commodore arranged to release special versions of two of Ellis Computing's best-selling CP/M packages: Nevada COBOL *and* Nevada FORTRAN.

*The 64 CP/M cartridge and the Nevada software packages were only manufactured for a short time, and neither is currently available. There is a new FORTRAN system that does not require the CP/M cartridge—*64-Tran, *from Trident Software. It is an enhanced FORTRAN development environment tailored to the 64. The suggested retail price of this package is $50. For more information, contact Trident Software, P.O. Box 180, Glenelg, MD.*

Apple DOS 3.3 Quirks

I own an Apple IIc. When writing programs, I often use the GET statement like this:

```
80 GET A$
90 PRINT CHR$ (4) "RUN PROGRAM"
```

When I run this and press a key, however, all the program does is print RUN PROGRAM to the screen. It does not run the program specified. Can what I'm trying be done?

Daniel Markarian

Your problem is inherent to DOS 3.3. A good rule of thumb when accessing DOS 3.3 from BASIC is to precede all disk commands with a single PRINT statement. To fix your program, simply insert the following line:

```
85 PRINT
```

If you use ProDOS, you do not have to prefix DOS commands with a PRINT. Only DOS 3.3 has this little quirk.

Compatible Graphics

I am writing to ask if you have any information on the Hercules monochrome graphics card. Can BASICA or Logo programs access the graphics card?

Timothy Hansell

I have an IBM XT clone. Once I started programming in BASICA, I found that I was not able to get any graphics even though I had a Hercules Graphics Adapter. My dealer suggested I buy an EGA (extended graphics adapter) which he said would solve my problems. Can you tell me a more reasonable alternative to buying an EGA card?

Ishan Joshi

The Hercules Graphics Adapter can produce beautiful monochrome graphics, but it doesn't respond to BASICA's graphics commands. To produce graphics on the Hercules card you normally must program it pixel

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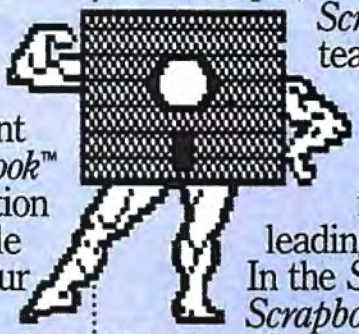

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by pixel in machine language, or in a high-speed compiled language like C. There is, however, a solution to your problem that doesn't involve buying a new monitor and video card.

SIMCGA *by Chuck Guzis allows a Hercules card to emulate a CGA. With* SIMCGA *you can use all your favorite BASICA graphic commands and run commercial programs—like* Flight Simulator*—that require a CGA card. There are both public domain and commercial versions of this program.*

Atari Corp.
1196 Borregas Ave.
P.O. Box 3427
Sunnyvale, CA 94088-3427

Indivisible

I have an Atari 800XL. How can I redefine a pixel in graphics mode 5? If I could do this, it would be easy to get 80 columns of text.

D. Botha

Unfortunately, you cannot redefine a pixel. The word pixel is short for picture element. *It is the smallest element that you can address in any graphics mode. Even if you could redefine the pixel, 80-column text would be nearly impossible to read on a television and not very legible on a composite monitor.*

Atari has been showing an 80-column adapter (the XEP80) for the Atari eight-bit computers. We haven't seen one yet, but it is supposed to display very readable text on an inexpensive monochrome monitor. The suggested retail price for the XEP80 is $79.95. Contact Atari for details.

No Easy Way To Color

I recently purchased an Atari 1040ST with a monochrome monitor. Color was not a major concern at the time. After reading about the computer in COMPUTE!, I expected it to have an RF modulator. Well, there's no modulator and I can't afford an RGB monitor. Do I have any other options?

Scott Berkey

The 1040ST was designed to accommodate an RF output, but at the last moment it was taken out, probably for cost considerations. The 520ST does have an RF modulator.

Although Atari's RGB monitor provides better color and sharper graphics than any alternatives, it is expensive. Cables To Go and Practical Solutions are two companies that market cables to let you use alternative monitors. For instance, Practical Solutions advertises a $14.99 cable that interfaces the Atari RGB output to a composite monitor. Since composite monitors are less expensive than their RGB counterparts, this might be a good solution for you, especially if you already have a composite monitor that you were using with an eight-bit computer like the Atari 800 or Commodore 64. This cable also should work with a VCR or TV/monitor.

Cables To Go
4215 N. Main, Suite 201
Dayton, OH 45405

Practical Solutions
1930 East Grant Rd.
Tucson, AZ 85719

Conversion One-Liners

I need a program for my Apple IIc that will convert hexadecimal numbers to base 10 and vice versa. I don't know where to start. Could you show me a BASIC program that does this?

David Kilzer

The two one-line subroutines listed below should do what you need. They were written under Applesoft BASIC, but should work with other BASICs with one small change, detailed below. The first one, numbered 1000, is adapted from line 580 of COMPUTE!'s "Apple MLX" program. It takes a decimal value, stored in the variable A and creates a four-digit hexadecimal equivalent in the string variable A$, with the assumption that A is a positive integer between 0 and 65535. To use it, just set A to the value you want to convert and GOSUB 1000. You can PRINT A$ to see the result.

A little bit about how it works: The subroutine is made from a single FOR-NEXT loop with the variable I acting as a loop counter. On each cycle of the loop, it adds one hexadecimal digit to the left side of A$, so A$ has to be set to null before the loop starts (A$ = ""). Within the loop, the operation T = INT (A / 16) creates a new value equal to A without its rightmost hex digit (that is, if A equaled 20178—$4ED2 in hex—it would set T to 1261—hex $4ED). The next statement finds the digit missing in T and uses the MID$ function to add it to A$. Having created one digit, the same thing is done for the next digit to the left by setting A = T and repeating the loop.

The second subroutine, numbered 2000, works in the opposite way. It accepts a four-digit hex number in A$ and produces the decimal equivalent in A. This routine is a condensed version of lines 520, 540, and 550 from Apple MLX.

*Again, a FOR-NEXT loop using the variable I is the main structure. On each loop, the decimal equivalent of a hex digit will be added to the variable A, moving from left to right through the string, so A is set to 0 before the loop starts. The MID$ operation selects a single character from the string, and the ASC function converts it into the equivalent ASCII code in the variable J. Since the ASCII code for the numeral 0 is 48, the following statement subtracts 48 from J, converting it to its actual value. But there's one catch: The ASCII code for the letter A, 65, is 8 greater than the code for 9, which is 57. In hex notation, these should differ only by 1. To compensate, an additional quantity of 7 is subtracted from the larger values. The expression 7 * (J > 64) accomplishes this since the condition within the parentheses evaluates to the number 1 if it's true and 0 if it's false. Note: This is the only statement in these two programs that won't work on Commodore and PC-compatible computers, since those versions of BASIC produce a −1 when a conditional expression is true. To adjust for this difference, change the subtraction operation to an addition.*

```
1000 A$ = "": FOR I = 1 TO 4:T = INT
     (A / 16):A$ = MID$ ("0123456789
     ABCDEF",A - 16 * T + 1,1) + A$:A
     = T: NEXT : RETURN

2000 A = 0: FOR I = 1 TO 4:J = ASC (
     MID$ (A$,I,1)):J = J - 48 - 7 * (J >
     64):A = A * 16 + J: NEXT :
     RETURN
```

Learning To Drive

I am just finishing my driver's course and I'm wondering if there is a driving simulator on the market. It should be as true to life as possible—just like the flight simulators are. This program could improve my reaction time and overall driving skills.

Mike Hofmann

Racing simulations have been popular for years. Programs like Pole Position *(Atarisoft),* Pit Stop *(Epyx), and* Auto Duel *(Electronic Arts) provide excitement and action, but lack settings for driver training. Accolade's new* Test Drive *may be more up your alley—it provides a less frantic setting for driving.*

Printer-Only Output For The Apple

I own an Apple II+ and a dot-matrix printer. Whenever I send something to my printer, the output is also sent to the screen. Is there any way to stop the screen output?

Richard J. Kuhn

Almost every printer interface for the Apple uses the same command for turning off video output. To issue this command, you must first open the printer for output with a PR#4. Next, print a CTRL-I (CHR$(9)) followed by the desired printer interface command. In your case, you want to send the three characters 80N, telling the interface to print 80-column text and to turn off video output. The following program illustrates this technique by printing a

familiar sentence to the printer, and not the screen.

```
10 PRINT
20 PRINT CHR$ (4) "PR#4": REM OPEN
   PRINTER FOR OUTPUT
30 PRINT CHR$ (9) "80N": REM 80-
   COLUMN TEXT/NO VIDEO
   OUTPUT
40 PRINT "THE QUICK BROWN FOX
   JUMPED OVER THE LAZY DOG."
50 PRINT CHR$ (4) "PR#1": REM
   RESET 40-COLUMN SCREEN AS
   OUTPUT DEVICE
```

There are several standard printer interface commands available to Apple owners. All are preceded by the CTRL-I command character. It is even possible to send these commands directly from the keyboard. For example, if you use a serial printer you can change your interface's baud rate to 9600 from immediate mode by typing the following lines (press RETURN after each line):

```
PR#4
CTRL-I 14B
PR#1
```

This changes your serial interface's output to 9600 baud, overriding whatever baud rate the dip-switch settings may specify. Of course, turning your computer's power off and on resets the interface to its default condition.

Typewriting

I recently purchased the Commodore MPS-803 printer and connected it to my Commodore 64 computer. I have been trying to figure out how to print directly from the computer keyboard to the printer. In other words, type a key and have it shown on the screen and printed immediately.

F. Matt Ford

The following command sends each line to the printer when you press RETURN. It works on a 64 with most printers. Type it in direct mode (without a line number). All commands will be interpreted. For example, if you type LIST, your program will be listed to the printer.

```
OPEN 4,4:CMD 4
```

Since you want each character to be sent to the printer as you type, you'll have to type in this short BASIC program:

```
10 OPEN 4,4
20 GET A$:PRINT A$;:PRINT#4,A$;
30 GOTO 20
```

Type RUN to begin. Each letter you type is sent to the printer. On many printers, this will produce the effect you desire: The printer will echo your typing just like a typewriter. However, some printers hold characters in an internal buffer and print them on paper only when the buffer is full or when a carriage return character is sent to the printer. If your printer falls into this

category, each line of your typing will be printed only after you press RETURN. When you've finished typing, press RUN/STOP and then type CLOSE 4 in direct mode.

Pound Cakes On The 64

I'm writing a recipe database program on my 64 for my mother and have run into a snag. The program, as written, stores recipes to disk as sequential files. The £ symbol, placed prior to each filename, marks it as a recipe file (that is, £CAKES). Problems occur when my mother wishes to reload a recipe file but can't recall its name. Can you give me a routine that will examine the directory and display only the recipe files (those beginning with a £)?

Ryan Desjarlais

To read and display only the filenames in the directory that begin with a £, add the following subroutine to your main program. Then simply insert a GOSUB 1000 just prior to your load and save routines.

```
QC 10 REM SUBROUTINE THAT PRIN
      TS "£" FILES FROM THE D
      IRECTORY
MR 1000 GOSUB1210:GOSUB1170
JD 1010 GET#2,A$,B$
RG 1020 GET#2,A$,B$:GET#2,A$,B
        $
KF 1030 A=0:IFA$<>""THENA=ASC(
        A$)
HF 1040 IFB$<>""THENA=A+ASC(B$
        )*256
GA 1050 PRINT"{9 RIGHT}{RVS}"M
        ID$(STR$(A),2);TAB(12)
        ;"{OFF}";
HH 1060 GET#2,B$:IFST<>0THENPR
        INT" BLOCKS FREE":GOTO
        1160
GG 1070 IFB$<>CHR$(34)THEN1060
JS 1080 GET#2,B$:IFB$<>CHR$(34
        )THENPRINTB$;:GOTO1080
AC 1090 GET#2,B$:IFB$=CHR$(32)
        THEN1090
RE 1100 PRINTTAB(28);:A$=""
CK 1110 A$=A$+B$:GET#2,B$:IFB$
        <>""THEN1110
EG 1120 PRINT"{RVS}"LEFT$(A$,3
        )
CR 1130 GETA$:IFA$<>" "THEN115
        0
FC 1140 GETA$:IFA$<>" "THEN114
        0
AK 1150 IFST=0THEN1020
MS 1160 GOSUB1220:RETURN
JC 1170 INPUT#15,A$,B$,C$,D$:I
        FVAL(A$)=0THENRETURN
FM 1180 PRINTA$,B$,C$,D$:PRINT
        "{DOWN}PRESS ANY KEY T
        O TRY AGAIN."
BP 1190 GETC$:IFC$=""THEN1190
XJ 1200 GOSUB1220:GOSUB1210:RE
        TURN
PX 1210 OPEN15,8,15:OPEN2,8,0,
        "$0:£*":RETURN
HD 1220 CLOSE2:CLOSE15:RETURN
```

This subroutine first opens the error channel (15) and a channel (2) through which to read the directory of £ programs. Should any errors occur at this point (that is, if the disk is not formatted or not in the drive, and so on), a description of the error will print to the screen. After attending to the problem, you can start over by pressing any key.

Once the subroutine begins to read in filenames, you can press the space bar to pause the routine. This is handy should your list of filenames exceed one screen. To continue reading the directory, press the space bar again.

When the routine is done, it returns you to your main program.

Note To Readers

In last month's feature "The Future of Computer Games: Ten Industry Leaders Speak Out," two pairs of photos were inadvertently interchanged: Mark Beaumont of Activision and Michael Dornbrook of Infocom (pp. 14, 20); and Roger Buoy of Mindscape and Thomas Frisina of Accolade (pp. 15, 21). COMPUTE! regrets the error.

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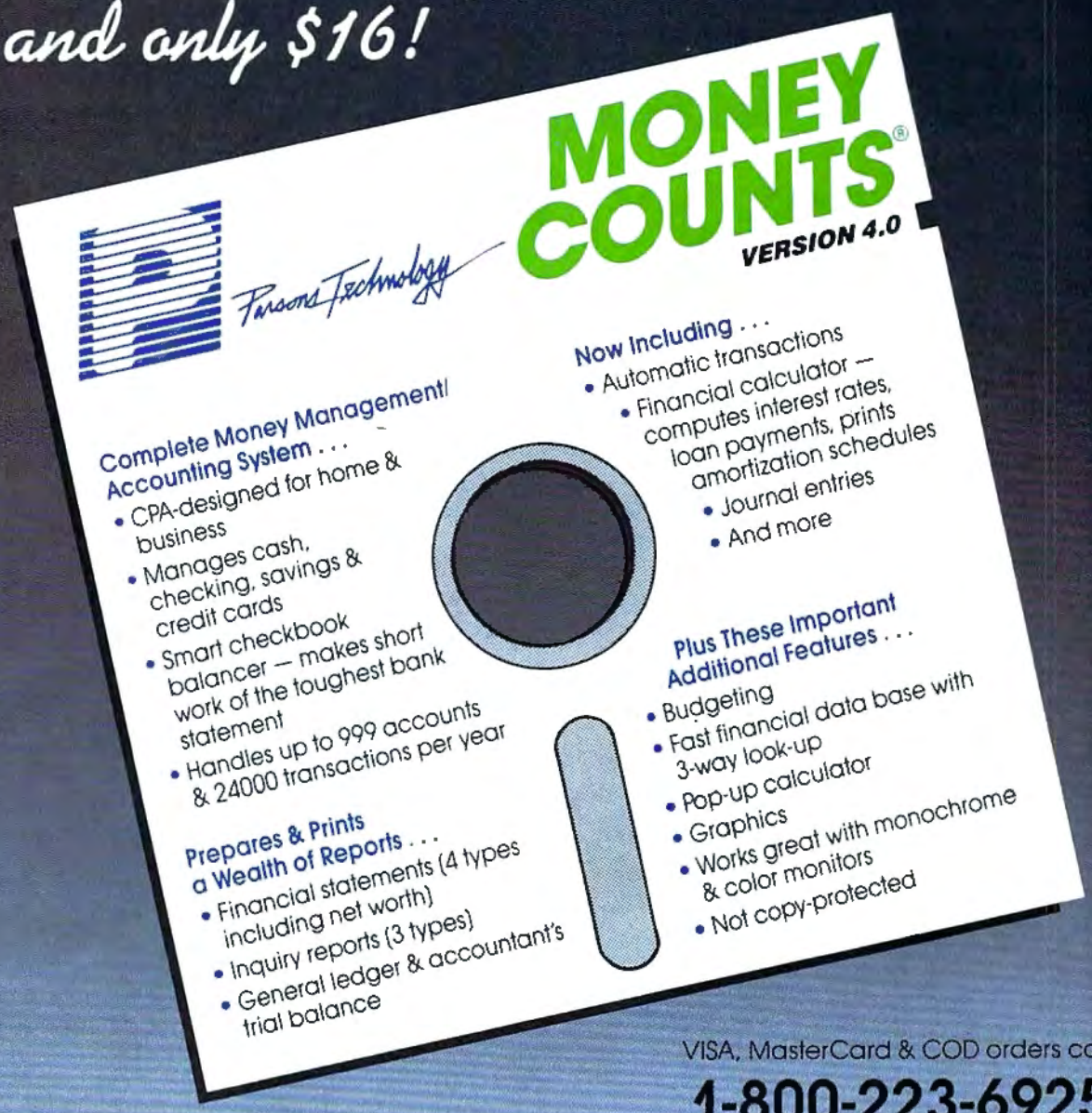

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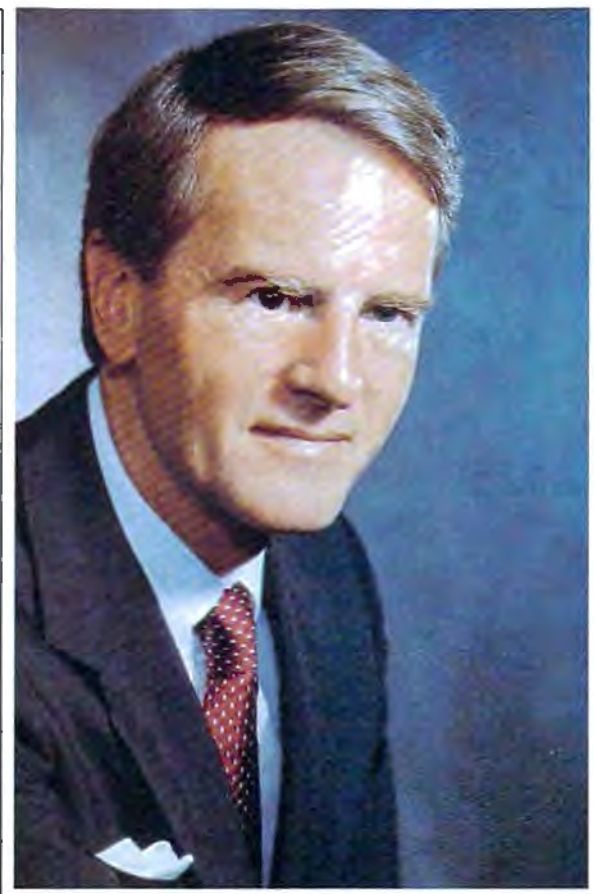
Out To Change The World:
A Conversation With John Sculley

Keith Ferrell, Features Editor, and Selby Bateman, Associate Publisher

John Sculley, Chief Executive Officer of Apple Computer, is a man more interested in ideas and innovation than traditional top management concerns. In conversation, he comes across as very much a visionary, someone more interested in extrapolating the consequences of decisions over decades than in financial matters. Of course, Apple's ongoing success, and its emergence from a period of crisis, show that Sculley's also a brilliant manager and businessman. That should come as no surprise. The two sides of John Sculley are really one—he is a man passionately interested in the future.

This sense of long-term thinking, of forward rather than simply current planning, served Sculley well at Pepsi-Cola, where he served as president. Pepsi was in many ways a traditional, structured American corporation. Even there, though, Sculley was different from the classic organization man. His childhood interest in electronics and technology helped him foresee the transition that Pepsi—and all other corporations—must make as the world moved from the Industrial Age into the Information Age.

His vision was matched by an almost uncanny marketing sense. It was during Sculley's tenure at the helm of Pepsi that the company introduced such strokes of marketing genius as The Pepsi Challenge, *transforming generational and lifestyle differences into market opportunities. This approach not only greatly boosted Pepsi's fortunes—it also had a dynamic effect on all of consumer advertising and marketing, an effect that can still be seen today.*



Five years ago, Sculley left the traditional East Coast corporate world behind. Handpicked to head Apple's management, Sculley entered the world of computers—and crisis. During the personal computer shakeout of the mid-1980s, there was a real risk that Apple—one of the most successful startups in history—would be severely damaged, if not destroyed.

John Sculley guided Apple through that crisis and the company emerged triumphant—stronger and more innovative than ever. The emergence, however, was not accomplished without pain, both personal and professional.

Now Sculley has written a book about his managerial and personal journey from the structured life of an industrial age company head, to the idea-based life of a man immersed in the birth of the information age. Odyssey: Pepsi to Apple *(just published by Harper & Row, and cowritten with John A. Byrne) is as much an account of ideas as of events. That Sculley thinks deeply about Apple's vital business interests is obvious throughout the book. That he also devotes much of his time to contemplating the consequences of the information revolution is equally clear.*

COMPUTE! spoke with John Sculley in San Francisco, in a conversation that ranged from computers to classrooms to corporations and business education. We found him to be articulate on every subject he approached, a man who does not let his commitment to vision overshadow the necessity of learning details.

We began by discussing his new book.

COMPUTE!: *What were your goals as you sat down to write* Odyssey?

Sculley: This book was written for people who are going to spend most of their lives in the twenty-first century. Apple is a company which has an average age of 29—so many of our people are going to spend most of their lives in the next century. It's only 13 years away. I felt that the world has passed through a transition from the Industrial Age to the Information Age, and, having run companies in both worlds, I felt I had a unique point from which to observe that transition. I felt that this was a perspective that might be useful.

COMPUTE!: *Books obviously have been important to you; your love of books is reflected throughout* Odyssey. *What would your advice be to young people who are discovering the power of computers, perhaps to the exclusion of the written word?*

Sculley: The wonderful experience you can have with books is that they open your mind to new experiences and discoveries that you might not have in your ordinary day-to-day experience. Life is really more than just episodes of what you do—it's being able to view the world ahead of you from the perspective of other people's eyes. That's what books allow you to do. They let you see life through many different lenses.

COMPUTE!: *How do we avoid the trap of having computers turn into just another TV screen? In what ways can computers contribute to literacy?*

Sculley: I think we have a serious challenge ahead, as well as a wonderful opportunity.

The challenge is that young people aren't reading books as much as they used to. We have become more dependent upon television for our information, but television is a very passive medium. You sit in front of it and don't have to interact with it.

The fundamental difference of computers is that by their nature you have to interact with them in order to make them perform. If we can take that idea—which is still relatively primitive; we're still just at the beginning of the personal computer age—and imagine what it might be as technology evolves, then I think we can see that there are some really wonderful things in store for us.

COMPUTE!: *H.G. Wells once wrote that civilization is a race between education and catastrophe. We gather that you're betting we'll win the race.*

Sculley: Yes. And that's another very good example of why it pays to read.

COMPUTE!: *What sorts of things do you foresee?*

Sculley: I try, in *Odyssey*, to envision a product called the *Knowledge Navigator*, which says that if we could make the process of learning as entertaining as *Star Wars*, or MTV, or video games, and combine the interactive process of computing, then we might come up with a wonderful new machine that will let people navigate through knowledge in incredibly interactive, yet entertaining ways. That's something that is very much possible, in terms of where technology is going to be around the turn of the century.

The challenge is how we use this wonderful machine to be able to revolutionize our entire educational system.

COMPUTE!: *Apple's new product, Hypercard, has attracted a lot of attention as an example of the sort of interactive software that will ultimately make the Knowledge Navigator possible. Underlying it are echoes of hypertext—the linkage of all information into an easily accessible base. You've called for a Hypercard for the* IIGS. *Are we now seeing the foundations laid for the sort of educational technology you speak of?*

Sculley: Yes. Almost all of the ideas that are imbedded in personal computers today, whether the IIGS or the Macintosh, have their roots back in the 1960s. The one fundamental idea that didn't make it across from the sixties, was hypertext. I felt very strongly that hypertext had to be in the roots of future technology.

When Bill Atkinson came forth with this wonderful idea of taking hypertext and turning it into a technology that we could incorporate into our computers, I was very enthusiastic and supportive.

As we look at computers in the next century, *Hypercard* will be one of the root technologies, without question.

COMPUTE!: *Do we run the risk of hypertexting changing in fundamental ways the nature of knowledge? Will the continuous flow of knowledge and culture be transformed into a collection of* snippets, *hypertexted together by key phrases rather than concepts?*

Sculley: No, I think that what *Hypercard* will do is rather let us avoid the problem of information doubling every three to four years. Database technology so highly structures, and is so highly procedural in the way that you have to access information that we run the risk of forcing people into a very structured way of retrieving information. That may discourage people from wanting to do it in the first place.

Hypercard makes the process of organizing information and accessing information completely natural and intuitive. That's really what you want to have as a fundamental concept if you want to pursue interactive video and multivideo learning. You can discover the contrasts and comparisons between different subjects which may have no other relationship than your own curiosity.

COMPUTE!: *One of the fundamental concepts underlying your book is the importance of innovation. Innovation is obviously key to something like Hypercard, hypertext, and the*

Knowledge Navigator. Can schools teach innovative thinking, or is innovation up to the individual?

Sculley: I think schools can do a tremendous amount with innovation. I've seen this with some of the experiments Apple has been involved with. In one of the Open schools in Los Angeles that we sponsor, they are doing some wonderfully innovative things with learning and computers. I believe that schools have to provide an environment that *encourages* people to be innovative.

How can we train people to develop their creative skills? To become builders, and not just administrators? There's a real need for our schools to develop sort of a *right brain tilt.* We need to look at the creative side of the mind as a real resource for the entire country, which will produce huge gains in productivity in a generation or so.

COMPUTE!: *Along the same lines, how can business schools encourage the levels of innovation needed to keep corporations strong? What lessons does Apple's success offer to American business?*

Sculley: One of the contrary ideas that Apple has brought forth, which corporate America hasn't been quite able to understand, is that work can be fun. If what you are doing is fun and interesting, the chances are that you're not only going to be more innovative, but you're probably going to be more personally productive.

This is a fairly simple but a fairly revolutionary idea, as far as business is concerned. Business schools don't really talk much about work being fun. Business schools focus on analytical skills, on case histories of what *was.*

COMPUTE!: *How do we avoid this? What areas should American business and business education address in order to better foster creativity and innovation?*

Sculley: There is a tendency in American business not only to institutionalize the process of business, but also to specialize. And that means that individuals find themselves forced into a more narrow perspective on business, without having a chance to zoom out and look at how the whole comes together.

I believe that much of the business school curriculum that we have today gives too much emphasis to the specialization of skills—and too much focus on where we've come from—as opposed to giving people the perspective that creativity, innovation, and building are the skills that are really going to make a difference, not only in business in general, but in their own performance in the future.

And that's a very contrarian idea.

COMPUTE!: *As you point out in your book, businesses tend to resist change except in those periods when there's a crisis that points out that the traditional isn't working. At Pepsi you approached problems such as this from a marketing perspective. Is marketing the direction from which innovation flows?*

Sculley: I never set out to be a businessman. My emphasis was always on design and architecture. I think that in some sense I had an advantage because I was always looking for a way to interpolate what I was being asked to do into terms that I was most interested and comfortable with.

Even though I had gone to business school and had learned to work and compete in a fairly traditional environment, I never approached it in very traditional ways. My sense was that people who succeed the best—even in very traditional companies—are those who don't work in traditional ways.

COMPUTE!: *Among Apple's competitors is one of the world's larger traditional corporations. IBM's traditional approach has helped it build phenomenally successful relationships with other traditional-style corporations. Is it difficult for Apple to persuade Fortune 500 companies to relax a little bit, to look at how open and innovative a computer can be?*

Sculley: It was very difficult for a long time. Macintosh was more of a dream and a vision than it was a deliverable productivity tool for what corporate America wanted to be able to do. Not until the Macintosh Plus came out, along with the SE and now the Macintosh II, along with some very rich productivity software, were we able really to capture the attention of corporate America.

Now we're finding this wonderful, enthusiastic reception. They really do understand that Macintosh offers a genuine alternative which can make tremendous differences in behavior and the way people work. I think there's a growing awareness in corporations that we aren't going to see any significant improvements in productivity until we can make some significant changes in people's behavior.

What other computers did was to continue the behaviors that people have had in the past, whereas the Macintosh actually alters the way people think, communicate, learn. You can look at a document that's created with desktop publishing tools and say, *That's different from anything we've ever done.* You could see that it was created by the people who were actually writing the substance of the document. They didn't have to send it off to some anonymous department which would then take their work and turn it into a document, or maybe not turn it into a document at all.

I think we've whetted many people's appetites. Now they want more and more.

COMPUTE!: *With this success comes growth, though. How do you avoid the risk of bureaucracy—traditional corporate structure—accompanying Apple's expansion?*

Sculley: I think top management's main role is to set the agenda, define the vision of the company, and then get all the obstacles out of the way so that the organization can then achieve the vision.

The obstacles are in most cases the bureaucracy of the organization. We approach this in several ways.

I believe that the network, which has always worked informally in any institution, needs to be given much higher priority. We focus on the network as opposed to the hierarchy. We pay very little attention to job titles, but we pay a lot of attention to internal communication. I spend a lot of my time listening and talking, fact finding. Sometimes I think of my title as *Chief Listener* for the company.

Then I believe there will be

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some new paradigms, new models that business may follow in the future that are quite different from those of the past.

COMPUTE!: *What sort of models?*

Sculley: During the industrial age, corporate America decided to demonstrate as much self-sufficiency as possible, by becoming as large as possible, and doing everything themselves.

On the contrary, during the information age, there's not just a network that's being formalized inside companies, there is also a network of interdependencies with companies outside the organization. At Apple, we are very dependent upon software developers, upon dealers who sell our products, upon critics who write about our products and inform users. That offers some suggestion as to how companies might want to organize in the future.

COMPUTE!: *How will this approach alter the ways in which corporations grow?*

Sculley: It's very possible that we'll see spinouts from corporations. In fact, we're creating one ourselves right now. With our new software applications company called *Claris.* We're actually taking a group of Apple managers, taking some Apple products, and spinning it out of the company. Apple holds a minority interest in Claris, so we can go and create a better entity which, hopefully, will help us sell more computers but also will create a lot of exciting software.

If that works, I expect to see other spinouts from Apple. We can grow, and our enterprise can get larger, but we also offer a wonderful avenue for individuals who don't want to work with a giant corporation, but want to continue to work in a much smaller environment.

COMPUTE!: *Your points of difference with traditional corporations are clearly elucidated in* Odyssey*—perhaps nowhere so clearly as in the book's opening section, where you talk about a personal and professional crisis in very open, emotional terms. Why did you start your book with that level of revelation?*

Sculley: I wanted to shatter the myth that corporate leaders are invincible. We have lived in an industrial age where corporate CEOs are modeled after John Wayne. I felt that in the information age, we have to have companies that are highly flexible, that are going to be taking big chances and sometimes, therefore, making mistakes, we needed to show that leadership must have a side to it that's willing to be human, that's willing to make mistakes in order to learn. Crisis, as painful as it may be, is often one of the most valuable experiences that a company can go through.

COMPUTE!: *From that painful beginning,* Odyssey *builds to a visionary epilogue:* A Twenty-First Century Renaissance. *It's clear, though, that the world faces many crises, transitions, and displacements on its way toward that Renaissance. How do you see Apple over the coming decades participating in the creation of these new orders?*

Sculley: In the book, I describe the biggest crisis that I foresee, and that's the weakening of the affluent American middle class. For us it's a lifestyle; to the world it's a marketplace. I compare it to the rain forests in Brazil, which are being destroyed each year at a rate comparable to a land mass the size of Arkansas. Yet those rain forests provide some 80 percent of the oxygen for the planet.

The American middle-class marketplace provides the greatest resources for a global, dynamic world economy that we are in for the information age. But we are living beyond our means. We no longer have a clear vision in this country of how we are going to pay for the lifestyle of the affluent middle class in the early twenty-first century. That's the crisis that looms ahead.

The key to the crisis, I believe, is not found in any of the ideas that politicians are setting forth today. They're all focusing on short-term goals. To solve this crisis is going to require a long-term vision. I think the long-term vision is one that is going to build upon rejuvenating innovation—and innovation is really what America was built upon in the first place. Ever since the country was founded and all through the industrial age, we have built on creativity, entrepreneurs, and innovation.

Somehow this has become so large and so institutionalized a country that we have forgotten what our roots are, what our strengths are.

COMPUTE!: *How do we rediscover those roots and reintroduce them into our lives?*

Sculley: To bring back innovation and creativity, the fundamental change must begin with our educational system. We have to revolutionize education. This doesn't mean just spending more money, although that's certainly a factor.

But it also means changing the tools that we give to students and to educators to help people learn. We must prepare them for a very different world that they're going to live in. The world that our education system today is designed for is essentially that of the early industrial age, when people could expect to have a manual job and do it for the rest of their lifetime.

Those jobs rarely exist any more. The jobs of the future are going to require thinking skills. People will probably change jobs—and therefore skills—four or five times during their lives. Our curriculum isn't preparing them for that. So I think there are some wonderful challenges for us in education.

And as I look at how much I have gotten out of my life, I asked how I can give something back. The area that I'm most interested in giving something back is in the area of education.

COMPUTE!: *What about Apple? Where do you think Apple will be at the turn of the century?*

Sculley: I believe that we have a chance of making Apple the most exciting company in the world during the 1990s. I see the epicenter of computing shifting from mainframes to networks such as we have today, and then to connecting people to those networks. This is what Apple is interested in—the individual. I see a wonderful future ahead for a company that can bring the individual and technology together.

My sense is that we are only at the beginning. If Apple continues to pursue this vision without compromises, we have a chance to be real world-changers in the twenty-first century. ©

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See the World!

In-House Experts

Putting Professional Skills On Disk

Keith Ferrell, Features Editor

Is there a doctor in the house? Someday the answer might be yes—in those houses equipped with computers. As professional information networks grow more sophisticated, so does the expert software being developed to manipulate the networks' data. Already doctors and lawyers are using computers to help make diagnoses and prepare cases. Before long, we'll see expert systems in the hands of consumers. As artificial intelligence becomes more powerful, computers will increasingly provide expert advice in the home.

One of speculative fiction's classic predictions is the automated doctor. Suppose you had a mechanical physician ready to attend at an instant's notice to your every ache. From that, it's an easy extension to conceive of other computerized professionals. Imagine the convenience of having your own in-house attorney, accountant, and psychologist. Scenarios that once were restricted to fiction are now being regarded with increasing seriousness by members of the professions themselves.

The prestigious *New England Journal of Medicine*, for example, frequently contains articles examining the ways in which computers and medical databases are impinging upon doctors. Last July, *The Journal of the American Medical Association* published a look at "Computer Programs to Support Clinical Decision Making." The popular press has carried many stories, recently, discussing the pros and cons of high finance's growing dependence upon computerized decision-making tools.

What is happening is that the entry and organization of professional information is approaching critical mass. Medical and legal databases, court and hospital records, clinical and diagnostic analyses, judicial and legislative rulings—all of this data is increasingly accessible via computer. Nor are areas of information isolated—huge networks have sprung up, letting a physician in one part of the world draw easily upon information and advice from all over the globe. As this information has grown more accessible, and computers more powerful, the ways in which the information is examined and assembled, likewise, continue to evolve.

We are fast approaching an age of expert systems, wherein the computer will play an integral role in medical diagnoses and the development of legal and financial strategy, and in making vital contributions to the actual decision-making processes.

Here Come The Experts

Sooner or later, advances at the upper end of computing find their way to the consumer. While we haven't yet reached the point of receiving medical attention or legal counsel via machine, we are increasingly able to draw upon expert software in our own home. At present, that software most often consists of databases made up of words, or stored text—such as standard contracts.

Tomorrow, however, or the day after, we may really have a desktop doctor, or a lawyer accessed through a compact disc interactive (CDI) system, or an automated accountant slaved to our electronic bankbook. None of this is inconceivable. The foundations for interactive professional assistance are already being put into place, and some of the structure is even now beginning to take shape.

The Word Is Given

At the heart of a profession, side by side with its specialized skills, are *words*. Every profession has its own vocabulary, its exclusive jargon. Already, those vocabularies are appearing on disk.

Lexicons, or words lists, can be assembled with relative ease, forming a database that consists of properly spelled words. Most word processors now include a spelling checker; many offer a thesaurus. Their acceptance has paved the way for dedicated lexicons—those devoted to specialized vocabularies.

Among the first of these new tools to appear are, perhaps unsurprisingly, professional dictionaries. Two standard professional texts, *Stedman's Medical Dictionary* and *Black's Law Dictionary*, are now available on floppy disk from Reference Software.

The immediate audience for these packages, of course, consists of doctors and lawyers, although Reference spokesman Scott Sedlik notes a growing consumer interest in the programs. As for the professionals, Sedlik points out that both physicians and attorneys are under mounting pressure from insurance companies to produce only perfect documents—no typos or corrections allowed. The availability of a resident proofreader familiar with legal and medical terms is warmly welcomed by the legal and medical communities.

Strong consumer response to such specialized lexicons is indicative of, among other things, consumer desire to know more about the professional services they com-

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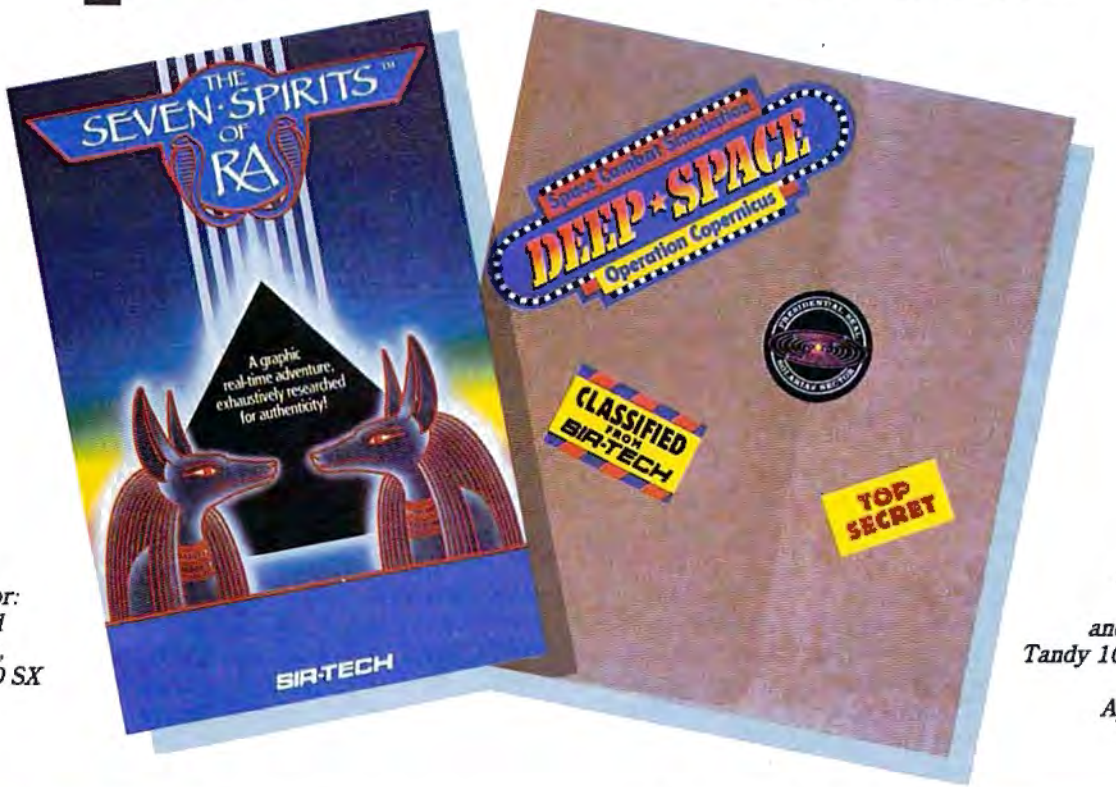

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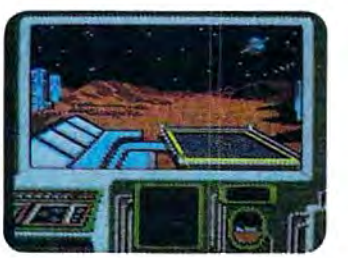

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mission and require. While word lists do not pretend to be anything on the order of an expert decision-making system, words *do* have power. By learning the vocabulary of a field, we take a large step toward being better able to evaluate advice given us by actual experts.

Step Up To The Bar

Once the vocabulary is available, it's a logical step to begin building structures of words. Like lexicons, templates are fairly easy to assemble and store on disk. Templates provide another consumer marketing opportunity: That "standard contract" we hear so much about is nothing but a template, a text file whose basic elements don't change, but which contains blank spaces for those elements that *do*.

Microlawyer, from Progressive Peripherals, is a collection of legal text files, or templates, of many types. Mortgages, leases, wills, affidavits, powers of attorney, purchase and sale agreements, and other examples of standard legal forms and documents are included on the program's disk.

While Progressive Peripherals states clearly on *Microlawyer*'s packaging, and in its documentation, that the forms are best used as a step-saver between client and attorney, it is clear that the program offers a fairly powerful legal tool to the average consumer. Nor is *Microlawyer* an intelligent system; it is a text base that relies upon the intelligence of the individual user to determine the appropriate template.

Whether or not computers will begin providing actual advice remains open to debate. Many of us are willing, for example, to call up a will template; few of us would be interested in having our computer designate the heirs of our estate.

Diagnosis And Prevention

Some medical advice is already available on disk for in-home use. Navic Software's *Family Medical Advisor* has been on the market since 1983, providing users with access to a medical glossary of close to 10,000 separate medical terms. The program's interface relies upon yes/no questions to relate symptoms to its database. Depending upon the answer given, *Family Medical Advisor* responds by suggesting one of several hundred diseases in its database.

In schools, any number of computer programs are helping to educate students about the nature of disease, the workings of the body, and the effects of substance abuse. Again, we see that increased computer intelligence is fostering, first, tools for increasing our own intelligence and expertise.

One area in which computers can play an active part is in preventive medicine. Sound health habits, good nutrition, and sensible physical regimens are all vital to good health. Programs are available by which consumers can analyze their own habits, developing a picture of those areas in which improvement is called for, and suggesting areas in which deficiencies or danger signs need to be addressed.

PC Psychologist

Nor are the consumer medical products restricted to physical medicine. Heuristic Research has recently begun marketing a program called *Mentor*, which serves as a psychological tester accessed via IBM PC and compatible computers. Developer Vladimir Asinovsky describes his product as "psychometric software."

Based on the standard and nonstandard IQ tests familiar to us from schools and employment interviews, Asinovsky views *Mentor* as a self-development tool. It provides users with the ability to measure their intelligence in several areas, from verbal and mathematical skills to depth and sound perception, as well as reaction time.

He stresses that although the program generates scores based upon accepted psychological standards, *Mentor* is not judgmental. Its interactivity is aimed at self-improvement, showing areas of strength as well as weakness. As for the computer, Asinovsky feels that it is "the second-best intellectual tool ever invented." The first, he believes, remains the book.

Financial Controversies

One of the first home applications suggested for microcomputers was household financial management. Balancing the checkbook, keeping track of mortgage and other payments, and following investment earnings are all applications that have generated consumer software.

Simultaneous with the growth of such consumer software has been the shift of our financial infrastructure to an electronic base. A topic, in fact, of much controversy, of late, has been the growing dependence of Wall Street on computerized trading, in which software plays as large a part in buy/sell decisions as do stock brokers.

Similar questions can be applied to home financial software. At present, the advantage of financial management software is the picture it provides of our economic well-being. Certainly the computer's ability to manage data and generate rapid calculations and projections has found an appreciative home audience. But that audience's enthusiasm may not extend to permitting the computer to play an active role in *deciding* how money is spent.

Compact Counselors

As an intellectual tool, computers have grown phenomenally in power and capability over the past decade, but remain very much in their infancy. Real in-house experts will come in other forms than lexicons and templates, and other media than magnetic disks. Computers are already increasingly able to work with other media. Reference Software, in fact, views its dictionary disks as only the beginning. The company elected to go to market with word lists on disk because of the convenience of the disk format. Farther ahead, though, is the possibility of putting the entire *Stedman's* or *Black's* dictionary on CD ROM—compact discs whose memory can be read many times but upon which the user cannot write.

The appeal of compact disc—or any optical technology such as CDI or laser storage—is the huge increase in information storage that becomes available. The larger the number of variables upon which the computer can act, the more accurate the advice that emerges at the end of the process. Additionally, these new media permit much faster access, examination, and comparison of the information they contain. More variables can be analyzed more quickly than is possible with magnetic disks.

The ability to manipulate larger

amounts of data faster is only one aspect of the emergence of in-house expertise. And perhaps it is not the most important aspect. Medical diagnoses, for example, require more than just data. There is an almost intuitive relationship between diagnosticians, their patients, and the body of medical knowledge. Medicine and law are not just book learning; the professions consist of more than just collections of information.

The challenge facing developers of expert systems is to find a way of replicating that intuition on a computer. It is a challenge that will not quickly be solved, but which is being taken seriously, with strides toward intuitive systems being made almost daily.

Our Litigious World

How willing will we be to accept medical or legal advice from machines? It is, after all, one thing to use your computer to check the spelling of *pellagra*, quite another to expect your PC to prescribe pharmaceuticals.

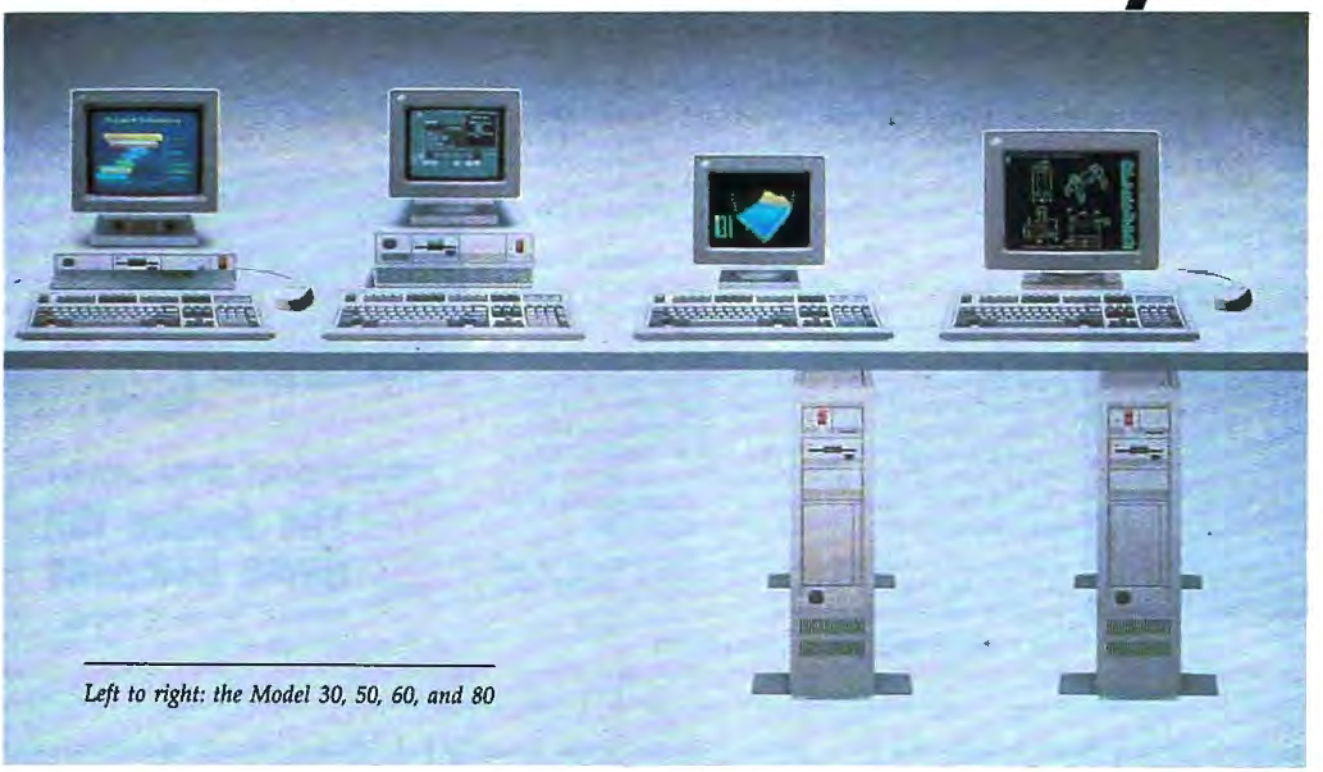
Other questions arise. Virtually all of the medical, legal, and financial software available today carry boldfaced disclaimers advising users that the software is intended as an adjunct for professional advice, not a replacement for it. Should reliable expert in-home systems become available, one can imagine as much resistance from the professions themselves as from consumers.

Additionally, there is the question of responsibility. We live in a litigious world. Suppose a computerized diagnostician makes an error that results in harm to a patient. Who bears the responsibility for the misdiagnosis? The computer ? The software developer? The consumer who relied upon the computer in the first place? There are risks as well as advantages to depending upon computers for important matters.

A likelier scenario than a computer which serves as the sole source of advice, is one in which the home computer becomes part of a huge network consisting of other computers and databases, the family doctor, outside specialists, and consultants. The medical profession has already reported many cases in which just such a network aided in tricky diagnoses. We have long since reached the point at which the body of computerized professional data far exceeds the ability of any single professional, or even team of professionals, to retain it.

The computer's ability to put experts in touch with other experts, with consumers, and with the accumulated experience and knowledge of previous generations, is one of information technology's great gifts. Whether or not we ever reach the point of active expert systems is an exciting question, but also a moot one. We are entering an age in which the computer can contribute to making each of us, ultimately, more expert. ©

IBM's Newest Entry:



Left to right: the Model 30, 50, 60, and 80

The Personal System/2

Dennis L. Foster

What does IBM's newest line of computers offer? Are they truly compatible with PC software? What about video display and add-on boards? These questions and more are answered in this excerpt from COMPUTE! Books' just-released Inside the IBM Personal System/2 *by Dennis Foster.*

IBM calls its newest microcomputer line *Personal Systems* (as opposed to the former idiom, Personal Computer, or PC) to stress that each model is integrated and contains built-in components that were once add-on options on older PCs.

This approach is carried out through two important design concepts: The components are interlocking, which eliminates most interior-mounted cables and switches, and the computers are self-configuring, meaning that they are capable of sensing what components or options are installed and can make the necessary internal adjustments automatically.

Here's an example of the differences between the old way (that is, with an IBM PC or clone) and the Personal System/2's self-integrating approach. To add a hard disk to an IBM PC, you first needed to install a controller board in an available expansion slot, then mount the disk, install two cables between the controller and the disk, and change internal switch settings on the circuit board. Often, you had to purchase the controller board and the drive separately.

In most cases, the computer's power supply wasn't capable of handling the extra load and had to be replaced as well. Some hard disks even required low-level formatting with the operating system debugger. This invariably required you to specify an interleaving factor.

It was not much easier to add a printer port, change from a mono-

chrome to a color display, or set up the computer to use a modem.

The Personal System/2 asks only that you plug in the desired new module. Want to add a hard disk? Just slide it in and connect the cable: The controller is already installed. Want to change to color graphics? No problem—all the hardware, except the monitor, is already installed on the system board (which IBM now calls the *planar board*). Printer, modem, and mouse connections are also built in.

All Personal System/2 computers use 3½-inch floppy disks and IBM PC DOS Version 3.3. This DOS version includes sophisticated software that speeds up data access.

The smaller disks are easier to store, are more portable, and are sturdier than the older 5¼-inch floppy disk. Yet the Model 30's 3½-inch drive writes twice as much data per disk (720K) as the old IBM PC's double-sided double density drive. The floppy drives on the Models 50 and higher write up to 1.44 megabytes on a single 3½-inch disk.

To support the smaller drives, IBM PC DOS had to be modified. Early attempts to control 3½-inch drives in the PC DOS environment were not satisfactory. To overcome initial problems, Version 3.3 (released for use with the Personal System/2 family) incorporates a sophisticated caching scheme whereby the drive reads an entire track in a single pass. The data is then *cached* temporarily in memory where it can be accessed with near-instant speed, virtually eliminating the problem of disk access time. The key to this scheme is the ability to cache only that data most likely to be used by the current program on a repeated basis.

A third feature common to all models in the series is high-quality graphics, supporting either monochrome or color displays. To select a display mode, you simply plug in the IBM analog monochrome monitor or analog color monitor of your choice. Standard monochrome, color, and RGB monitors which could be used with the IBM PC are not compatible with any of the Personal System/2 models. The entry-level Model 30 uses a color graphics subsystem called *Multi-Color Graphics Array (MCGA)*. The Model 50 and higher incorporate an even more advanced graphics system called *Video Graphics Array (VGA)*.

Components Of The Model 30

At the low end of the Personal System/2 line, the Model 30 desktop system comes in two configurations: the basic 30-002, which has two 720K, 3½-inch floppy drives, and the hard disk-based 30-021, which has one 720K floppy drive and a 20-megabyte fixed disk.

With its Intel 8086 processor running at a clock speed of 8 MHz (compared to an IBM PC XT with an 8088 processor running at 4.77 MHz), the Model 30 is closest in design and performance to the IBM PC XT. The faster clock speed means faster processing.

Both configurations include 640K standard memory (RAM). Compare that to the IBM PC's 256K RAM. To build up to 640K, a PC user needed one, possibly two, add-on memory cards (depending on the manufacturer) and no fewer than 80 plug-in RAM chips in increments of 64K.

The built-in MCGA graphics system supports both text and graphics modes, without any add-on display adapters. In text mode, the display produces an impressively clear character, 8 pixels by 16 pixels—better than some monochrome displays. The graphics mode offers a 320 × 200–pixel resolution with 256 different colors. A 640 × 480 resolution can be achieved by limiting the palette to two colors.

But the real reason the Model 30 is capable of producing such stunning graphics is its mix of 256,000 hues, delivering full color images with near-lifelike precision. That's approximately 255,700 more colors than Rembrandt used to paint his most famous masterpiece, *The Night Watch*. With an IBM analog monitor, the image translates into 64 shades of gray. By contrast, that's roughly four times more variation than a wireless photo, and about two-thirds as much tone as a good black-and-white TV picture.

The Model 30 is the only member of the Personal System/2 fam-

Color display on the Model 30

ily that truly bridges the gap from the IBM PC environment to the Personal System/2. Although all models operate with IBM PC DOS 3.3 or higher, and therefore will theoretically run a large body of software already developed for IBM PCs, only the Model 30 accepts standard IBM-compatible expansion boards.

Placing the Model 30 in historical perspective, it combines the efficiency and storage capacity of the IBM PC XT with the glitter of enhanced, Macintosh-like graphics. Its promise is to make IBM PCs and their lookalikes seem like primitive forebears in comparison.

Components Of The Model 25

A subset of the Model 30 is the Model 25, a specially packaged Model 30 modified with the educational market in mind. The Model 25 is marketed both as a standalone system and, alternatively, as a Collegiate Kit including a mouse device and four floppy disks.

Although it has a separate model number, the Model 25 is largely identical to the Model 30, except in the following respect: Whereas the Model 30 is modular in design, the Model 25 is completely integrated. In fact, even the monitor casing is physically attached to the system unit. Thus, there are two different versions of the Model 25—monochrome and color—even though both versions include the MCGA video interface. In other respects, the Model 25 is a stripped-down economy edition of the Model 30.

The monochrome version (8525-01) includes a built-in 12-inch analog display, and the color Model 25 (8525-04) has an analog color display of the same size. As with the standard Model 30, both versions of the Model 25 include integral serial and parallel ports and a mouse port. The processor is the same 8086 chip used in the Model 30. The regular Model 25 is fitted with 512K RAM; the collegiate version has 640K on the planar board.

The Model 25 Space Saving keyboard is a modified version of the professional-style keyboard supplied with the other Personal System/2 models, containing all the same keys except for the numeric pad. By eliminating the traditional accounting-style number keys on the right side of the keyboard, IBM hardware designers were able to lop four inches off the length. The standard IBM Enhanced Keyboard is available as an optional upgrade to the Model 25.

Besides the choice of color or monochrome CRTs, the Model 25 comes with either one or two 720K, 3½-inch floppy disk drives. An external 5¼-inch floppy disk drive is sold separately as an option. However, unlike its big-brother Model 30, the Model 25 does not have a formal hard disk option. The hard disk controller that is included on the Model 30 planar board is absent

Personal System/2 Model Comparison Chart

	Model 25	Model 30	Model 50	Model 60	Model 80
Processor	8086	8086	80286	80286	80386
Standard RAM	512K	640K	1MB	1MB	1 or 2MB
Maximum RAM	640K	---	7MB	15MB	16MB
Clock Speed	8 MHz	8 MHz	10 MHz	10 MHz	16 or 20 MHz
Video Display	MCGA	MCGA	VGA	VGA	VGA
Character Box	8 × 16	8 × 16	9 × 16	9 × 16	9 × 16
Resolution	300 × 200	300 × 200	640 × 480	640 × 480	640 × 480
Colors	256	256	256	256	256
Expansion Slots	1 full-size 1 half-size	3 (8-bit)	3 (16-bit)	7 (16-bit)	4 (16-bit) 3 (32-bit)
Power Supply	70 W	70 W	92 W	207 W	225 W
Floppy Drives	3½-inch 720 K	3½-inch 720K	3½-inch 1.44MB	3½-inch 1.44MB	3½-inch 1.44MB
Hard Disk		20MB Optional	20MB Standard	44MB Standard 70MB Optional	44MB Standard 70MB Optional 15MB Optional
HD Expansion	---	---	---	185MB	230MB
Operating System	DOS 3.3	DOS 3.3	DOS 3.3 OS/2	DOS 3.3 OS/2	DOS 3.3 OS/2
Weight	33 lbs.	17 lbs.	23 lbs.	52 lbs.	52 lbs.
Potential System Throughput	More than 2 times PC	More than 2 times PC XT	Up to 2 times PC AT	Up to 2 times PC AT	Up to 3½ times PC AT

from the classroom-oriented Model 25.

Moreover, the Model 25 has only one and a half expansion slots, both PC-compatible. The half-slot accepts only shortcards, such as an internal modem or a second asynchronous adapter. A use that comes readily to mind for the full-size slot is a hard disk card, containing a 3½-inch fixed disk on a printed circuit board.

Despite these variances in the way the hardware is packaged, there are no real architectural differences (only omissions) to distinguish the Model 25 from a standard Model 30. Therefore, throughout the remaining sections of this article, when we refer to the architecture of the Model 30, we imply the Model 25 also.

Components Of The Model 50

If the Model 30 is a superpowered offspring of the IBM PC XT, then the Model 50 may rightly be termed the Personal System/2 remake of the PC AT. Like the AT, the Model 50 uses the Intel 80286 processor, but runs at 10 MHz, compared with the PC AT's 8 MHz clock speed. The Model 50 also incorporates a full megabyte of RAM on the planar board, expandable to seven megabytes.

The standard configuration includes a single 1.44 megabyte 3½-inch floppy drive and a 20 megabyte internal fixed disk.

The Model 50, 60, and 80 all include a built-in VGA graphics subsystem. The graphics controller supports three color modes: 640 × 480–pixel resolution with 16 colors, 320 × 200–pixel resolution with 256 colors, or 320 × 200–pixel resolution with 16 colors. (The term *pixel* refers to a single dot on a screen.) In text mode, the system offers 720 × 400–pixel resolution with 16 colors and a 9 × 16–pixel character box. In other words, VGA equips the Personal System/2 with graphics capabilities on a par with the most powerful add-on display adapters sold for use on IBM PCs. The result is an image reproduction at least as satisfactory as the Apple Macintosh, in a PC-like hardware environment.

There are three available expansion slots inside the Model 50.

(Actually, there are four slots, but one is reserved for the hard disk controller card.) These slots will not accept cards designed for the original IBM PC expansion bus. With the Personal System/2 Model 50 and higher, IBM introduced a new expansion bus called *Micro Channel Architecture*. This system uses a different connector, pin arrangement, and card size from the previous expansion bus. There are currently two versions of the Micro Channel Architecture bus—a 16-bit version for systems based on the 80286 microprocessor, and a 32-bit version for 80386-based systems. All three Model 50 slots are of the 16-bit version.

Components Of The Model 60

The Model 60 is an upgrade of the Model 50, incorporating the same Intel 80286 processor, 10 MHz clock speed, and 1 megabyte internal RAM. The Model 60 also offers as standard equipment a 1.44 megabyte 3½-inch floppy drive, but offers a 44 megabyte hard disk (Model 60-041) or a 70 megabyte hard disk (Model 60-071). An optional 115 megabyte hard disk is also available for the Model 60-071.

Both Model 60 versions have expandable RAM, up to 15 megabytes maximum. Hard disk storage can be expanded to a maximum of 185 megabytes. Like the Model 50, the Model 60 has a sophisticated VGA graphics subsystem included on the planar board.

The Model 60 has seven Micro Channel Architecture expansion slots, all 16-bit versions. (Actually, the unit has eight slots, one of which is reserved for the hard disk controller card.) As noted, these slots will not accept cards designed for older PC models.

Components Of The Model 80

The Model 80 represents IBM's acknowledgment of the potential of desktop computing. It combines the power of the 80386 processor with VGA graphics and expandable RAM up to 16 megabytes in size. With up to 230 megabytes of hard disk storage, the Model 80 compresses the power of a warehouse-sized mainframe costing several millions of dollars into a small package about the size of a suitcase and costing around $10,000.

The Model 80 comes in three standard configurations: the 80-041, with a 16 MHz clock speed, one megabyte of RAM, and 44 megabytes of hard disk storage; the 80-071, running at 16 MHz, with two megabytes of RAM and 70 megabytes of hard disk storage; and the 80-111, with a 20 MHz clock speed, two megabytes of RAM, and 115 megabytes of hard disk storage.

Every Model 80 includes a single 1.44 megabyte 3½-inch floppy drive and seven Micro Channel Architecture expansion slots—four of the 16-bit variety and three 32-bit slots. (The Model 80 actually has five 16-bit slots, but one is reserved for the hard disk controller card.)

What Does It All Really Mean?

What does the Personal System/2 really mean for the typical user, especially one who recently owned an IBM PC or MS DOS-based system and now wants to make the transition? Although much has been written about the Personal System/2's technical specifications and engineering design, little has been done to interpret them in a practical light. The following information provides the answers to a few fundamental but significant questions.

Is the Personal System/2 compatible with existing software written for the IBM PC? All models run IBM PC DOS 3.3 and, in theory, should run application programs written with the IBM PC in mind. However, several users have encountered several problems attempting to run some packages that rely on assembly language graphics routines. In general, programs designed for the IBM PC which write to video RAM and which require a color/graphics board should be considered suspect until proven otherwise.

Most PC DOS or MS DOS software which does not rely on a color/graphics adapter should run without problem. On a Model 30, there is very little worry about compatibility. Aside from the graphics interface, the Model 30 is code-compatible with virtually every program written for the IBM PC.

OS/2 provides a DOS compatibility feature, but the 80286 and 80386 instruction sets are not totally upward-compatible with 8088/8086 code. Moreover, some programs use critical timing loops that will not work at all on the advanced hardware. In general, most applications programs will have to be rewritten especially for OS/2 before they will run on the new operating system.

How can IBM PC software contained on a 5¼-inch floppy disk be transported to a 3½-inch disk? The most economical way is with a IBM Data Migration Facility, which connects an IBM PC to a Personal System/2, via a standard parallel printer cable. With this option, any files stored on the PC can be copied directly onto the Personal System/2 computer's floppy or fixed disk.

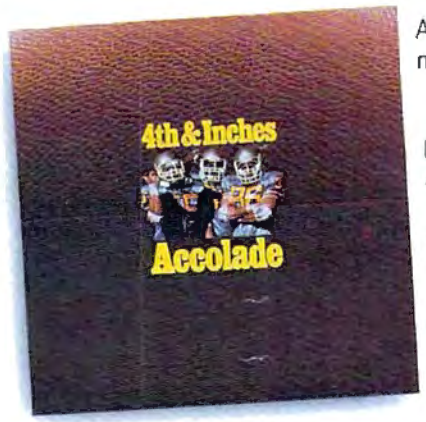
The setup requires an IBM PC and a Personal System/2. An alternative is to attach an add-on 3½-inch disk drive to an IBM PC, running DOS 3.3 or higher. Format the disk and copy the files you wish to transport from the PC's 5¼-inch floppy drive or fixed disk to the 3½-inch disk.

Yet a third alternative is to purchase and install an external 5¼-inch floppy drive for the Personal System/2.

Can standard monochrome, color, or RGB monitors be used with any model of Personal System/2? No. Both the MCGA (Model 30) and VGA (Model 50, 60, and 80) graphics subsystems require analog monitors. The standard monitors used with IBM PCs and their clones are incompatible with the Personal System/2 family.

Can add-on boards designed for IBM PCs be used with any Personal System/2 models? Only the Model 30 supports the 8-bit IBM PC-compatible expansion boards, and there are only three available expansion slots. However, with high-resolution graphics, 640K RAM, and both serial and parallel ports already built in, there are not many reasons to install add-on peripheral boards.

The Model 50, 60, and 80 have expansion slots, but they accept only cards specifically designed for the new Micro Channel Architecture bus. ©



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DeluxeVideo 1.2 For The Amiga

Larry White

Requirements: Amiga with a minimum of 512K, and Kickstart 1.2.

[Ed. Note: Larry White is technical director of Modern Photography *magazine.]*

This is it: a program that takes full advantage of everything that is Amiga—high-quality graphics with animation, sound and music, and even multitasking. This program might well be reason enough to justify the purchase of an Amiga.

DeluxeVideo lets you create animated scenarios that can range from something as simple as a drawing slowly fading in and out, to a full-fledged video that shows characters moving in all directions, and has sound effects and even background music. The package contains four disks and a comprehensive manual. The manual, written clearly and concisely, contains step-by-step instructions for the first-time user, as well as very advanced topics and references for experienced and even professional users.

After a quick pass through the first chapter of the manual, I booted the Player disk to check out the demos. An icon of a VCR appeared next to a drawer labeled *Videos.* Clicking the mouse with the pointer on the video drawer produced a window containing several little video tape icons, one labeled *Demo.* Clicking on this started things rolling.

Animated charts and graphs appeared accompanied by various sound effects. Then came a short "commercial" proclaiming the virtues of an automobile that sped off toward the horizon. That was impressive, but it was hard to believe what happened next. After a short, clever, humorous math lesson, my monitor began to play the famous opening chords of *2001: A Space Odyssey* ("Thus Spake Zarathustra") as a scene of a space shuttle on its launch pad appeared. The shuttle blasted off with a roar, and then the scene switched to a view of Earth with the shuttle coming toward me. Next, an astronaut waving his arms approached a spaceship demanding, "Open the pod bay doors, HAL." In a frighteningly familiar voice, the computer replied, "Sorry, I can't do that, Dave." I was stunned.

Hands On

I couldn't wait to work through the tutorials and create my own videos. It didn't take long. After a few hours, I had reconstructed the shuttle sequence from the various components on the disk—background drawings, objects (smaller drawings that are moved like sprites and bobs), sound effects, and music. To get the most out of *DeluxeVideo*, you must use it in concert with other programs. Any program that can create drawings or music in the IFF-file format can be used to produce pictures, objects, sounds, and music, which you can then choreograph using *DeluxeVideo.*

I decided to make a short title sequence for some home videos that I was editing. I began by digitizing a camera with its flash in the up and down positions by using *Digi-View* from Newtek. I used a companion paint program, *Digi-Paint* (also from Newtek), to remove unwanted background. Using EA's *Deluxe Paint II,* I then combined and copied the drawings to create a sequence. I drew a series of expanding white and yellow ovals over the flash to simulate the flash firing.

With a utility named Framer from the *DeluxeVideo* Parts & Utilities disk, I changed the sequence into a four-frame animation. This procedure is remarkably simple: Specify the number and layout of frames (in this case, two rows by two columns), use the mouse to grab a grid, and then position and stretch it so that each drawing is completely enclosed in a separate rectangle. I suggest that you keep your drawings fairly simple and use few colors to conserve memory. Unfortunately, *DeluxeVideo* gives you no easy way to calculate just how much memory the object will need, and I had to try more than a few times to design one that would work. (A utility named Vidcheck will help, but only after the video has been created). Select Animate from the menu to view the sequence.

To add the whirring sound of the camera's winder to my video, I used the *Future Sound* digitizer and software from Applied Visions to create a digitized sound file of the actual camera noise.

I chose to leave the background blank (so that I could later replace it with live video via a genlock accessory), but I could have used any IFF-file drawing made with any paint program as a background.

Like A Time Line

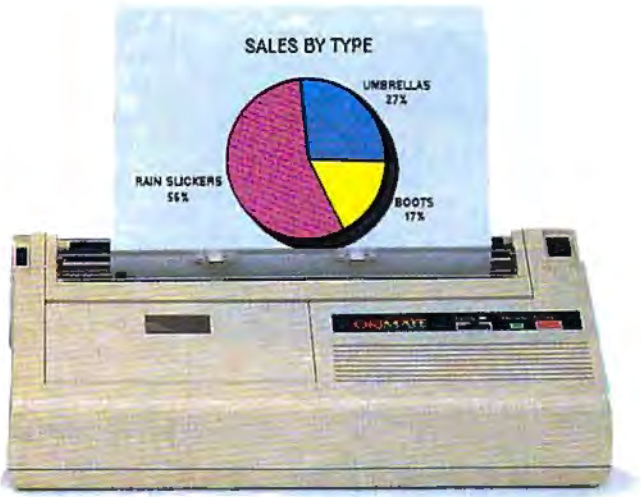
Using *DeluxeVideo* is like working with a time line. The main screen has a time bar across the top of the display.

Icons representing tracks (video, control, foreground, background, music, and control) are placed on the left side. Effect icons (scenes, fades, size, play, and so on) are then placed along each track line, with arrows indicating the start and end times for each effect. Clicking on an effect icon lets you set or change the attributes of the effect.

When you select *scene,* the "video" screen is replaced by a similar screen, except that now the time bar represents the duration specified for the specific scene. Tracks can now include object, picture, text, and sound. Choose object and the computer will request the name of an object file. Using the effect icons, you can specify when the object will be loaded from disk, when and where it will appear on the screen, where it should move to, and how long it should take to get there. If the object has been created as an animated sequence (like my flashing camera), you can specify when to start and stop the sequence, and even in which order to play the individual frames.

I specified that after loading the "camera" from disk, it should appear in the upper left corner of the screen; then, during the next 4.3 seconds, it should move to the lower right corner, disappearing at the end. (You can do this by specifying the screen coordinates, or by moving a scaled box within a rectangle, or by switching to a screen that lets you position the actual object on the full screen). While all this is going on, the object should sequence through the four frames, three times. Instead of just four frames (A,B,C,D), I used a se-

All work and some play.



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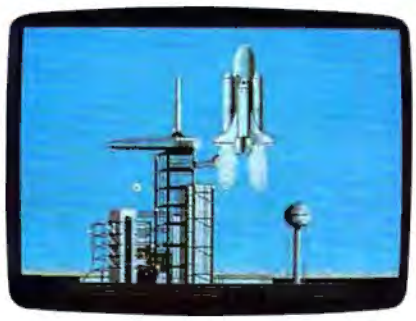

A scene from DeluxeVideo 1.2: *An animated shuttle blasts off, accompanied by background music and a roar.*

Sample titles, such as this one, are included with the package.

quence of A,A,B,C,D,B,C,A,A, which stretched and enhanced the effect of the simple animation. By selecting *view scene* from the pull-down menu, I could make any necessary adjustments, while playing the scene, until I was satisfied.

On the sound track, I played the file containing the digitized sound effect of the motor three times—starting just after, and ending just before the object sequence.

For another scene, I used *DeluxeVideo*'s special polygon text to spell out my title. With this text, you can animate a title and even rotate it in three dimensions so that it appears to be coming out of the screen right at you.

Returning to the main video screen, I added a music track and specified an upbeat little ditty from EA's *Instant Music*. I started the music before the first scene and played it throughout both scenes.

Additional tracks let me make fancy transitions (wipes and fades) between scenes, and even chain videos together for play, one after the other (as the designers did with the demo).

The postproduction disk contains all the files you need to create animated titles that seem somewhat familiar; for example, a simple black-and-white nighttime sky flickered to the title *The Twinkle Zone*, while a familiar theme played. Other titles included *Amazing Videos* and a pastel *Amiga Vice*.

The *DeluxeVideo* manual has an extensive section which describes techniques for transferring your finished video to videotape. You can get excellent results, even with your home VCR (you'll get the best results through a genlock device that gets the video signal from the RGB interface). For more sophisticated users, *DeluxeVideo* supports overscanning so that you won't lose the edge of your videos when you transfer them to tape. The manual even explains how you can send videos to another Amiga by modem.

DeluxeVideo is a remarkable software package that takes advantage of all the special capabilities of the Amiga. It's easy to learn, but also contains sophisticated features that can take time to master. You can do so much that it's easy to run out of disk space and memory before you know it, but with time, you'll learn how to work around this.

Don't be misled by the program's low ($129.95) price, as you'll need at least one paint program and one music program to work with it, but those are practically essential for any properly outfitted Amiga. *DeluxeVideo* should help Amiga become the next major home computer. It has certainly helped convince me that I made the right computer purchase.

DeluxeVideo 1.2
Electronic Arts
1820 Gateway Dr.
San Mateo, CA 94404
$129.95

The *Easy Working Series*

Carol S. Holzberg

Requirements: Apple II series (reviewed here) with a minimum of 128K, Commodore 64, and IBM PC or compatibles with a minimum of 192K.

Spinnaker's *Easy Working Series* consists of three personal productivity programs: *The Writer*, *The Filer*, and *The Planner*. Each can be purchased separately and can stand alone or work in combination with the others. This means you can use *The Writer* to type reports with financial displays from *The Planner*, or mailing labels created with *The Filer*, and analyze your *Filer* databases using the spreadsheet functions of *The Planner*.

Each program comes on an unprotected 5¼-inch disk with its own eight-page instruction booklet. Many of the special edit commands are the same throughout the series. They require the use of the Open- and Closed-Apple keys in association with other letter and number keys. An onscreen "help" file is accessible from each program.

The series offers a Macintosh-like user interface, complete with windows and pull-down menus. These are accessed using the right, left, and down arrow cursor keys, or by typing the command's first letter. Despite the apparent look and feel of mouse support, the *Easy Working* series does not allow the use of the mouse as an input device.

Word Processing

The Writer, the series' word processor, is not particularly powerful. But if you want a good introduction to word processing, this program offers an easy-to-learn, multifeatured program for a very low price ($9.95). It comes with such features as block editing; cutting and pasting to and from memory; inserting and deleting text; setting tabs, headers, and footers; right, left, and center text justification; searching for text; and searching and replacing text (either case sensitive or not).

You can preview the document as it will appear printed, and print all or part of a document in boldface, underline, compressed, or expanded (and near letter quality print), and you have a choice of two fonts. *The Writer* also has a 100,000-word spellchecker on its flip side. You cannot modify the spellchecker word list, and you should be prepared to wait as much as ten minutes to check the spelling of text with as few as 500 words.

Some of the more interesting features include *cut to file*, *copy to file*, and *print/merge* (mail merge) options. The first two allow you to mark out a block of text, write it to a file, delete the original block, or just copy it without deleting it. The program then asks you for a filename for your new text. The *print/merge* option makes it possible to mark the place in your text file where you wish to bring in data fields from *The Filer*. *The Writer* also allows you to create longer documents by "chaining" or linking smaller word processed files.

The Database

The Filer, the series' database program, is designed for first-time database users. It offers five menu options: storage, update, print, setup, and quit. You select these options with the help of the arrow cursor and return keys. Call up *storage* to start a new database, open or close a database file, view your data disk directory, erase files, or format a data disk.

Each program in the series requires its own data disk. You cannot save *Writer*, *Filer*, and *Planner* program files

onto a single data disk for ease of access and storage. *The Filer* did allow me to format a data disk with an open-database file in memory without losing the RAM-stored records, but it is strongly recommended that you have a formatted data disk on hand before opening a database file.

With the *update* option, you can add, edit, find, or remove records. In addition, you can export records to, or import records from, other programs in the series. With the *print* option you can output to printer or to screen. Printing to screen enables you to check your records for errors.

Setup allows you to configure the program to work with your printer and use drive 2 as your default-data disk drive. (It was not possible for me to enter any print command definitions when configuring the printer setup because my Epson printer requires the use of the escape key in its printer definitions. Pressing the escape key, however, always sent me back to the program's main menu.)

The Filer's format is reminiscent of the once-popular, but now somewhat outdated *Visifile* database program. Restrictions apply to the number of fields (maximum ten), the length of the field name (maximum 12 characters), and the maximum number of characters (25) permitted for each field. These size limitations can prove quite frustrating because your field name and size may exceed the character limit. Moreover, once you have created your database, you cannot insert or delete field categories. In defining your database, you must designate a *key* field. This is the only field the program uses to find a record in the database.

Entering Information

Once you've created the database by defining and designating its fields, you're ready to enter your information. After a record is complete, it is saved to disk by pressing Open Apple–1. Pressing the escape key allows you to exit from the *add a record* mode. If you wish to edit a record, call it up by pressing the escape key to exit from your current activity, and then use the arrow keys to advance to *edit*. Specify the record's key category, move the cursor to the field you wish to modify, and type in your new data. Pressing Open Apple–1 accepts the screen.

There are many record selection options, although some of their instructions are a bit confusing. You can select all of the records in the database or just those records that meet certain criteria (using equal, greater than, less than, not equal, less than and equal, or more than and equal). This is where the *key* field comes in. If you want a specific range, enter the beginning key and ending key of the records you wish to select.

Two types of wildcards exist to make record selection easier. Using an asterisk (*) ignores everything from its location to the end of the field contents. In printing a zip-code list, for example, 01* would print all records beginning with 01. Using the question mark (?) as in ???01, tells the program to ignore characters in the ? slots and select all records ending with 01. *The Filer* does not retrieve its records with great speed, but it does serve its purpose as a database compiler—and it does it inexpensively.

Templating

The Planner, the series spreadsheet program, comes with six sample templates already stored in its directory. Call up such common home-type calculations as budget, net worth, expenses, mileage, and profit/loss to get an idea of how the program works. Its built-in functions include adding, subtracting, multiplying, and dividing, as well as calculating sums, averages, percentages, and absolute values. The program can return the minimum and maximum values for a range of locations and count the number of entries in a range.

There is a menu of six options: *work, print, change, storage, setup,* and *quit. Work* enables you to enter your spreadsheet. Once you've accessed this option, you can call up the editing menu to cut, copy, or paste from memory/to file, insert or delete rows and columns, and blank or reformat single cells and specially marked blocks of cells. *Print* enables you to print to the printer or a file and set your print margins, paper length, and print controls.

As with *The Filer*, it's not possible to enter print commands for the Epson printer because pressing the escape key returns you to the main menu.

Accessing the *change* menu calls up the program's formatting option. You can select the options globally; or specially mark a block of cells for column width or fixed-dollar, percent, bargraph, integer, or decimal (one to four places) formats. Turn the calculating feature on for immediate recalculation after every cell entry. Turn it off to hasten the process of entering large amounts of data.

The pop-up menu for *storage* includes loading, saving, or accessing a new worksheet; loading or saving a *DIF* file; importing or exporting data; or selecting a file from the disk directory. With the *setup* option, you configure the storage drive and specify your printer type.

Enter text, numbers, or formulas. Use *The Planner* on its own or in combination with the other programs in the series. Export a spreadsheet to a document written with *The Writer*. Import a sequential data file created with *The Filer*. With *The Planner* you can set up a grid of 250 rows and 224 columns. You move around the rows and columns with the help of the Open Apple and number keys 3–9.

The Planner is not a flashy, full-featured spreadsheet program. It has a limited number of functions—nevertheless, for the price ($9.95), it serves as a solid introduction to number-crunching.

(Editor's note: As this issue went to press, Spinnaker announced a revision of the Easy Working Series, *with prices to remain the same.)*

Easy Working Series
Spinnaker Software
One Kendall Square
Cambridge, MA 02139
$9.95 per program

Borodino: 1812, Napoleon In Russia

James Maki

Requirements: Commodore 64 and Atari eight-bit computers with a minimum of 48K.

Your mission is stated simply: *Destroy the Russian Army that opposes you in the fields surrounding Borodino, a small Russian village 60 miles west of Moscow.* At your disposal are the troops of Napoleon's Grande Armee, including elite units of the Old Guard, Dragoons of the Guard Cavalry, and Cuirassiers and Lancers to pursue broken troops, and artillery to soften up the enemy for frontal assault. You command 130,000 troops from France, Poland, Italy, Spain, Portugal, and Westphalia. Opposing you are almost 120,000 Russian troops in fortification, defending their homeland.

Achieving a decisive victory will force a peace settlement with the Czar, avoid the long retreat from Moscow during the Russian Winter, and preserve the empire. If you fail, the surviving Russian troops will regroup and pursue your army relentlessly, hounding your every move as you try to flee their country.

Borodino: 1812, Napoleon in Russia is an historical simulation depicting the battle that many believe led to the downfall of Napoleon and the French Empire. One- and two-player games are included, with the computer play-

ing the Russian commander in the single-player game. The game can be saved at any point. Instructions and hints for play-by-mail are included.

A menu-driven screen allows the game to be customized for the level of play desired. The computer Russian player can be designated as easy, medium, or hard. Troop morale and fatigue can be included for more realistic combat results. To compensate for an inexperienced player in a two-player game, or to give yourself a handicap in the single-player game, the French or Russians can be designated as weak or normal. Choosing *weak* lowers the army's morale, thus making it easier to defeat. Making the French player normal and Russian player weak is a good starting point, and is also the default setting.

Many Options

Eight scenarios are provided ranging from a 20-minute game depicting the September 5 assault on the Shevardino Redoubt (fortification) to a five-hour (or more) game depicting all three days of the Borodino engagement: September 5–7, 1812. In addition to historically accurate scenarios, several variant scenarios are included depicting troop deployment had either Napoleon or the Russian Commander, Kutuzov, heeded the advice of subordinates.

The map of the Borodino battlefield contains symbols for trees, rivers, streams, fortifications, and towns. These terrain features have an effect on troop movement and battle, so careful inspection of the terrain is a necessity before issuing orders. The fine-scrolling map moves both horizontally and vertically to display the entire battlefield. The map will scroll when the joystick-controlled cursor comes in contact with the edge of the screen. Position the cursor over a terrain feature and press the fire button for a one-word description of the terrain at that point.

The armies consist of infantry, light and heavy cavalry, artillery, and horse artillery. The French units are blue, the French allies red, and the Russians green. The units are depicted as a colored symbol on a white background if they are ready for battle. A white symbol on a colored background means the unit is disorganized, and a solid colored square without a symbol means the unit is routed (demoralized to the point of ignoring commands and fleeing the field of battle).

All troop movement is made with a joystick. The keyboard is used to set the game speed (from one-minute turns to realtime play) or to pause the game. Position the cursor over a unit, press and hold the fire button, and move the cursor to another position to order the unit to move toward the target square. The unit will continue to move toward the target square until it is reached, a new order is issued, or combat causes it to retreat, rout, or change formation. The fast action and ease of input at times resembles an arcade game, but the temptation must be resisted. Careful planning and execution rather than quick action are required to win.

Infantry units assume one of three formations: column, line, or square. And each has its own inherent weakness and strength. A column formation adds to the unit's morale, through safety in numbers, as the men are arranged in blocklike formation. The disadvantage is that only a small number of troops can fire their weapons. A line formation maximizes the firepower of a unit but leaves it open to penetration and flanking by the enemy. A square formation is used as a defense against cavalry, in which the troops form a square with guns pointing outward in all directions. A cavalry unit cannot melee with an infantry unit in square.

Infantry units automatically go into a square formation whenever an enemy cavalry unit is within two or three squares distance. While in square, the unit cannot move and is limited in its firepower against infantry attack. A quick cavalry unit can sometimes catch an infantry unit before it forms square and do severe damage. Therefore, the mere presence of cavalry in the area of a battle makes mounting an infantry attack difficult.

Tactics

Borodino is a game of tactics rather than grand strategy. Many troops are lost to unplanned retreat (that is, break and rout), and engagements end before the attacker can press home an advantage when the attacking units break and rout. The object of an attack is to demoralize the enemy by attacking a weak point so that he flees the battlefield. This allows penetration and flanking of enemy lines.

The perfect plan by the French would consist of softening up an area with artillery, moving cavalry close enough to the enemy to either quickly attack or force the enemy unit to form square, and then move the French infantry forward to the attack. When the enemy unit breaks (becomes disorganized or is routed because of low morale and/or fatigue), finish the attack with the cavalry unit. A disorganized or routed infantry unit cannot form square to defend against a cavalry charge.

An intelligent Russian opponent will position his cavalry near the front line so the French infantry will form square before the attack. In addition, the Russians have built fortifications that are hard to assault, and the Russian artillery can break or weaken French units before they reach the enemy lines.

This game realistically translates the feel of 19th-century Napoleonic warfare to the computer screen: the interplay of infantry and cavalry, and the timing of attacks; the morale problem with green troops; and the almost-impossible odds of frontal assault on a fortified artillery position.

As much as I enjoy *Borodino*—I was able to learn the rules in a short time, but will be playing a long time before I master it—I do have a wish list of modifications. I'd like to be able to check the score during the game. The author himself notes this and indicates he spent more time checking the score than playing the game. Rather than a simple victory or loss designation, terms such as strategic victory, tactical victory, and marginal defeat would be more descriptive. Finally, I'd like a method of creating my own initial troop deployment for both the French and Russians in the one-player game. But, in light of all that *Borodino* offers, I must say that these complaints are of a minor nature.

If you're game for trying to better Napoleon and extend the dominion of France, try *Borodino*.

Borodino: 1812, Napoleon in Russia
KRENtek Software
P.O. Box 720081
McAllen, TX 78502-9990
$59.95

WordPerfect For The Amiga

Neil Randall

Requirements: Amiga with a minimum of 512K memory.

The long wait is over.

Ever since its introduction, the Amiga has suffered from one glaring deficiency. Spectacular creativity software was available, as was video production software, and music software was superb. Where the Amiga faltered was in one very important, and, oddly, very fundamental area: word processing.

Textcraft was originally bundled with the system, but, except for correspondence and short papers, it was far from ideal. *Scribble* helped, but it, too, lacked truly professional features. One person I know actually dumped her Amiga in favor of a Macintosh, simply because she was tired of waiting for the perennially promised, but never delivered, full-featured Amiga word proces-

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sors. Indeed, for word processing I often abandoned my miracle machine and returned, with some bitterness, to my venerable 64.

Among the most eagerly awaited of all the promised packages has been *WordPerfect*. An established favorite among MS-DOS users, *WordPerfect* promised Amiga owners that their machine was finally being taken seriously by one of the most important companies in the MS-DOS world. Of course, this alone does not suggest excellence—MS-DOS business packages have a reputation for severe lack of friendliness— but being noticed by the "big boys" is important for any computer system. Besides, everyone knew that *WordPerfect* worked.

Ready At Last

WordPerfect has now arrived, and it brings to the Amiga its full MS-DOS package. All commands are accessible from both the keyboard and the mouse menus, with submenus bearing *WordPerfect*'s distinctive choose-by-number system. The List Files command, for example, produces a submenu showing 10 possibilities. You either click on one of the choices with the mouse, or you type the appropriate number. For some reason, the numbering system has produced controversy among MS-DOS users, but since it is so easy to use, I really can't see why. Combined with the mouse, the numbers make *WordPerfect*'s commands highly accessible.

The program's manual contains more than 600 pages, and it comes in a loose-leaf binder to simplify updating. Roughly half of the documentation is devoted to an extended tutorial, introducing users to many of the package's features. The rest contains a reference section (the most important for repeated use of the package), an installation section that shows how to set up *WordPerfect* for your own needs, an appendix, a glossary, and an index.

Unlike many companies that port a program from one machine to another, WordPerfect Corporation supplied an Amiga-specific manual; the right-hand third of each page displays mouse commands for the explanations given on the left. Throughout the manual are notes about how to use the software on the Amiga itself. Also included in the package are templates to place above or around the function keys (two are included: one for the 2000 and one that works for both the 500 and the 1000) and a set of transparent stick-ons for the numeric keypad, for such functions as Screen Up, Page Up and Page Down, and Insert. Finally, there is a detailed reference card to keep beside the keyboard.

The software itself comes on four disks. The first contains the *WordPerfect* program itself, along with the Print program for printing documents. A second disk contains a spell-checker and thesaurus, while a third holds the printer drivers and the Printer Definition program. On the last disk, labeled *Learn*, are the text files needed for the tutorial and a couple of ancillary programs, such as Printer Test.

Professional Tools

What, though, makes the program professional? What features does *WordPerfect* have that no other Amiga word processors have? Are these features worth *WordPerfect*'s considerable price? Certainly these are questions you should ask before even thinking of buying this package.

All word processors allow you to do certain things. You can enter and edit text, save files, print files, choose among print styles, insert and delete text, work with blocks of text, and so on. At this point in the history of the personal computer, most users have a fairly sophisticated word processor, even one from the public domain. What separates the standard package from the professional are the unusual features, some of which indeed may not appeal to every user. The professional package attempts to satisfy the user who needs the sophistication.

To give you an idea of what I mean, here are a few of *WordPerfect*'s extras. These are by no means all of the extras that accompany the program's sophisticated text editor:

- *Advance*—prints the selected text a half-line above or below the regular text or moves the printer to a specific line.
- *Binding Width*—widens the margin (on the printer) to the right on even-numbered pages and to the left on odd-numbered pages, so you can punch holes in the pages without putting a hole through the text itself.
- *Border Draw*—puts borders around your text, using characters such as asterisks or number signs (you choose the characters). It can also be used for charts and graphs.
- *Center Page*—All word processors center text on a line, but this command lets you center the entire page. This is particularly useful for business letters.
- *Columns*—lets you define text columns or math columns across the page. You can place text in either newspaper columns, which snake from the bottom of one to the top of the next, or parallel columns, meant to be read side to side. Creating columns is easy, and you can change standard pages into columns at any time.
- *Footnotes and End Notes*—Some of the most requested features for writers of essays, reports, and books, footnote and end note formatting are included as features on suprisingly few word processors. *WordPerfect* allows the creation of footnotes and end notes (you can have both), keeping track of the numbers and allowing you many pages for each note. Footnotes print on the appropriate page, and the program even handles lengthy notes that overlap onto the next page. Finally, you can choose from several numbering styles.
- *Hyphenation*—will automatically hyphenate words, but lets you see what it's doing to let you correct it.
- *Help*—online help (but not memory-resident), detailing most of *WordPerfect*'s features. What is impressive about Help is the way it operates. To find out about retrieving files, for example, you go to the *Rs* in the Help menu. Alongside Retrieve, it shows Shift-F10. This means that by pressing Shift and F10 you can retrieve files, but it also means that doing so now will produce a further Help screen about retrieving files. In other words, you invoke Help about a feature by using the same keys you would use to invoke the feature itself.
- *Index and Table of Contents*—Although far from easy to use, these features are thorough and comprehensive. The index will produce headings and subheadings, and there is no limit to the number of words you can tag. By using the macros properly (the manual shows how to set these up), putting together even a highly detailed index becomes quite straightforward.
- *List Files*—The F5 key gives you a file management menu. From here, you can load, delete, rename, and print files, load ASCII files, and copy files from disk to disk. You can even search for files that contain specific words (without actually loading the file into memory)—a highly useful feature if your disk contains many files, and you can't remember which one has the needed information. You can also look at a file without loading it into memory, another useful, memory-saving feature.
- *Lists*—In addition to the Index and Table of Contents, you can generate a list of figures, tables, maps, and so on. *WordPerfect* allows five separate lists per document.
- *Locked Documents*—You can protect a file from prying eyes by locking it with a password. The manual warns you, though, that if you forget the password you have no way of retrieving the file. (A possible amnesia subplot on an espionage soap opera here.)

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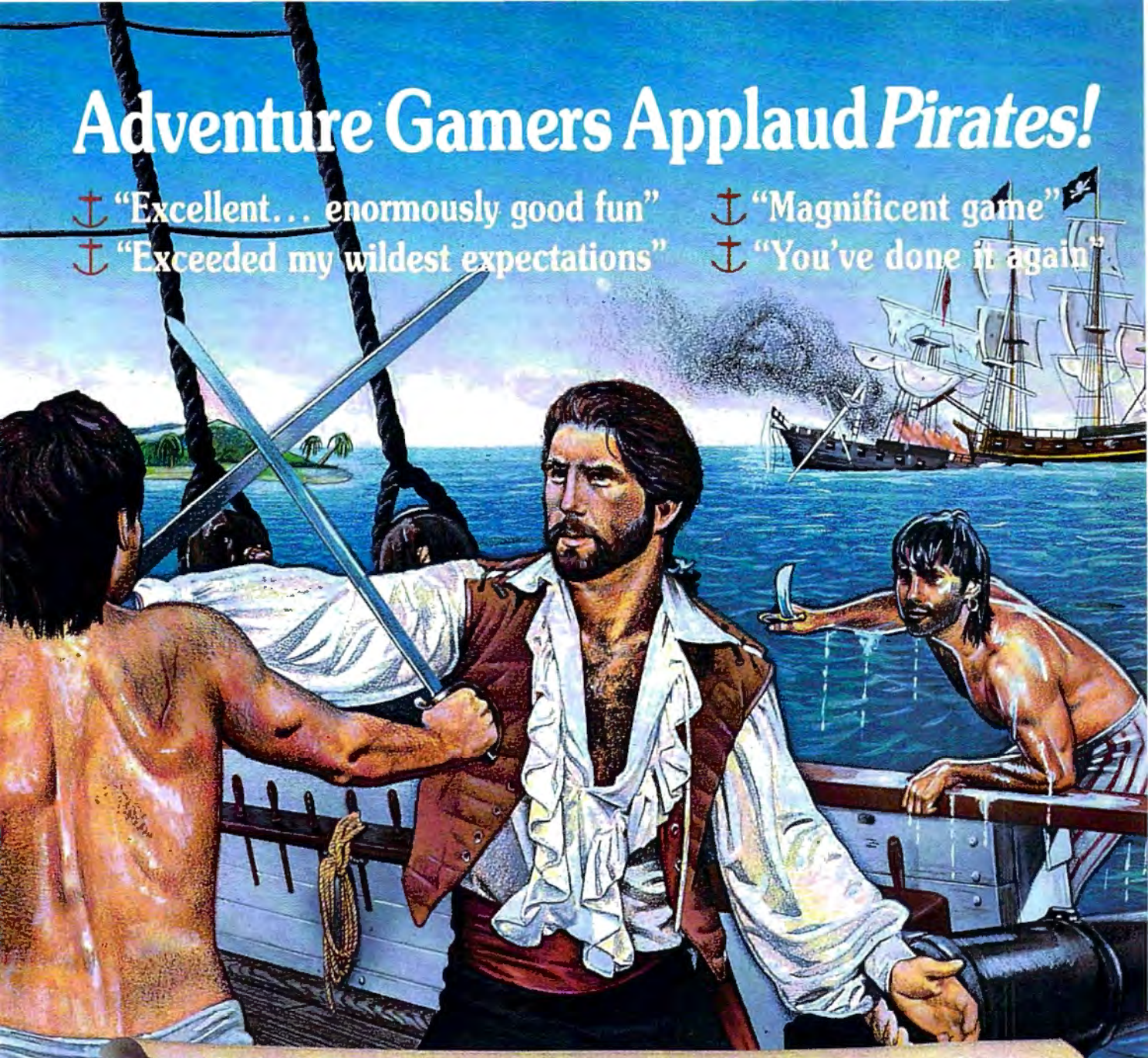

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• *Math*—You can perform several mathematical calculations with a document. I have never in my life used mathematical formulas in a word processing document, but the capability is here for those who do. It seems fairly sophisticated, and for most of us it should well-satisfy our limited spreadsheet needs.

• *Mail-merge*—allows the mass production of letters, mailing addresses, envelopes, and so on. This is the most sophisticated mail-merge feature I have seen as part of any word processing program.

• *New CLI*—You can invoke the Amiga's Command Line Interpreter from within the program. Since *WordPerfect* supports multitasking, you can use the CLI to load another program, perform disk copies, set Preferences, and so on.

• *Overstrike*—allows you to print two characters in the same position. This is useful when you are marking text that you feel should be deleted. Simply overstrike the text in question, print out the document, and give it to the person who must verify the changes.

• *Redline*—This places a vertical line in the margin beside the marked text, for the purposes of highlighting it. As with Overstrike, this allows you to show the reader what sections you feel should be changed.

And so on. Obviously, listing all the special features is neither useful nor possible, but from this list you can get the idea. Even so, there are several other important features that deserve somewhat more detailed commentary. These include Spell, Thesaurus, Print, Macros, Backup Options, and Reveal Codes.

Other Major Features

The 100,000-word Speller is complete, sophisticated, and, if you use floppy disks, unbelievably slow. It allows you to change incorrect words when it finds them, and it displays a list of suggested alternatives. You can even try to find a word phonetically. It locates double words as well as misspelled words, and it performs a word count. But you may want to spell check only if you have a hard drive or expanded RAM. I checked a 20-page document (10,000 words), and after 33 minutes the program had checked only the first four pages (it found three errors). For almost the entire time, my external drive was running constantly, finding the possible alternative words.

The Thesaurus is very useful. At any point in your writing or editing, you can put the cursor on a word and invoke the Thesaurus. A list of 5–10 synonyms will appear, sorted by part of speech. In addition, the Thesaurus gives one or two antonyms. Since much writing is done speedily, editing with the Thesaurus will ease the problem of repeated words.

The Print program is sophisticated but a little intimidating, especially for those used to hitting Control-P and going for coffee. First of all, you must set up your printer (unless you own one of the few contained in Workbench). The Print disk contains drivers for every printer I have ever heard of, including several laser printers and daisywheels, and you can transfer up to six drivers to your boot disk (for those with more than one printer). On the slim chance that *WordPerfect* does not contain a driver for your printer, you can use the Print Define program to customize your own driver. If you kept your printer manual, defining a driver should be almost no problem at all.

One of the most impressive features of the Print command is the ability to specify Print jobs—by listing several files in order of priority, you can print several separate documents in succession, without having to worry about them. You can even change the priority of the files as the documents are printing, moving some to the top of the list and others to the bottom. You can, incidentally, work on another file while printing is going on.

Put It In A Macro

The Macros system is extremely detailed, and it demands considerable effort. What it does, though, is allow you to set up any number of macros, in any number of ways, to perform tasks you normally repeat. Any *WordPerfect* function can be placed within a macro, so you can define these precisely to your demands. For instance, if you regularly finish a short document, create an index and table of contents, and then send it to the printer, you can do so in a macro. Instead of doing all these things separately, simply invoke the macro and go for more coffee.

WordPerfect offers a few useful Backup options. You can specify, for instance, that you want your files saved automatically every so often (I use 20 minutes) to guard against typing for two hours, forgetting to save your files, and then watching as the power goes down. In the case of a reboot, *WordPerfect* searches for the backed-up file on disk (it's a special kind) and tells you to retrieve it or delete it. Highly functional, this option has saved my work on several occasions already.

Finally, *WordPerfect* uses what is called a Reveal Codes command. Because the screen is partially WYSIWIG (What You See Is What You Get), such commands as Boldface, Italics, Center, Hard Return, Indent Paragraph, and so on, appear not as printer codes but rather as you would see them on the page. The Reveal Codes command splits the screen in half, the bottom part showing the codes within the text. You can use the cursors and the delete key to change these commands, getting rid of the Boldface or the Superscript, for example. This feature is most useful when working with a long document filled with printer commands. If it fails to print properly, you can move the cursor down to the problem area, use Reveal Codes, and try to correct the problem.

What these features suggest, of course, is *WordPerfect*'s enormous flexibility. Unlike many word processing programs, which force you to work within the programmer's design, *WordPerfect* gives you the features and lets you do with them as you will. The price for this is that you must learn the program thoroughly to make it work exactly as you want, but for people who word process for a living, the payoff is enormous.

WordPerfect Corporation is renowned for supporting and upgrading its software, so we can expect even more in the future. I did manage to crash the program twice, both times while trying to hyphenate a long document I had just transformed into multiple columns, but there is no doubt such minor problems will disappear in future versions. *WordPerfect* has established the new standard for Amiga word processors. It does not allow the mixture of graphics and text, but apart from that it uses the Amiga well. If there are important features it doesn't have, I simply don't know about them.

If you need a word processor with a wealth of proven features, and you word process enough to justify the price, I recommend *WordPerfect* highly.

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Chuck Yeager's Advanced Flight Trainer

Ervin Bobo

Requirements: IBM PC and compatibles, and Commodore 64.

I was in grammar school when I first learned of Chuck Yeager breaking the sound barrier, and I suppose it is because youth is impressionable that he has remained one of my heroes, and the Bell X-1 aircraft has retained an aura of daring and adventure. A younger generation knows Yeager now, courtesy of *The Right Stuff* and his recent autobiography. And now, one of the best computer flight simulators bears his name.

Yet, as good as it is, and in spite of the fact that it gives you the chance to fly the X-1 at Mach speeds, it is not a simulator that will appeal to everybody. Perhaps because Yeager had a hand in developing it (he is credited as a co-designer), it demands a precise style of flying that is far removed from arcade-type flight simulators. And in spite of the fact that the hangar holds some of the best combat aircraft in the world, you'll never get a chance to fire guns or rockets at an enemy. What you will get is a look into the world of the test pilot.

Planes Real And Imagined

In aircraft to be flown, *Yeager's AFT* gives you many choices: 14 airplanes, ranging from a World War I Sopwith Camel to the Bell X-1, the SR-71 "Blackbird," and on to several craft that apparently never got beyond the drawing board.

It is in flying the latter that the nature of *AFT* is revealed. Performance characteristics of these craft are not known, and it is up to you to fly them in such a way as to push the outer edges of the "envelope"—to find maximum speed, cruising speed, and maximum altitude; to determine stall criteria in all flight modes; to measure rate of climb; and so on. In effect, you are a test pilot. (To aid you in evaluating performance, *AFT* allows you to print blank test-flight check lists with which you can record your observations in coherent form.)

Rather than flying around observing scenery or darting around in combat, *Yeager's AFT* puts you in touch with the unknown and leaves it up to you to find a way to make it familiar. In the prologue to *The Right Stuff* (the movie), Yeager says, "There was a demon that lived in the air. . . ." This simulator brings you into the company of that demon, for it is still there and it is still known to those who fly higher, faster, and farther.

Trading arcade action for realism makes *AFT* a serious simulator, and this will, for some of us, cut into the fun—until you realize that the seriousness has elevated the adventure. It is a challenge to fly an aircraft according to its characteristics and an even greater challenge to fly it well.

Yet there is hare-brained flying for those of us who like it. You can try formation flying in which you follow Yeager as he darts in and around pylons, or into aerobatic maneuvers such as hammerheads, Cuban eights, and the like. And when you crash—and you will, repeatedly—a digitized photo of General Yeager will appear with a caption on the order of, *Boy, you dug a hole clear through to China.*

Still more challenges can be found in air races over several different courses, in navigating from one airstrip to another, and in takeoffs and landings.

Yeager's AFT builds upon flight simulators of the past by duplicating some of the more outstanding features of its predecessors. To observe a flight, we have views from both tower and chase plane, and a new view is from a satellite. Left and right views are also possible, and there is a flight recorder which will allow you an instant replay of your actions—especially nice for seeing how badly you botched an Immelmann. Close-ups of the ground or of your craft seen from another angle are possible through use of the zoom feature.

In using such features as the zoom, or in using any of the pull-down menu choices, the flight will pause momentarily while your computer accesses the disk. Since this interrupts the continuity of a flight, it can be rather jarring. I'd rather have an instantaneous zoom by means of pressing a single key, but I realize you can't have everything.

I also have some problems with the graphics: Though 3-D graphics are used, they are less than complex; the ground objects that rise from the desert floor are featureless blocks and pyramids (though solid as opposed to wireframe). The other problem is that all aircraft, seen from outside, look the same—or almost so. There is one blocky shape for propeller aircraft and another blocky shape for jet and rocket aircraft, and neither is exciting. (It would be nice to go to a chase-plane view and see the wedge shape of an SR-71 or the stiletto shape of the X-3).

Although the aircraft look alike, they do have individual flying characteristics. Besides providing a measure of variety, this feature insures longevity: It will take you a while to master one aircraft and much longer to master 14 of them.

Imitating Yeager

To aid you in your mastery, there is a Flight Instruction routine. Here, Yeager is flying the craft and you duplicate his movements through one of several maneuvers by matching your windscreen cursors to his. There is a center cursor that represents the aileron and elevator control, as well as other indicators that allow you to match throttle and rudder movements. This is reminiscent of driver's ed cars with dual controls, but in this case, the instructor is driving and you're merely trying to match his movements. How much can really be learned from this is open to question, but we'd rather have the feature than not have it.

Documentation is very good, although it is written in general terms, since *AFS* will be released for other computers (for specifics, the quick-reference insert fills the bill). Especially noteworthy here are Chuck Yeager's marginal comments on the various aircraft and on flying in general. Everything I've ever heard him say (with the exception of certain TV commercials) has been both pithy and interesting, and his comments here are no exception.

In summing up, I'll mention that *Chuck Yeager's Advanced Flight Simulator* has some shortcomings, notably in the blocky graphics and the monotonous sound. And while saying this, I'll also point out that the control panel graphics are very good, and that no program can exceed the capabilities of the computer for which it was designed. These shortcomings are more than offset by the high frame rate—a fast screen updating that provides the feel of moving at high speed.

Although some prior routines from programs of this genre have been utilized and built upon, *AFS* is not an imitation of anything. It does not strive to be better than previous simulators so much as it strives to be different—to present high-performance flying from the point of view of a test pilot, and in this case, to present such flying from the viewpoint of one who has not only met the demon of the air, but who has also shaken its hand.

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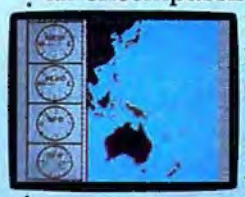

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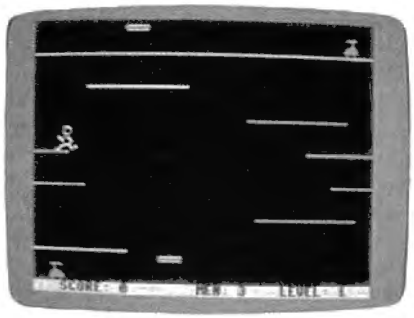
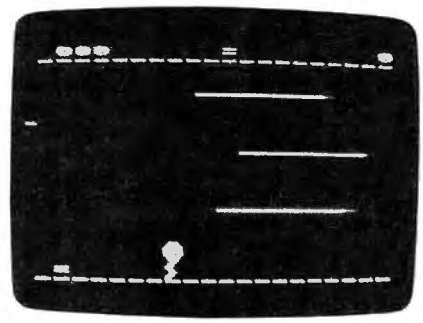
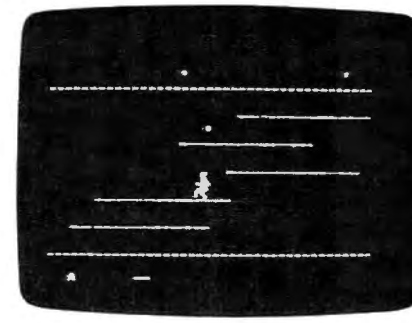


"Leaping Larry" for the Commodore 64, a challenging arcade-action game with great graphics and sound effects.



"Leaping Larry" for the Atari 400/800/XL/XE, written entirely in machine language.



The Apple II version of "Leaping Larry" is played with the keyboard and runs with either DOS 3.3 or ProDOS.

Leaping Larry

Michael Streeter

In this fast-paced action game, your goal is to retrieve important plans from a futuristic factory filled with nasty hazards. The original version was written for the Commodore 64. We've added new versions for the Apple II series, as well as the Atari 400, 800, XL, and XE. The Apple II version runs on any Apple II-series computer with either DOS 3.3 or ProDOS. The Atari version requires a disk drive and at least 48K RAM. The 64 and Atari versions each require a joystick.

In "Leaping Larry," you're an apprentice inventor in a future world. One evening after leaving the factory, you realize that you've left behind three sets of important plans that you intended to take home. You return to the factory, but the security robots—which can be quite dangerous—are patrolling, and you don't know how to turn them off. And the elevators have been shut down, so the only way to move from the ground floor to the top floor—where the most important plans are stored—is by riding a series of moving conveyor belts, each on a different floor. The only way to avoid the robots and move from floor to floor on the belts is by leaping.

To get started with Leaping Larry, type in the version for your computer, save a copy, and run the program (see below for special notes concerning the version for your computer). When the game begins, you'll see Larry on the bottom floor, along with a robot and one set of plans. Above Larry there are six floors of conveyor belts moving parallel to the floor. On the top floor you'll find another robot and another set of plans. If one of the robots touches Larry, you lose him—but don't despair: You start each game with three Larrys.

To move Larry from left to right, simply move the joystick. Pressing the fire button causes Larry to leap, but he must be moving—if you press the fire button while he's standing still, he won't move at all.

To move from the bottom level to the top, Larry has to leap on moving conveyor belts. The belts move just a little bit faster than Larry, so he can stay on one only for a moment. And if Larry stands still on a belt, it will move out from under him, and he'll fall.

The object of the game is to move Larry to the top and have him pick up the plans. When the plans are secured, the game moves to the next higher level. In levels 1–6, the conveyor belts become shorter with each progressive level. Beginning with level 7, certain floors become invisible—one additional floor with each progressive level. In level 7, the top floor is invisible. In level 8, the top floor and the floor below it are invisible, and so on, until all floors are invisible.

The Commodore 64 Version

Because this version of Leaping Larry (Program 1) is written entirely in machine language, it must be typed in using "MLX," the machine language entry program found elsewhere in this issue. Be sure to read the instructions for using MLX before you begin entering data. When you run MLX, you'll be asked for a starting and an ending address for the data you'll be entering. The correct values for Leaping Larry are as follows:

Starting address: C000
Ending address: CD0F

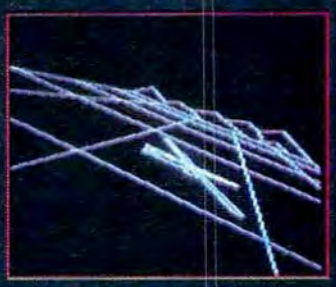
1987 - Expanding Scenery disk coverage; East Coast, Japan, & Europe

1985 - High-performance Jet flight simulator for the IBM, Commodore 64, and Apple II computers

1986 - Flight Simulator II for the 68000 computers

1982/1983 - Microsoft Flight Simulator & Flight Simulator II

1979 - 3D graphics applied to the original FS1 Flight Simulator for the new Apple II and TRS-80 computers



1977 - SubLOGIC's 3D graphics package in BASIC and M6800 Assembly Language

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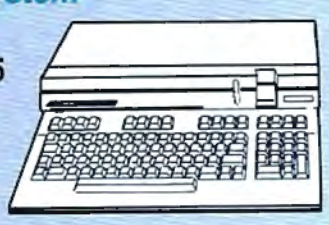

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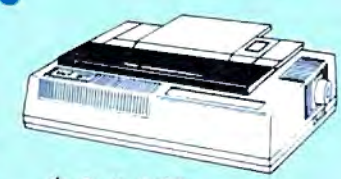

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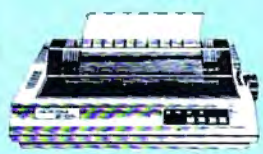

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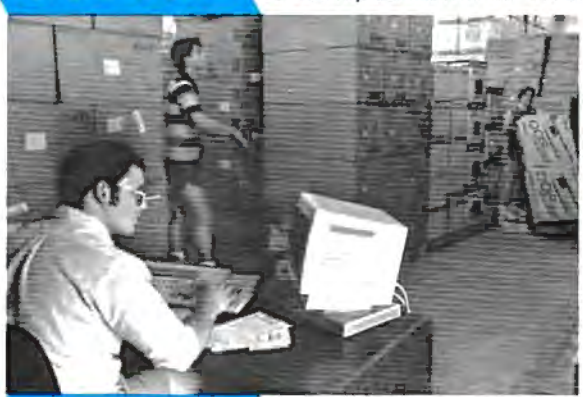

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After you've entered all the data, be sure to save a copy before leaving MLX.

To load the program, type

```
LOAD"filename",8,1
```

where *filename* is the name you used to save the program. To run Leaping Larry, type **SYS 49152**.

In the 64 version, Larry earns points for picking up plans. The plans on the top floor are worth 600 points; the ones on the bottom floor worth 100 points; and there are several other plans, worth 50 points each, that appear randomly.

Apple II Version

The Apple version of Leaping Larry (Program 2) must be typed in using "Apple MLX," found elsewhere in this issue. When Apple MLX asks for the starting and ending addresses, enter the following values:

```
STARTING ADDRESS?   6000
ENDING ADDRESS?     6ACF
```

After you've entered all the data, be sure to save a copy before leaving MLX.

To start Leaping Larry, type **BRUN *filename***, where *filename* is the name you used for saving the Leaping Larry data. The Apple version of Leaping Larry uses keyboard controls in place of the joystick. To move Larry left use *J;* to move him right, use *L;* stop him with *K;* use the space bar to make him leap.

This version doesn't use robots, but it has a unique and interesting twist: The conveyor belts move in random patterns. To compensate for this added difficulty, the third set of plans doesn't fall, but remains stationary. With each progressive level, the belts become shorter and shorter until they're just flickers.

Atari 400, 800, XL, And XE Version

Leaping Larry for the Atari is similar to the 64 version of the game. Program 3 is a BASIC program which, when run, creates a machine language program on disk. Type Program 3 in carefully and save a copy to disk before running it. When you save the program, use a name other than LEAPIN, which is the name of the program generated when you run the program. To create the machine language game, type RUN.

To start the game, go to the DOS 2.0 or 2.5 menu and select the Load Binary File option. When asked for the filename, specify LEAPIN/N. Next, select the Run At Memory option. When asked for an address, enter 6000. If you use a third-party DOS (such as OS/A or DOS XL), you may be able to simply type LEAPIN at the DOS prompt to start the game.

There are a few minor differences in the Atari version of the game. First, there are no falling plans. Plans located on the bottom of the screen are worth 2 points; plans at the top are worth 10. The only way to score is by collecting plans.

There are no invisible levels in the Atari version. Instead, there are different hazards. The platforms become shorter on each level. Also, the robots (which are intelligent and persistent in this version) become faster after several levels have passed.

You begin the game with five lives. You lose a life each time a robot touches you or you fall off a platform.

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

Program 1: Leaping Larry—Commodore 64 Version

```
C000:20 74 C9 A9 01 8D A4 C9 D3
C008:A9 00 8D A3 C9 8D A0 C0 D0
C010:8D C8 C0 8D CA C9 8D CB DF
C018:C9 8D 00 D4 8D 21 D0 A9 6B
C020:03 8D C9 C9 20 42 C9 A9 A3
C028:FF 8D 0F D4 A9 80 8D 18 BE
C030:D4 A9 81 8D 12 D4 A9 01 C7
C038:8D 28 D0 A9 00 8D 86 02 84
C040:8D 10 D0 8D 03 D0 A9 0C 3A
C048:8D 29 D0 8D 2A D0 78 A9 FC
C050:5D 8D 14 03 A9 C0 8D 15 17
C058:03 58 4C 69 C0 EE 03 D0 2A
C060:EE 03 D0 20 23 C8 4C 31 3C
C068:EA A9 0E 8D 20 D0 A9 00 FB
C070:8D 9D C9 AD 10 D0 29 FA 45
C078:09 08 8D 10 D0 A9 35 8D 58
C080:05 D0 A9 DD 8D 07 D0 A9 9F
C088:19 8D 04 D0 A9 3F 8D 06 F2
C090:D0 A2 F4 8E FA 07 E8 8E FE
C098:FB 07 A9 93 20 D2 FF A2 37
C0A0:00 A9 51 9D DC 04 9D 4A 0D
C0A8:05 9D BE 05 9D 44 06 9D E3
C0B0:A8 06 9D 39 07 E8 E0 0C F8
C0B8:D0 E9 A2 00 9D 50 04 9D 45
C0C0:98 07 E8 E0 28 D0 F5 A2 8E
C0C8:00 A9 77 9D 04 05 9D 72 5F
C0D0:05 9D E6 05 9D 6C 06 9D B1
C0D8:D0 06 9D 61 07 E8 E0 0C B7
C0E0:D0 E9 A2 00 9D 78 04 9D 0E
C0E8:C0 07 E8 E0 28 D0 F5 A2 CA
C0F0:00 A9 A0 9D C0 07 E8 E0 9F
C0F8:28 D0 F8 A2 00 A9 01 9D 52
C100:C0 DB E8 E0 28 D0 F8 A9 26
C108:00 A2 00 9D 50 D8 9D C8 F7
C110:D8 9D 40 D9 9D 98 DB 9D B1
C118:B8 D9 9D 30 DA 9D A8 DA 9E
C120:9D 20 DB E8 E0 28 D0 E3 B1
C128:A2 00 A9 0D 9D 78 D8 A9 2D
C130:01 9D F0 D8 A9 04 9D 68 48
C138:D9 A9 03 9D E0 D9 A9 0A 19
C140:9D 58 DA A9 05 9D D0 DA B9
C148:A9 07 9D 48 DB E8 E0 28 07
C150:D0 D8 18 A2 18 A0 03 20 09
C158:F0 FF A9 A5 A0 C9 20 1E 6E
C160:AB 20 12 C8 20 EF C7 A9 8A
C168:01 8D 2B D0 8D 2C D0 A9 AA
C170:CE 8D 09 D0 A9 26 8D 0B F8
C178:D0 A9 F6 8D FC 07 8D FD A3
C180:07 AD A3 C9 C9 05 90 0B 92
C188:AD A4 C9 D0 06 EE A0 C0 40
C190:EE C8 C0 20 FB C6 20 9C AF
C198:C1 4C C2 C1 20 B7 C1 AD 95
C1A0:1B D4 29 01 C9 01 D0 08 18
C1A8:AD 10 D0 09 02 8D 10 D0 E8
C1B0:AD 1B D4 8D 02 D0 60 AD 07
C1B8:10 D0 29 FD 8D 10 D0 A9 75
C1C0:00 60 A9 3F 8D 15 D0 A9 91
C1C8:DD 8D 01 D0 A9 FF 8D F8 2D
C1D0:07 A9 19 8D 00 D0 8D 9A 37
C1D8:C9 A9 F7 8D 9B C9 AD 1E 01
C1E0:D0 4C E4 C1 20 95 C5 20 9B
C1E8:A9 C4 AD 00 DC C9 77 F0 16
C1F0:17 C9 7B F0 25 C9 6B F0 09
C1F8:15 C9 67 F0 17 A9 FF 8D 62
C200:F8 07 8D 9B C9 4C E4 C1 3A
C208:20 20 C2 4C E4 C1 20 4E 7F
C210:C3 4C E4 C1 20 AD C3 4C CE
C218:E4 C1 20 86 C2 4C E4 C1 BF
C220:AD 9B C9 C9 F7 90 04 C9 0D
C228:FB 90 05 A9 FA 8D 9B C9 1A
C230:AD 9B C9 8D F8 07 AD 9C 61
C238:C9 C9 01 F0 18 CE 9B C9 41
C240:AD 9B C9 C9 F7 B0 0B A9 9B
C248:01 8D 9C C9 EE 9B C9 4C A7
C250:55 C2 4C 6B C2 EE 9B C9 44
C258:AD 9B C9 C9 FB 90 0B A9 53
C260:00 8D 9C C9 CE 9B C9 4C 3E
C268:3D C2 EA 20 EF C2 20 76 DD
C270:C5 20 EF C2 20 EF C2 20 71
C278:76 C5 20 EF C2 20 95 C5 35
C280:20 A2 C4 4C CA C6 AD 9B 84
C288:C9 C9 FF 90 05 A9 FB 8D C2
C290:9B C9 C9 FB 90 F7 AD 9B AA
C298:C9 8D F8 07 AD 9C C9 C9 33
C2A0:01 F0 18 EE 9B C9 AD 9B CF
C2A8:C9 C9 FF 90 0B A9 01 8D 1D
C2B0:9C C9 CE 9B C9 4C BB C2 44
C2B8:4C D1 C2 CE 9B C9 AD 9B 19
C2C0:C9 C9 FB B0 0B A9 00 8D B4
C2C8:9C C9 EE 9B C9 4C A3 C2 30
C2D0:EA 20 1D C3 20 76 C5 20 3A
C2D8:1D C3 20 1D C3 20 76 C5 05
C2E0:20 1D C3 20 95 C5 AD 9A F1
C2E8:C9 8D 00 D0 4C CA C6 AD 8C
C2F0:9A C9 C9 40 F0 18 C9 FF EE
C2F8:F0 06 EE 9A C9 4C 4A C3 D7
C300:AD 10 D0 09 01 8D 10 D0 3C
C308:A9 00 8D 9A C9 60 AD 10 FA
C310:D0 29 01 C9 01 F0 03 EE C7
C318:9A C9 4C 4A C3 AD 9A C9 61
C320:C9 18 F0 1A C9 00 F0 06 88
C328:CE 9A C9 4C 4A C3 AD 10 88
C330:D0 29 FE 8D 10 D0 A9 FF 3A
C338:8D 9A C9 4C 4A C3 AD 10 F7
C340:D0 29 01 C9 01 D0 03 CE 57
C348:9A C9 20 A2 C4 60 A9 FE B7
C350:8D F8 07 A2 00 20 1D C3 66
C358:CE 01 D0 CE 01 D0 20 76 90
C360:C5 20 76 C5 20 95 C5 E8 C9
C368:E0 08 D0 E9 A2 00 20 1D 8D
C370:C3 20 1D C3 CE 01 D0 20 FD
C378:76 C5 20 76 C5 20 95 C5 B7
C380:E8 E0 0A D0 E9 EE 01 D0 E0
C388:20 76 C5 EE 01 D0 AD 1F 2B
C390:D0 20 98 C4 29 01 C9 01 C9
C398:F0 12 20 0C C4 AD 1F D0 CD
C3A0:20 98 C4 29 01 C9 01 F0 AB
```

```
C3A8:03 4C 26 C5 60 A9 F7 8D 0D
C3B0:F8 07 A2 00 20 EF C2 CE DF
C3B8:01 D0 CE 01 D0 20 76 C5 98
C3C0:20 76 C5 20 95 C5 E8 E0 27
C3C8:08 D0 E9 A2 00 20 EF C2 13
C3D0:20 EF C2 CE 01 D0 20 76 AB
C3D8:C5 20 76 C5 20 95 C5 E8 42
C3E0:E0 0A D0 E9 EE 01 D0 20 51
C3E8:76 C5 EE 01 D0 AD 1F D0 57
C3F0:20 98 C4 29 01 C9 01 F0 FB
C3F8:12 20 52 C4 AD 1F D0 20 D3
C400:98 C4 29 01 C9 01 F0 03 73
C408:4C 26 C5 60 A9 FE 8D F8 5D
C410:07 A2 00 20 1D C3 20 1D 1D
C418:C3 EE 01 D0 20 76 C5 20 F2
C420:76 C5 20 95 C5 E8 E0 0A 51
C428:D0 E9 A2 00 20 1D C3 EE D4
C430:01 D0 EE 01 D0 20 76 C5 16
C438:20 76 C5 20 95 C5 E8 E0 A0
C440:08 D0 E9 CE 01 D0 20 76 2E
C448:C5 CE 01 D0 A9 FF 8D F8 F6
C450:07 60 A9 F7 8D F8 07 A2 2B
C458:00 20 EF C2 20 EF C2 EE 49
C460:01 D0 20 76 C5 20 76 C5 6B
C468:20 95 C5 E8 E0 0A D0 E9 69
C470:A2 00 20 EF C2 EE 01 D0 F2
C478:EE 01 D0 20 76 C5 20 76 57
C480:C5 20 95 C5 E8 E0 08 D0 AF
C488:E9 CE 01 D0 20 76 C5 CE 1D
C490:01 D0 A9 FF 8D F8 07 60 C2
C498:20 76 C5 20 76 C5 AD 1F CF
C4A0:D0 60 AD 9A C9 8D 00 D0 5F
C4A8:60 20 BC C4 AD 1F D0 20 F9
C4B0:98 C4 29 01 C9 01 F0 03 24
C4B8:4C 26 C5 60 AD 1E D0 8D C5
C4C0:03 CA 29 11 C9 11 D0 10 F8
C4C8:AD 15 D0 29 EF 8D 15 D0 CB
C4D0:20 A3 C6 A0 64 4C 00 C8 53
C4D8:AD 03 CA 29 03 C9 03 D0 FB
C4E0:10 AD 15 D0 29 FD 8D 15 FE
C4E8:D0 20 A3 C6 A0 32 4C 00 2A
C4F0:C8 AD 03 CA 29 21 C9 21 D9
C4F8:D0 19 AD 15 D0 29 DF 8D B0
C500:15 D0 EE CB C9 EE CB C9 50
C508:A0 58 20 00 C8 20 A3 C6 D2
C510:4C 71 C5 AD 03 CA 29 05 4C
C518:C9 05 F0 0A AD 03 CA 29 C0
C520:09 C9 09 F0 01 60 A9 0F BE
C528:8D 18 D4 A9 11 8D 05 D4 53
C530:8D 04 D4 A9 41 8D 06 D4 D9
C538:AD 01 D0 AA 8D 01 D4 A9 63
C540:00 8D A4 C9 CE A3 C9 CE C7
C548:A0 C0 CE C8 C0 E8 8A 49 C2
C550:FF 8D 01 D4 8E 01 D0 20 E6
C558:76 C5 E0 FF D0 EF A9 10 56
C560:8D 04 D4 CE C9 C9 20 EF E0
C568:C7 AD C9 C9 D0 03 4C C7 0C
C570:C7 68 68 4C 24 C0 A9 00 43
C578:8D 98 C9 A9 00 8D 99 C9 F7
C580:EE 99 C9 AD 99 C9 C9 C8 4E
C588:D0 F6 EE 98 C9 AD 98 C9 A1
C590:C9 03 D0 E7 60 8E 9E C9 9E
C598:20 98 C6 EE 9D C9 AD 9D 2F
C5A0:C9 C9 03 D0 03 4C A9 C5 53
C5A8:60 A9 00 8D 9D C9 AD EF 07
C5B0:04 8D 8C C9 AD 17 05 8D 31
C5B8:8D C9 AD DF 05 8D 8E C9 76
C5C0:AD 07 06 8D 8F C9 AD CF 4D
C5C8:06 8D 90 C9 AD F7 06 8D 50
C5D0:91 C9 AD 40 05 8D 92 C9 9E
C5D8:AD 68 05 8D 93 C9 AD 30 1E
C5E0:06 8D 94 C9 AD 58 06 8D 6A
C5E8:95 C9 AD 20 07 8D 96 C9 CE
C5F0:AD 48 07 8D 97 C9 A2 26 6E
C5F8:BD C8 04 9D C9 04 BD F0 BA
C600:04 9D F1 04 BD B8 05 9D ED
C608:B9 05 BD E0 05 9D E1 05 E0
C610:BD A8 06 9D A9 06 BD D0 F2
C618:06 9D D1 06 CA E0 FF D0 55
C620:D7 A2 00 BD 41 05 9D 40 B7
C628:05 BD 69 05 9D 68 05 BD 7B
C630:31 06 9D 30 06 BD 59 06 6E
C638:9D 58 06 BD 21 07 9D 20 C7
C640:07 BD 49 07 9D 48 07 E8 5F
C648:E0 27 D0 D7 AD 8C C9 8D 68
C650:C8 04 AD 8D C9 8D F0 04 3C
C658:AD 8E C9 8D B8 05 AD 8F 37
C660:C9 8D E0 05 AD 90 C9 8D 73
C668:A8 06 AD 91 C9 8D D0 06 C6
C670:AD 92 C9 8D 67 05 AD 93 C9
C678:C9 8D 8F 05 AD 94 C9 8D 71
C680:57 06 AD 95 C9 8D 7F 06 D3
C688:AD 96 C9 8D 47 07 AD 97 ED
C690:C9 8D 6F 07 AE 9E C9 60 A8
C698:AD 03 D0 C9 02 B0 03 20 6D
C6A0:9C C1 60 A9 0F 8D 18 D4 47
C6A8:A9 11 8D 05 D4 A9 41 8D AE
C6B0:06 D4 A9 1C 8D 01 D4 A9 31
C6B8:00 8D 00 D4 A9 21 8D 04 E7
C6C0:D4 20 76 C5 A9 20 8D 04 D8
C6C8:D4 60 A9 0F 8D 18 D4 AD 23
C6D0:F8 07 C9 FA D0 03 4C DE 8F
C6D8:C6 C9 FB F0 01 60 A9 11 B8
C6E0:8D 05 D4 A9 41 8D 06 D4 CC
C6E8:A9 50 8D 01 D4 A9 81 8D FE
C6F0:04 D4 20 76 C5 A9 80 8D 84
C6F8:04 D4 60 A9 01 8D A4 C9 B5
C700:20 B2 C7 EE A3 C9 18 A2 4B
C708:18 A0 24 20 F0 FF A9 00 2D
C710:AE A3 C9 20 CD BD AD A3 7F
C718:C9 C9 01 F0 34 C9 02 F0 EB
C720:3C C9 03 F0 38 C9 04 F0 91
C728:34 C9 05 F0 30 C9 06 F0 99
C730:33 C9 07 F0 3C C9 08 F0 C5
C738:45 C9 09 F0 11 C9 0A F0 C1
C740:07 C9 0B F0 06 4C A5 C7 AA
C748:4C 98 C7 4C A5 C7 4C 8B 52
C750:C7 A9 F6 8D F9 07 EE A0 50
C758:C0 EE C8 C0 60 EE A0 C0 E9
C760:EE C8 C0 60 A2 00 A9 00 20
C768:9D F0 D8 E8 E0 28 D0 F8 EE
C770:60 A2 00 A9 00 9D 68 D9 94
C778:E8 E0 28 D0 F8 60 A2 00 55
C780:A9 00 9D E0 D9 E8 E0 28 03
C788:D0 F8 60 A2 00 A9 00 9D 39
C790:58 DA E8 E0 28 D0 F8 60 05
C798:A2 00 A9 00 9D D0 DA E8 7D
C7A0:E0 28 D0 F8 60 A2 00 A9 8B
C7A8:00 9D 48 DB E8 E0 28 D0 52
C7B0:F8 60 AD 1B D4 C9 1E 90 D6
C7B8:F9 8D 08 D0 AD 1B D4 C9 04
C7C0:1E 90 F9 8D 0A D0 60 A9 99
C7C8:00 8D 15 D0 18 A2 0B A0 6D
C7D0:0B 20 F0 FF A9 CE A0 C9 9F
C7D8:20 1E AB 20 10 C9 20 E4 44
C7E0:FF C9 59 F0 06 C9 4E F0 02
C7E8:05 D0 F3 4C 00 C0 00 18 8D
C7F0:A2 18 A0 18 20 F0 FF A9 DB
C7F8:00 AE C9 C9 20 CD BD 60 1E
C800:8C 01 CA 18 AD CA C9 6D 8C
C808:01 CA 8D CA C9 90 03 EE B0
C810:CB C9 18 A2 18 A0 0A 20 9E
C818:F0 FF AE CA C9 AD CB C9 0B
C820:4C CD BD AD 02 CA F0 11 0C
C828:20 4A C8 20 E2 C8 A9 F4 F9
C830:8D FA 07 A9 F5 8D FB 07 A7
C838:60 20 7F C8 20 AD C8 A9 71
C840:F5 8D FA 07 A9 F4 8D FB 38
C848:07 60 AD 04 D0 C9 40 F0 8A
C850:18 C9 FF F0 06 EE 04 D0 34
C858:4C AC C8 AD 10 D0 09 04 09
C860:8D 10 D0 A9 00 8D 04 D0 80
C868:60 AD 10 D0 29 04 C9 04 95
C870:F0 04 EE 04 D0 60 AD 02 FE
C878:CA 49 01 8D 02 CA 60 AD 64
C880:04 D0 C9 18 F0 1A C9 00 86
C888:F0 06 CE 04 D0 4C AC C8 08
C890:AD 10 D0 29 FB 8D 10 D0 B0
C898:A9 FF 8D 04 D0 4C AC C8 CA
C8A0:AD 10 D0 29 04 C9 04 D0 D9
C8A8:03 CE 04 D0 60 AD 06 D0 93
C8B0:C9 40 F0 18 C9 FF F0 06 0D
C8B8:EE 06 D0 4C 0F C9 AD 10 2D
C8C0:D0 09 08 8D 10 D0 A9 00 ED
C8C8:8D 06 D0 60 AD 10 D0 29 3B
C8D0:08 C9 08 F0 04 EE 06 D0 A1
C8D8:60 AD 02 CA 49 01 8D 02 5E
C8E0:CA 60 AD 06 D0 C9 18 F0 D4
C8E8:1A C9 00 F0 06 CE 06 D0 51
C8F0:4C 0F C9 AD 10 D0 29 F7 8E
C8F8:8D 10 D0 A9 FF 8D 06 D0 1D
C900:4C 0F C9 AD 10 D0 29 08 AF
C908:C9 08 D0 A0 CE 06 D0 60 37
C910:AD CB C9 CD CD C9 90 1B 55
C918:F0 02 B0 0B AD CA C9 CD 65
C920:CC C9 90 0F 4C 27 C9 AE D0
C928:CA C9 AC CB C9 8E CC C9 D1
C930:8C CD C9 AE CC C9 AC CD 56
C938:C9 8E CA C9 8C CB C9 4C BD
C940:1A C8 AD A4 C9 F0 2C A9 27
C948:00 8D 15 D0 A9 93 20 D2 9D
C950:FF 18 A2 0B A0 10 20 F0 65
C958:FF A9 04 A0 CA 20 1E AB 9F
C960:A9 00 AE A3 C9 E8 20 CD D8
C968:BD A2 00 20 76 C5 E8 E0 03
C970:32 D0 F8 60 A2 00 BD 0D 14
C978:CA 9D 00 3D BD 0D CB 9D 04
C980:00 3E BD 0D CC 9D 00 3F 48
C988:E8 D0 EB 60 00 00 00 00 48
C990:00 00 00 00 00 00 00 00 24
C998:00 00 00 00 00 00 00 00 2C
C9A0:00 00 00 00 00 05 12 53 BF
C9A8:43 4F 52 45 3A 20 20 20 03
C9B0:20 20 20 20 20 20 4D 71
C9B8:45 4E 3A 20 20 20 20 20 AD
C9C0:20 4C 45 56 45 4C 3A 20 75
C9C8:00 00 00 00 00 00 92 96 18
C9D0:50 4C 41 59 20 41 47 41 33
C9D8:49 4E 3F 20 28 59 2F 4E E1
C9E0:29 11 11 9D 9D 9D 9D 9D 85
C9E8:9D 9D 9D 9D 9D 9D 9D 9D 7C
C9F0:9D 9D 9D 9D 48 49 47 48 86
C9F8:20 53 43 4F 52 45 3A 20 0B
CA00:00 00 00 00 00 05 92 4C 45 E5
CA08:56 45 4C 20 00 00 00 00 A5
CA10:00 00 00 00 00 00 00 00 A5
CA18:00 00 00 00 00 00 00 00 AD
CA20:00 00 00 00 00 03 FE 00 BF
CA28:03 FF 80 00 60 00 00 60 B2
CA30:00 00 60 00 00 F8 00 01 B6
CA38:FE 00 03 FF 80 07 FF C0 8E
CA40:07 FF E0 07 FF E0 00 81 EA
CA48:00 01 C3 80 00 00 00 00 9E
CA50:00 00 00 00 00 00 00 00 E5
CA58:00 00 00 00 00 00 00 00 ED
CA60:00 00 00 00 00 00 7F C0 B5
CA68:01 FF C0 00 06 00 00 06 CC
CA70:00 00 06 00 00 1F 00 00 43
CA78:7F 80 01 FF C0 03 FF E0 01
CA80:07 FF E0 07 FF E0 00 81 2B
CA88:00 01 C3 80 00 00 00 00 DE
CA90:00 00 00 00 00 00 00 00 26
CA98:00 00 00 00 00 00 00 00 2E
CAA0:00 00 00 00 00 00 00 00 36
CAA8:00 00 00 00 00 00 00 00 3E
CAB0:00 00 00 00 00 00 00 00 46
CAB8:00 00 00 00 00 3F FF FE 4A
CAC0:6A AA A9 55 55 59 3F FF 4F
CAC8:FE 00 00 00 00 00 3C 00 56
CAD0:00 FE 00 01 C2 00 01 0A 58
CAD8:00 01 01 00 00 CE 00 00 0A
CAE0:3C 00 00 44 20 00 76 70 37
CAE8:00 F2 F0 01 C3 C0 03 83 14
CAF0:00 01 C2 00 00 FE 00 18 33
CAF8:EF C0 3D C1 E0 67 80 74 94
CB00:03 00 3C 00 00 10 00 00 E0
CB08:00 00 00 00 3E 00 3C 00 0A
CB10:00 FE 00 01 C2 00 01 0A 99
CB18:00 01 01 00 00 CE 00 00 4B
CB20:3C 00 00 44 40 00 76 E0 E9
CB28:00 73 E0 00 E3 80 00 E2 BC
CB30:00 00 BA 00 00 FE 00 00 1B
CB38:EF 00 00 C3 80 07 C1 C0 68
CB40:0F 81 D0 0C 00 F0 08 00 6E
CB48:60 00 00 00 3E 00 3C 00 7A
CB50:00 FE 00 01 C2 00 01 0A D9
CB58:00 01 01 00 00 CE 00 00 8B
CB60:3C 00 00 44 00 00 76 80 C7
CB68:00 73 C0 00 BB C0 00 BF 95
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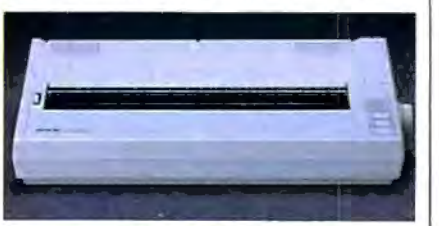

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```
CB70:00 00 9E 00 00 FE 00 00 D7
CB78:EE 00 00 C6 00 01 E7 00 C7
CB80:03 83 00 07 03 40 03 03 0D
CB88:C0 01 81 00 3E 00 3C 00 5B
CB90:00 FE 00 01 C2 00 01 0A 1A
CB98:00 01 01 00 00 CE 00 00 CB
CBA0:3C 00 00 44 00 00 76 00 87
CBA8:00 72 00 00 B3 00 00 BF 3A
CBB0:80 00 BF 00 00 FE 00 00 7C
CBB8:7C 00 00 3C 00 00 3C 00 CA
CBC0:00 7E 00 00 FC 00 01 D8 BA
CBC8:00 00 F4 00 3E 00 3C 00 69
CBD0:00 7F 00 00 43 80 00 50 B4
CBD8:80 00 80 80 00 73 00 00 96
CBE0:3C 00 00 22 00 00 6E 00 95
CBE8:00 4E 00 00 CD 00 01 FD 82
CBF0:00 00 FD 00 00 7F 00 00 46
CBF8:3E 00 00 3C 00 00 3C 00 EB
CC00:00 7E 00 00 3F 00 00 1B 4E
CC08:80 00 2F 00 3E 00 3C 00 32
CC10:00 7F 00 00 43 80 00 50 F5
CC18:80 00 80 80 00 73 00 00 D7
CC20:3C 00 00 22 00 01 6E 00 DA
CC28:03 CE 00 03 DD 00 00 FD 14
CC30:00 00 79 00 00 7F 00 00 F6
CC38:77 00 00 63 00 00 E7 80 14
CC40:00 C1 C0 02 C0 E0 03 C0 D2
CC48:C0 00 81 80 3E 00 3C 00 E4
CC50:00 7F 00 00 43 80 00 50 36
CC58:80 00 80 80 00 73 00 00 18
CC60:3C 00 02 22 00 07 6E 00 73
CC68:07 CE 00 01 C7 00 00 47 CE
CC70:00 00 5D 00 00 7F 00 00 B3
CC78:F7 00 01 C3 00 03 83 E0 5E
CC80:0B 81 F0 0F 00 30 06 00 DB
CC88:10 00 00 00 3E 00 3C 00 94
CC90:00 7F 00 00 43 80 00 50 76
CC98:80 00 80 80 00 73 00 00 58
CCA0:3C 00 04 22 00 0E 6E 00 10
CCA8:0F 4F 00 03 C3 80 00 C1 AF
CCB0:C0 00 43 80 00 7F 00 03 1C
CCB8:F7 18 07 83 BC 2E 01 E6 F4
CCC0:3C 00 C0 08 00 00 00 00 11
CCC8:00 00 00 00 3E 00 3C 00 CC
CCD0:00 FE 00 01 C2 00 01 0A 5C
CCD8:00 01 01 00 00 CE 00 00 0E
CCE0:7C 00 03 C7 80 06 82 C0 77
CCE8:0E 82 E0 0E 82 E0 07 83 50
CCF0:C0 03 83 80 00 FE 00 00 20
CCF8:EE 00 00 EE 00 00 EE 00 D6
CD00:00 EE 00 00 EE 00 01 EF C0
CD08:00 03 EF 80 3E 00 00 00 5C
```

Program 2: Leaping Larry—Apple II Version

Version by Bill Chin, Editorial Programmer

```
6000: 4C 2F 68 A9 7F A2 00 9D 7E
6008: 00 71 E8 D0 FA AD 5F 70 0D
6010: 20 86 61 8D 60 70 18 69 E5
6018: 27 8D 61 70 A9 00 A0 01 92
6020: 8D 62 70 B9 61 70 48 AA F1
6028: B9 8C 60 9D 00 71 68 38 9D
6030: 6D 5F 70 99 62 70 AA CA 1C
6038: B9 93 60 9D 00 71 C8 C0 B8
6040: 09 D0 E0 A9 00 8D 53 70 BD
6048: A9 D5 8D 52 70 AE 53 70 7F
6050: BD 62 70 A8 BD 63 70 8D 0B
6058: 54 70 AD 53 70 29 01 F0 65
6060: 05 A9 AA 8D 52 70 20 D5 A6
6068: 67 29 80 19 00 71 2D 52 3B
6070: 70 99 00 71 AD 52 70 49 C7
6078: 7F 8D 52 70 C8 CC 54 70 40
6080: D0 E4 EE 53 70 A9 07 CD FB
6088: 53 70 D0 BC 60 7F 7E 7C 6F
6090: 79 70 60 40 01 03 07 0F 6B
6098: 1F 3F 7F AD 18 70 8D 56 77
60A0: 70 AD 28 70 8D 57 70 AD 69
60A8: 10 70 8D 5D 70 AD 20 70 FF
60B0: 8D 5E 70 BD 08 70 18 7D 69
60B8: 20 70 9D 20 70 BD 08 70 56
60C0: 30 12 BD 28 70 69 00 9D 1F
60C8: 28 70 C9 18 90 13 DE 28 2B
60D0: 70 4C E1 60 BD 28 70 E9 78
60D8: 00 9D 28 70 10 03 FE 28 BF
60E0: 70 BD 00 70 18 7D 10 70 97
60E8: 9D 10 70 C9 07 90 1D 30 0C
60F0: 08 E9 07 9D 10 70 4C FE C4
60F8: 60 69 06 9D 10 70 BD 00 9C
6100: 70 30 05 FE 18 70 38 60 EA
6108: DE 18 70 38 60 AD 18 70 2C
6110: C9 25 90 0C AD 56 70 8D 09
6118: 18 70 AD 5D 70 8D 10 70 D8
6120: 60 BD 18 70 30 10 C9 28 0A
6128: 90 1B AD 60 70 9D 18 70 50
6130: A9 27 9D 38 70 60 CD 60 C9
6138: 70 B0 0A A9 27 9D 18 70 8B
6140: A9 00 9D 38 70 60 AD 64 D3
6148: 61 A8 B9 B1 69 18 6D 63 22
6150: 61 85 EC B9 99 69 6D 82 2E
6158: 70 85 ED AD 63 61 10 02 10
6160: C6 ED 60 24 15 BD 28 70 B0
6168: A8 B9 B1 69 85 EE B9 99 AF
6170: 69 18 65 E6 85 EF 60 B9 6F
6178: B1 69 85 EE B9 99 69 18 2D
6180: 6D 82 70 85 EF 60 49 FF 94
6188: 18 69 01 60 A9 00 8D D3 14
6190: 61 8D 08 70 A9 80 8D D4 AE
6198: 61 AD 00 C0 2C 10 C0 C9 70
61A0: CC F0 1E C9 EC F0 1A C9 8F
61A8: CA F0 1C C9 EA F0 18 C9 42
61B0: CB F0 1A C9 EB F0 16 C9 8E
61B8: A0 D0 05 A9 18 8D D3 61 3B
61C0: 60 A9 02 8D D4 61 60 A9 CD
61C8: FE 8D D4 61 60 A9 00 8D 56
61D0: D4 61 60 00 80 A9 00 8D 9A
61D8: 08 70 8D 6D 70 AD 20 70 2F
61E0: C9 20 D0 13 AD 28 70 18 E2
61E8: 69 03 A8 20 77 61 AC 18 EA
61F0: 70 C8 B1 EE 8D 6D 70 AD F3
61F8: 50 70 F0 4C 30 10 A9 E0 D8
6200: 8D 08 70 CE 50 70 AD 50 78
6208: 70 C9 04 90 5B 60 A9 20 D0
6210: 8D 08 70 AD 6D 70 F0 1B B0
6218: AD 28 70 CD 6F 70 B0 13 5A
6220: A9 00 8D 08 70 8D 50 70 B6
6228: AD 28 70 69 04 8D 6F 70 18
6230: 4C 68 62 AD 28 70 C9 14 07
6238: 90 0D A9 00 8D 50 70 8D D9
6240: 08 70 A9 FF 8D 7E 70 60 02
6248: A9 00 8D 08 70 AD 6D 70 99
6250: D0 06 A9 FF 8D 50 70 60 23
6258: AD D3 61 F0 0B 8D 50 70 C3
6260: AD 28 70 69 03 8D 6F 70 48
6268: AD D4 61 C9 80 F0 29 8D A9
6270: 00 70 AD D4 61 F0 21 30 95
6278: 10 AD 84 70 09 04 8D 84 40
6280: 70 C9 06 90 13 CE 84 70 07
6288: 60 AD 84 70 29 03 8D 84 75
6290: 70 C9 02 90 03 CE 84 70 16
6298: 60 BD 28 70 8D 64 61 A9 73
62A0: FF 8D 52 70 AD 5F 70 8D 73
62A8: 53 70 BD 18 70 8D 63 61 4E
62B0: 30 11 CD 61 70 90 15 A9 3B
62B8: 27 38 ED 63 61 8D 53 70 6B
62C0: 4C CC 62 20 86 61 8D 52 54
62C8: 70 CE 52 70 20 46 61 BD 65
62D0: 10 70 A8 B9 62 70 18 69 D8
62D8: 00 8D EC 62 A9 71 69 00 AA
62E0: 8D ED 62 AC 53 70 BD 40 17
62E8: 70 F0 0F B9 09 71 19 48 28
62F0: 70 91 EC 88 CC 52 70 D0 D9
62F8: F2 60 20 D5 67 C9 F7 90 93
6300: 08 20 D5 67 91 EC 4C 0D E9
6308: 63 A9 80 91 EC 88 CC 52 89
6310: 70 D0 E7 60 A9 17 8D 52 5D
6318: 70 AD 20 70 4A 4A 4A 4A E7
6320: 4A 8D 53 70 0A 0A 8D 54 C8
6328: 70 A9 07 38 ED 53 70 8D 21
6330: 53 70 8D 58 70 AD 84 70 A7
6338: A8 B9 B2 63 8D 80 63 B9 3D
6340: BA 63 18 AE 10 70 7D AB 14
6348: 63 8D 81 63 A9 BD 8D 7F 69
6350: 63 A2 00 AD 18 70 8D 63 4D
6358: 61 AD 28 70 8D 64 61 20 28
6360: 46 61 A5 EC 8D 59 70 AD 86
6368: 54 70 18 65 ED 85 ED 8D BD
6370: 5A 70 A9 04 8D C2 63 A0 D4
6378: 00 B1 EC C9 F9 F0 05 A9 2D
6380: 00 EA 91 EC C8 E8 CC C2 49
6388: 63 D0 EE A5 ED 18 69 04 14
6390: 85 ED CE 52 70 F0 13 CE D0
6398: 53 70 10 DB EE 64 61 20 D0
63A0: 46 61 A9 07 8D 53 70 4C 6F
63A8: 77 63 60 00 03 06 09 0C 5E
63B0: 0F 12 00 5C B8 B8 14 70 8A
63B8: CC 28 72 72 72 72 73 73 1D
63C0: 73 74 04 A9 17 8D 52 70 7D
63C8: AD 38 70 8D 53 70 AD 48 5B
63D0: 70 85 EC AD 40 70 85 ED 66
63D8: A9 A9 8D 7F 63 A9 00 8D D7
63E0: 80 63 A9 EA 8D 81 63 AD 8B
63E8: 5B 70 8D 63 61 AD 5C 70 4C
63F0: 8D 64 61 A2 00 20 72 63 B6
63F8: AD 59 70 8D 48 70 AD 5A 8D
6400: 70 8D 40 70 AD 58 70 8D B0
6408: 38 70 AD 56 70 8D 5B 70 05
6410: AD 57 70 8D 5C 70 60 AD 7F
6418: 82 70 C9 40 A9 00 2A AA C7
6420: BD 54 C0 AD 82 70 85 E6 97
6428: 49 60 8D 82 70 60 A2 00 D1
6430: A9 03 8D 7A 64 8E 7B 64 A0
6438: A0 07 BD C9 69 4A 08 88 74
6440: D0 FB E8 CE 7A 64 D0 F0 72
6448: A9 03 8D 7A 64 AE 7B 64 39
6450: A0 07 28 7E C9 6A 88 D0 F1
6458: F9 7E C9 6A BD C9 6A 29 B0
6460: 7F 9D C9 6A BD C9 69 29 41
6468: 80 1D C9 6A 9D C9 6A E8 6A
6470: CE 7A 64 D0 DB E0 DE 90 89
6478: B7 60 00 DB 20 2E 64 A9 1F
6480: 17 8D 52 70 A9 80 8D 53 47
6488: 70 A2 00 A9 00 85 EC A9 66
6490: 72 85 ED A9 69 8D A1 64 75
6498: A0 00 A9 03 8D 7A 64 BD F3
64A0: C9 6A 0D 53 70 91 EC 20 83
64A8: 3A 65 E8 CE 7A 64 D0 EF E8
64B0: AD 53 70 91 EC 20 3A 65 0E
64B8: CE 52 70 D0 0A A9 17 8D 4B
64C0: 52 70 A9 80 8D 53 70 AD 54
64C8: 52 70 C9 0B B0 05 A9 00 AD
64D0: 8D 53 70 E0 CF 90 C3 AD 47
64D8: A1 64 C9 69 D0 08 A2 00 47
64E0: EE A1 64 4C 9A 64 A9 02 96
64E8: 8D 7A 64 BD C9 69 91 EC 83
64F0: E8 20 3A 65 CE 7A 64 D0 CD
64F8: F2 A9 00 91 EC 20 3A 65 B0
6500: A9 00 91 EC 20 3A 65 E0 36
6508: FC 90 DB A9 00 85 EC 85 01
6510: EE A9 72 85 ED 18 69 03 09
6518: 85 EF A9 04 8D 71 65 20 34
6520: 41 65 A5 EC 18 69 04 85 5C
6528: EC 85 EE A5 ED 69 00 85 9D
6530: ED 69 03 85 EF C9 88 90 4D
6538: E1 60 E6 EC D0 02 E6 ED 02
6540: 60 A0 00 18 08 28 B1 EC 16
6548: 2A 91 EE 10 04 38 4C 52 57
6550: 65 18 08 C8 CC 71 65 D0 29
6558: EC 28 A0 00 B1 EE 29 7F D2
6560: 91 EE B1 EC 29 80 11 EE 11
6568: 91 EE C8 CC 71 65 D0 EC 4D
6570: 60 04 CE 6E 70 D0 14 A9 C5
6578: 04 8D 6E 70 AD 50 70 F0 FD
6580: 0B AD 84 70 29 04 09 01 40
6588: 8D 84 70 60 AD 84 70 C9 79
6590: 02 F0 07 C9 05 B0 03 4C 53
6598: 9F 65 A9 FF 8D 84 70 EE 10
65A0: 84 70 AD 00 70 D0 09 A9 02
65A8: 02 0D 84 70 8D 84 70 60 0F
65B0: 30 09 A9 04 0D 84 70 8D 34
65B8: 84 70 60 AD 84 70 29 03 04
65C0: 8D 84 70 60 20 03 60 A2 F7
65C8: 07 BD FB 66 9D 28 70 A9 84
65D0: 00 9D 38 70 9D 48 70 9D 9D
65D8: 20 70 9D 08 70 A9 20 9D 0C
65E0: 40 70 8D 0B 67 9D 48 70 03
65E8: BD 03 67 9D 10 70 A9 FF AF
65F0: 9D 30 70 BD F3 66 9D 00 F4
65F8: 70 10 09 AD 5F 70 18 69 52
6600: 01 9D 30 70 20 D5 67 29 12
6608: 1F 69 04 9D 18 70 CA 10 41
6610: B8 AD 18 70 29 01 8D 10 27
6618: 70 A9 00 8D 56 70 8D 57 47
6620: 70 AD 18 70 8D 5B 70 AD 03
```

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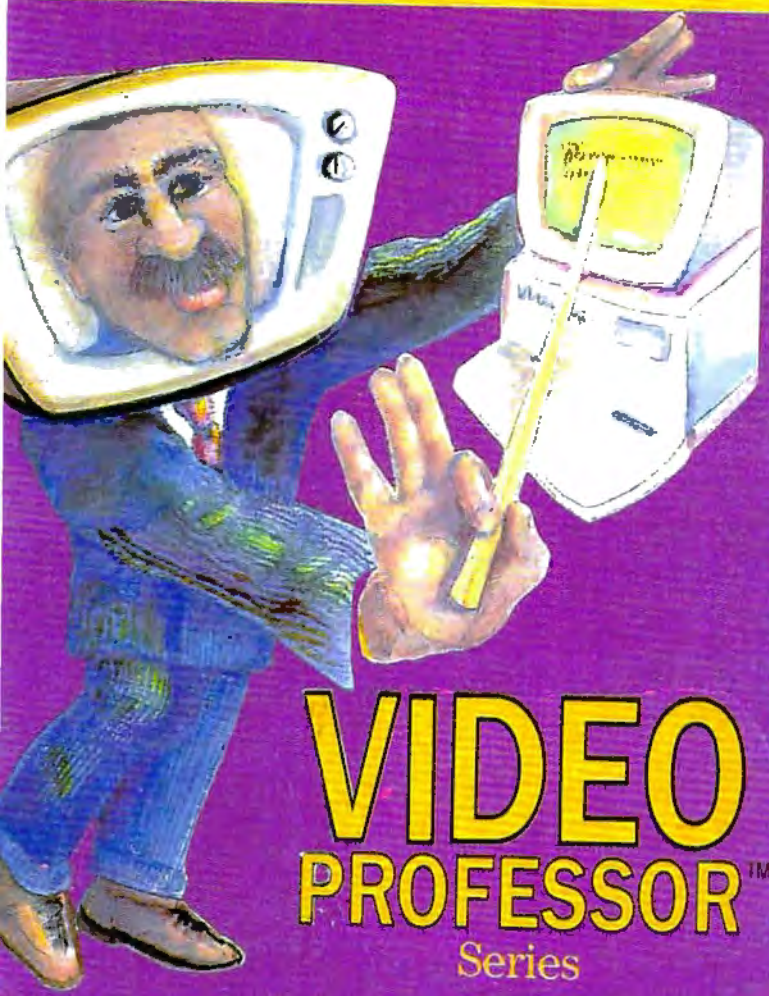

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6628: 28 70 8D 5C 70 A9 20 85 8C
6630: E6 A9 40 8D 82 70 20 EA BC
6638: 67 A9 20 8D 20 70 A9 06 1C
6640: 8D 38 70 A9 04 8D 6E 70 2E
6648: 8D 50 70 AD 2D 70 8D 52 71
6650: 70 38 E9 03 A8 20 68 67 CE
6658: A0 27 A9 F9 91 EE 91 EC 6C
6660: 88 10 F9 AD 2D 70 CD 52 A8
6668: 70 D0 0F AD 28 70 8D 52 CE
6670: 70 18 69 03 8D 6F 70 4C 30
6678: 54 66 AC 7C 70 A9 00 99 2A
6680: 40 70 A0 17 20 57 67 A2 DE
6688: 00 AD 7B 70 F0 1E 0A A8 F3
6690: C8 BC 6A 70 AC 6A 70 BD E6
6698: 13 67 91 EC 91 EE 88 88 AB
66A0: C0 01 D0 F3 20 5A 67 E8 89
66A8: E0 06 D0 E8 20 1C 67 A2 F2
66B0: 02 20 D5 67 29 1F 69 04 54
66B8: 9D 71 70 A9 00 9D 77 70 2F
66C0: 20 D5 67 29 07 8D 52 70 16
66C8: C9 07 D0 03 CE 52 70 AD D4
66D0: 52 70 0A 38 6D 52 70 9D DA
66D8: 74 70 A9 01 8D 76 70 A9 12
66E0: F9 8D 52 70 20 7C 67 CA EB
66E8: 10 C7 A9 00 8D 7E 70 60 8C
66F0: 01 01 13 00 02 FE 02 FE EF
66F8: 02 02 02 12 12 0F 0C 09 96
6700: 06 13 04 00 00 00 01 01 1A
6708: 00 00 01 00 80 80 00 00 FC
6710: 80 00 00 1C 1C 7F 1C 36 2E
6718: 63 6C 36 00 A0 17 20 57 73
6720: 67 20 5A 67 20 5A 67 20 C5
6728: 5A 67 AD 7A 70 F0 27 8D 7E
6730: 52 70 69 0A C9 26 90 11 2B
6738: A9 1D 8D 52 70 A9 07 8D BF
6740: 7B 70 A9 00 8D 7A 70 A9 FE
6748: 27 A8 A9 3F 91 EC 91 EE 50
6750: 88 CE 52 70 D0 F6 60 20 AB
6758: 68 67 A5 ED 18 69 04 85 BC
6760: ED A5 EF 69 04 85 EF 60 9A
6768: B9 B1 69 85 EE 85 EC B9 27
6770: 99 69 18 69 20 85 EF 69 60
6778: 20 85 ED 60 BD 74 70 A8 C5
6780: 20 57 67 BD 71 70 A8 C8 65
6788: AD 52 70 91 EC 91 EE 20 95
6790: 5A 67 20 5A 67 AD 52 70 17
6798: 91 EC 91 EE 60 A2 02 BD DB
67A0: 71 70 CD 18 70 D0 2A BD 58
67A8: 74 70 38 ED 28 70 C9 02 4C
67B0: B0 1F A9 00 8D 52 70 20 8B
67B8: 7C 67 EE 7A 70 20 1C 67 C8
67C0: E0 02 D0 03 EE 7E 70 A9 C6
67C8: FF 9D 77 70 A9 27 9D 71 8B
67D0: 70 CA 10 CB 60 A5 4E 0A 89
67D8: 0A 38 65 4E 85 4E 60 A9 1C
67E0: 00 8D 54 C0 8D 51 C0 4C 29
67E8: 58 FC A9 00 8D 50 C0 8D 15
67F0: 57 C0 8D 54 C0 8D 52 C0 34
67F8: 20 FE 67 4C 03 68 A9 20 76
6800: 4C 05 68 A9 40 8D 0E 68 9C
6808: A9 00 A0 20 8D 00 60 EE DF
6810: 0D 68 D0 F8 EE 0E 68 88 34
6818: D0 F2 60 A9 05 8D 80 70 84
6820: 8E 81 70 E8 EC 81 70 D0 54
6828: FA CE 80 70 D0 F5 60 20 80
6830: DF 67 A0 00 B9 60 69 F0 F1
6838: 06 99 29 04 C8 D0 F5 A0 ED
6840: 00 B9 85 69 F0 06 99 33 CC
6848: 05 C8 D0 F5 A9 DC 8D 52 75
6850: 70 20 1B 68 CE 52 70 D0 BC
6858: F8 A9 10 8D 5F 70 A9 03 FD
6860: 8D 7B 70 A9 00 8D 7A 70 1B
6868: A9 06 8D 7C 70 20 C4 65 FB
6870: 20 7C 64 20 8C 61 20 D5 FE
6878: 61 20 72 65 20 9D 67 A2 8F
6880: 00 20 9B 60 20 0D 61 20 EA
6888: 14 63 A2 01 8E 83 70 BD C1
6890: 28 70 30 15 20 E1 60 90 C2
6898: 0D BD 18 70 18 7D 30 70 F0
68A0: 9D 38 70 20 21 61 20 99 C6
68A8: 62 EE 83 70 AE 83 70 E0 23
68B0: 06 D0 DC 20 17 64 A2 00 E5
68B8: 20 C3 63 A2 01 20 65 61 D5
68C0: BD 38 70 A8 A9 00 91 EE 76
68C8: E8 E0 06 D0 F0 20 1B 68 BA
68D0: AD 7E 70 F0 9E AD 79 70 44
68D8: 30 0B CE 7B 70 30 2C 20 D2
68E0: C4 65 4C 73 68 AC 5F 70 53
68E8: 88 88 8C 5F 70 C0 09 B0 F0
68F0: 14 A9 08 8D 5F 70 CE 7C E6
68F8: 70 D0 0A A9 05 8D 7C 70 D9
6900: A9 11 8D 5F 70 20 C4 65 86
6908: 4C 73 68 A9 FF 8D 52 70 D0
6910: AD 00 C0 10 13 2C 10 C0 FC
6918: C9 CE F0 1F C9 EE F0 1B 9A
6920: C9 D9 F0 14 C9 F9 F0 10 D5
6928: 20 1B 68 20 1B 68 20 1B B6
6930: 68 CE 52 70 D0 DA F0 06 16
6938: 4C 59 68 4C DF 67 20 DF 16
6940: 67 A0 00 B9 4E 69 F0 C3 48
6948: 99 2F 04 C8 D0 F5 D0 EC AD
6950: E1 F9 A0 E1 E7 E1 E9 EE 4E
6958: A0 A8 D9 AF CE A9 BF 00 78
6960: C3 EF F0 F9 F2 E9 E7 E8 C6
6968: F4 A0 B1 B9 B8 B7 A0 C3 59
6970: CF CD D0 D5 D4 C5 A1 A0 B7
6978: D0 F5 E2 EC E9 E3 E1 F4 F3
6980: E9 EF EE F3 00 C1 EC EC 2F
6988: A0 F2 E9 E7 E8 F4 F3 A0 C7
6990: F2 E5 F3 E5 F2 F6 E5 E4 57
6998: AE 00 00 01 01 02 02 03 E9
69A0: 03 00 00 01 01 02 02 03 1C
69A8: 03 00 00 01 01 02 02 03 24
69B0: 03 00 80 00 80 00 80 00 1A
69B8: 80 28 A8 28 A8 28 A8 28 CC
69C0: A8 50 D0 50 D0 50 D0 50 D4
69C8: D0 00 3E 00 00 14 00 00 1C
69D0: 15 00 00 14 00 00 14 00 97
69D8: 00 1A 00 00 3A 00 00 2E 32
69E0: 00 08 6E 01 70 6F 01 00 D6
69E8: 6B 00 00 2A 00 00 2A 00 68
69F0: 40 7F 00 60 3F 00 70 1F C3
69F8: 00 38 0F 00 18 0E 00 18 CC
6A00: 0C 00 38 38 00 14 30 00 16
6A08: 00 30 00 00 28 00 00 3E 68
6A10: 00 00 14 00 00 15 00 00 BB
6A18: 14 00 00 14 00 08 1A 00 8C
6A20: 18 7A 00 30 6A 00 60 7A 31
6A28: 00 00 3A 00 00 2A 00 00 EC
6A30: 2A 00 00 2A 00 00 7E 00 B9
6A38: 40 3F 50 70 3B 0C 3C 18 A8
6A40: 06 1C 30 03 18 40 01 18 31
6A48: 00 00 18 00 00 18 00 00 80
6A50: 14 00 00 00 3E 00 00 14 35
6A58: 00 00 15 00 00 14 00 00 20
6A60: 14 00 00 3A 00 00 3A 00 57
6A68: 00 3A 00 68 3A 00 00 3E 62
6A70: 00 20 2F 00 00 2A 00 00 DB
6A78: 2A 00 00 3E 00 00 1E 00 82
6A80: 00 1B 00 40 1B 00 60 19 D2
6A88: 00 30 30 00 60 60 00 40 34
6A90: 41 01 00 03 03 40 02 05 98
6A98: 00 00 00 00 00 00 00 00 6D
6AA0: 00 00 00 00 00 00 00 00 75
6AA8: 00 00 00 00 00 00 00 00 7D
6AB0: 00 00 00 00 00 00 00 00 85
6AB8: 00 00 00 00 00 00 00 00 8D
6AC0: 00 00 00 00 00 00 00 00 95
6AC8: 00 FF 00 00 FF FF 00 00 9D
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Program 3: Leaping Larry—Atari Version

Version by Rhett Anderson, Assistant Editor

```
BC 50 REM COPYRIGHT 1987 COM
      PUTE! PUBLICATIONS, IN
      C.  ALL RIGHTS RESERVE
      D.
FA 60 PRINT "{CLEAR}COPYRIGH
      T 1987":PRINT "COMPUTE
      ! PUBLICATIONS, INC."
HA 70 PRINT "ALL RIGHTS RESE
      RVED."
LB 80 FOR TT=1 TO 1000:NEXT
      TT:PRINT
FB 90 OPEN #1,8,0,"D:LEAPIN"
KE 100 FOR I=1 TO 1746
NM 110 READ NUM:CHK=CHK+NUM
PM 120 PUT #1,NUM
BM 130 NEXT I
CM 140 IF CHK<>195025 THEN P
      RINT "ERROR IN DATA S
      TATEMENTS.":END
LA 150 PRINT "FILE WRITTEN T
      O DISK."
MD 1000 DATA 255,255,0,96,25
      1,96,76,72
MB 1001 DATA 96,0,2,0,0,0,0,
      0
JB 1002 DATA 0,0,0,0,0,0,0,0
KK 1003 DATA 0,0,2,0,83,58,1
      41,71
MJ 1004 DATA 96,162,96,169,1
      2,157,66,3
JC 1005 DATA 32,86,228,169,3
      ,157,66,3
AD 1006 DATA 169,22,157,68,3
      ,169,96,157
IP 1007 DATA 69,3,173,71,96,
      41,240,73
ML 1008 DATA 28,157,74,3,173
      ,71,96,157
GG 1009 DATA 75,3,76,86,228,
      0,169,17
CB 1010 DATA 32,24,96,169,25
      5,141,220,98
KJ 1011 DATA 169,0,141,0,208
      ,160,3,185
FB 1012 DATA 192,96,145,88,2
      00,192,16,208
GA 1013 DATA 246,160,43,185,
      165,96,145,88
MF 1014 DATA 200,192,100,208
      ,246,160,124,185
IF 1015 DATA 141,96,145,88,2
      00,192,135,208
KE 1016 DATA 246,173,31,208,
      41,1,201,0
CH 1017 DATA 208,247,169,17,
      32,24,96,160
CC 1018 DATA 40,169,13,136,1
      45,88,192,20
JB 1019 DATA 208,247,160,204
      ,230,89,169,77
MF 1020 DATA 136,145,88,192,
      184,208,247,169
JP 1021 DATA 157,160,165,145
      ,88,198,89,169
BK 1022 DATA 157,160,10,145,
      88,160,1,169
EN 1023 DATA 16,145,88,200,1
      45,88,200,145
IN 1024 DATA 88,169,2,141,20
      ,96,76,20
BF 1025 DATA 97,44,37,33,48,
      41,46,39
BD 1026 DATA 0,44,33,50,50,5
      7,35,47
CB 1027 DATA 48,57,50,41,39,
      40,52,0
KL 1028 DATA 17,25,24,23,0,0
      ,0,35
PE 1029 DATA 47,45,48,53,52,
      37,1,0
BC 1030 DATA 48,53,34,44,14,
      12,0,41
BF 1031 DATA 46,35,14,33,44,
      44,0,50
MF 1032 DATA 41,39,252,96,24
      7,97,40,52
BI 1033 DATA 51,0,50,37,51,3
      7,50,54
EL 1034 DATA 37,36,14,240,24
      2,229,243,243
OM 1035 DATA 192,243,244,225
      ,242,244,169,128
LH 1036 DATA 141,7,212,169,4
      6,141,47,2
OO 1037 DATA 169,3,141,29,20
      8,169,0,160
```

```
AJ 1038 DATA 0,153,0,130,153
        ,128,131,153
HI 1039 DATA 128,129,153,128
        ,130,153,0,131
KL 1040 DATA 200,208,238,169
        ,255,141,45,130
EF 1041 DATA 141,56,130,141,
        67,130,141,78
GL 1042 DATA 130,141,89,130,
        141,34,130,141
MF 1043 DATA 173,130,141,184
        ,130,141,195,130
MM 1044 DATA 141,206,130,141
        ,217,130,141,162
KL 1045 DATA 130,169,60,141,
        143,129,141,144
PA 1046 DATA 129,141,227,129
        ,141,228,129,169
LF 1047 DATA 66,141,145,129,
        141,146,129,141
ON 1048 DATA 229,129,141,230
        ,129,169,255,141
OL 1049 DATA 147,129,141,148
        ,129,141,231,129
LB 1050 DATA 141,232,129,169
        ,36,141,149,129
HB 1051 DATA 141,233,129,162
        ,100,142,7,208
MA 1052 DATA 232,232,142,6,2
        08,232,232,142
BE 1053 DATA 5,208,232,232,1
        42,4,208,173
HI 1054 DATA 111,2,9,16,141,
        111,2,169
LM 1055 DATA 8,141,192,2,141
        ,195,2,169
FB 1056 DATA 0,141,194,2,169
        ,3,141,8
BL 1057 DATA 208,141,9,208,1
        69,160,141,0
FP 1058 DATA 2,169,98,141,1,
        2,173,48
OG 1059 DATA 2,133,205,173,4
        9,2,133,206
EB 1060 DATA 169,134,160,8,1
        45,205,160,11
HA 1061 DATA 145,205,160,13,
        145,205,160,15
HD 1062 DATA 145,205,160,18,
        145,205,160,21
FH 1063 DATA 145,205,160,19,
        169,21,145,88
DC 1064 DATA 165,20,248,97,2
        43,98,197,20
LF 1065 DATA 240,252,169,192
        ,141,14,212,169
LK 1066 DATA 32,141,18,96,16
        9,0,141,15
LK 1067 DATA 96,32,166,101,1
        69,2,141,3
CH 1068 DATA 96,169,104,141,
        52,99,141,51
MH 1069 DATA 99,169,0,141,3,
        96,141,135
PL 1070 DATA 99,141,133,99,1
        41,9,96,141
LJ 1071 DATA 13,96,141,11,96
        ,141,12,96
BB 1072 DATA 165,20,197,20,2
        40,252,32,13
FD 1073 DATA 102,32,75,102,2
        38,215,98,238
GJ 1074 DATA 217,98,238,213,
        98,206,214,98
BC 1075 DATA 206,216,98,206,
        218,98,173,15
CB 1076 DATA 96,24,105,1,41,
        7,208,3
BJ 1077 DATA 206,214,98,32,1
        07,101,32,53
DE 1078 DATA 99,32,178,99,17
        3,9,96,208
DE 1079 DATA 3,32,74,101,173
        ,14,208,141
LL 1080 DATA 11,96,173,6,208
        ,141,12,96
OJ 1081 DATA 173,10,208,141,
        13,96,173,7
EL 1082 DATA 208,141,14,96,1
        41,30,208,173
IK 1083 DATA 13,96,41,8,240,
        162,169,1
PK 1084 DATA 141,135,99,141,
        3,96,169,15
NB 1085 DATA 141,17,96,76,50
        ,98,72,138
BL 1086 DATA 72,238,220,98,1
        74,220,98,189
EN 1087 DATA 207,98,141,10,2
        12,141,18,208
CI 1088 DATA 141,19,208,189,
        213,98,141,0
PD 1089 DATA 208,24,109,18,9
        6,141,1,208
BK 1090 DATA 224,5,208,5,169
        ,255,141,220
PB 1091 DATA 98,104,170,104,
        64,24,54,84
AN 1092 DATA 118,152,182,0,1
        00,80,60,160
ED 1093 DATA 20,0,0,0,60,126
        ,245,255
MH 1094 DATA 243,126,60,24,4
        8,96,48,24
LH 1095 DATA 48,96,0,0,0,0,6
        0,126
KC 1096 DATA 245,255,244,98,
        239,99,243,126
EN 1097 DATA 60,56,112,56,28
        ,112,0,0
FG 1098 DATA 60,126,175,255,
        207,126,60,24
HM 1099 DATA 12,6,12,24,12,6
        ,0,0
MK 1100 DATA 0,0,60,126,175,
        255,207,126
EK 1101 DATA 60,28,14,28,56,
        14,0,172
CL 1102 DATA 52,99,162,15,18
        9,221,98,153
HF 1103 DATA 128,131,136,202
        ,16,246,173,51
FD 1104 DATA 99,141,3,208,96
        ,0,0,173
LB 1105 DATA 133,99,240,3,76
        ,75,100,32
BO 1106 DATA 40,101,173,135,
        99,208,67,32
AA 1107 DATA 242,100,173,132
        ,2,201,0,208
FM 1108 DATA 8,173,10,96,208
        ,3,76,61
NF 1109 DATA 100,173,120,2,2
        01,7,208,16
BF 1110 DATA 173,51,99,201,2
        00,240,9,238
MK 1111 DATA 51,99,169,1,141
        ,134,99,96
AD 1112 DATA 173,120,2,201,1
        1,208,15,173
LH 1113 DATA 51,99,201,48,24
        0,8,206,51
JB 1114 DATA 99,169,0,141,13
        4,99,96,0
LC 1115 DATA 0,0,173,52,99,2
        01,128,208
MN 1116 DATA 31,104,104,169,
        0,141,12,96
ML 1117 DATA 141,11,96,141,3
        0,208,141,3
AK 1118 DATA 96,32,251,100,3
        2,242,101,32
LO 1119 DATA 74,101,32,61,10
        2,76,19,98
AK 1120 DATA 238,52,99,96,17
        2,52,99,169
HB 1121 DATA 60,153,0,131,16
        9,0,153,1
HL 1122 DATA 131,153,255,130
        ,173,51,99,141
OA 1123 DATA 2,208,173,134,9
        9,201,1,240
LO 1124 DATA 11,173,133,99,2
        40,3,76,39
EI 1125 DATA 100,76,17,100,1
        73,133,99,240
NI 1126 DATA 3,76,251,99,76,
        229,99,172
DC 1127 DATA 52,99,162,15,18
        9,221,98,153
KL 1128 DATA 128,131,240,99,
        235,100,136,202
PE 1129 DATA 16,246,173,51,9
        9,141,3,208
DC 1130 DATA 96,172,52,99,16
        2,15,189,237
HP 1131 DATA 98,153,128,131,
        136,202,16,246
PE 1132 DATA 173,51,99,141,3
        ,208,96,172
DE 1133 DATA 52,99,162,15,18
        9,253,98,153
NJ 1134 DATA 128,131,136,202
        ,16,246,173,51
HP 1135 DATA 99,141,3,208,96
        ,172,52,99
FJ 1136 DATA 162,15,189,13,9
        9,153,128,131
FE 1137 DATA 136,202,16,246,
        173,51,99,141
BM 1138 DATA 3,208,96,169,60
        ,141,170,100
MC 1139 DATA 169,1,141,133,9
        9,32,87,99
HM 1140 DATA 96,206,170,100,
        240,91,173,170
AP 1141 DATA 100,201,30,144,
        90,169,60,56
FC 1142 DATA 237,170,100,74,
        170,173,52,99
FB 1143 DATA 56,253,154,100,
        141,52,99,173
MP 1144 DATA 134,99,201,0,24
        0,21,173,51
DP 1145 DATA 99,201,10,240,1
        3,173,235,100
NM 1146 DATA 73,1,141,235,10
        0,240,3,238
ME 1147 DATA 51,99,96,173,51
        ,99,201,48
EM 1148 DATA 240,248,173,235
        ,100,73,1,141
FK 1149 DATA 235,100,240,238
        ,206,51,99,96
JM 1150 DATA 1,1,1,1,0,1,1,1
JJ 1151 DATA 0,1,1,0,1,0,0,0
MA 1152 DATA 0,169,0,141,133
        ,99,96,173
FC 1153 DATA 11,96,41,3,240,
        29,169,0
FP 1154 DATA 141,133,99,141,
        135,99,169,15
LP 1155 DATA 141,16,96,169,3
        ,141,10,96
DO 1156 DATA 173,52,99,201,3
        5,144,3,206
JM 1157 DATA 52,99,96,173,12
        ,96,41,15
KN 1158 DATA 208,220,173,170
        ,100,74,170,173
CA 1159 DATA 52,99,24,125,15
        4,100,76,102
PE 1160 DATA 100,0,236,100,2
        31,101,0,108
JB 1161 DATA 20,88,10,98,206
        ,4,96,173
```

```
CO 1162 DATA 4,96,240,1,96,1
        73,3,96
JB 1163 DATA 205,51,99,144,6
        ,206,3,96
BC 1164 DATA 206,3,96,238,3,
        96,174,3
ON 1165 DATA 96,142,7,208,23
        2,232,142,6
HI 1166 DATA 208,232,232,142
        ,5,208,232,232
LI 1167 DATA 142,4,208,173,2
        0,96,141,4
MJ 1168 DATA 96,96,173,10,96
        ,240,4,206
BC 1169 DATA 10,96,96,173,11
        ,96,41,3
OK 1170 DATA 208,16,173,12,9
        6,41,15,208
IM 1171 DATA 9,169,1,141,135
        ,99,141,3
PJ 1172 DATA 96,96,234,96,16
        9,10,133,20
EM 1173 DATA 32,75,102,169,1
        00,197,20,208
PC 1174 DATA 247,169,0,141,1
        35,99,141,3
CC 1175 DATA 96,32,242,100,1
        41,13,96,169
BK 1176 DATA 1,141,9,96,96,1
        73,14,96
LP 1177 DATA 41,4,240,29,173
        ,52,99,201
OJ 1178 DATA 50,176,23,169,0
        ,160,10,145
AD 1179 DATA 88,169,10,141,1
        9,96,238,15
BM 1180 DATA 96,32,166,101,1
        04,104,76,19
AC 1181 DATA 98,96,169,0,230
        ,89,160,165
AI 1182 DATA 145,88,198,89,1
        69,1,141,19
BC 1183 DATA 96,96,35,75,40,
        90,20,60
GB 1184 DATA 169,157,160,10,
        145,88,230,89
DN 1185 DATA 160,165,145,88,
        198,89,169,0
LE 1186 DATA 141,3,96,32,251
        ,100,32,74
HB 1187 DATA 101,160,5,185,2
        36,100,153,213
AE 1188 DATA 98,136,16,247,1
        69,0,133,77
OM 1189 DATA 141,14,96,141,1
        1,96,141,13
BJ 1190 DATA 96,141,12,96,14
        1,30,208,141
CD 1191 DATA 170,100,206,18,
        96,206,18,96
IA 1192 DATA 206,18,232,101,
        179,102,96,206
NE 1193 DATA 18,96,206,18,96
        ,206,18,96
BB 1194 DATA 169,0,160,0,153
        ,128,131,153
BM 1195 DATA 0,131,200,208,2
        47,173,15,96
IB 1196 DATA 201,7,208,5,169
        ,1,141,20
KL 1197 DATA 96,96,96,160,3,
        173,19,96
GI 1198 DATA 240,248,206,19,
        96,177,88,201
DF 1199 DATA 25,208,16,169,1
        6,145,88,136
PA 1200 DATA 177,88,201,25,2
        08,5,169,16
PC 1201 DATA 145,88,136,177,
        88,24,105,1
BI 1202 DATA 145,88,96,32,74
        ,101,104,104
DD 1203 DATA 76,169,96,160,1
        9,177,88,201
OB 1204 DATA 16,240,240,56,2
        33,1,145,88
CH 1205 DATA 96,172,16,96,24
        0,15,185,116
BB 1206 DATA 102,141,1,210,1
        85,132,102,141
LK 1207 DATA 0,210,206,16,96
        ,172,17,96
DP 1208 DATA 240,15,185,148,
        102,141,3,210
EB 1209 DATA 185,164,102,141
        ,2,210,206,17
IK 1210 DATA 96,96,224,224,2
        25,226,227,228
NE 1211 DATA 229,230,231,232
        ,233,234,231,227
JJ 1212 DATA 224,224,20,30,4
        0,50,40,30
DH 1213 DATA 40,50,40,30,40,
        50,40,50
HN 1214 DATA 60,70,224,224,2
        25,226,227,228
NI 1215 DATA 229,230,231,232
        ,233,234,231,227
MD 1216 DATA 224,224,120,130
        ,140,150,140,130
MD 1217 DATA 140,150,140,130
        ,140,150,140,150
EB 1218 DATA 160,170
```

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Attention Programmers

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Microscope

Sheldon Leemon

I picked up the 1988 Radio Shack catalog and found that the computer section reads almost like a retrospective of Tandy microcomputers. It describes not only the new and innovative line of Tandy PC-compatibles, but the entire old line of Tandy computers as well. These include the Model 4D, the Tandy 6000, the Color Computer, and the Model 102 laptop.

The catalog touts the Model 4D computer as "the perfect computer for busy managers, professionals, educators, and home users," when in fact, it's just the latest incarnation of the TRS-80—the computer that started it all for Tandy back in the late seventies. There are obviously still a few TRSDOS fans around, since Radio Shack continues to sell this 64K Z-80 machine with two 360K drives and a monochrome monitor for the amazing price of $1,200. The same page advertises the Model 6000 as "ideally suited to today's offices." Few people remember that the 6000 was the first computer from a major manufacturer to use the 16-bit 68000 processor. Unfortunately, its vaunted multiuser office software was slow to come, and as a result, the 6000 was eventually left in the dust by other 68000 computers like the Macintosh, Amiga, and Atari ST. You can still buy a 512K Tandy 6000 complete with 15-meg hard disk and 8-inch floppy for $3,495—about the same price as a complete Macintosh system.

The other two members of Tandy's old line of computers still have a bit more life in them. Though the Color Computer never was as big a hit as the Commodore 64, it was more sophisticated than it got credit for. Because it used the advanced 6809 microprocessor, it was able to run the powerful Unix-like OS-9 operating system years before most users ever heard of multitasking. It continues to have a small, loyal following, which Radio Shack actively supports. The latest model, the $200 Color Computer 3, can use an 80-column screen and up to 512K of memory, and it can even use a mouse and a hard disk.

The other member of Tandy's pre-PC lineup is the Tandy 102, successor to the Tandy 100. The original laptop computer may look a little primitive now, but it was the ground-breaking machine that lead the way for today's 80286 models, with their megabytes of memory and built-in hard disks. Weighing in at 3 pounds, about a quarter as much as most other laptops, this machine is still the traveling companion of choice for many journalists on the go.

****

After looking over the old line of Tandy computers, it's hard to believe that the current line of aggressively competitive PC-compatibles come from the same company. Tandy's first venture into MS-DOS, the near-compatible Tandy 2000, didn't go over too well, but the company soon learned that it could be innovative and yet remain compatible. The result has been that, for the past couple of years, Tandy has managed to stay one step ahead of IBM. When IBM came out with its disastrous PCjr, Tandy answered with its very successful Model 1000, a small PC that wasn't crippled. And now, on the heels of IBM's introduction of the PS/2 line, Tandy has come up with a whole flock of interesting new machines in response, all of which feature 3½-inch drives, just like the IBM's.

On the low end, the Tandy 1000 line has grown to four models: the 1000EX, the 1000SX, the 1000HX, and the 1000TX. The EX and SX have been around a while, but their prices have dropped to $600 and $850, respectively. Both are small, all-inclusive turbo PC clones with 5¼-inch drives, the major difference being that the EX is a one-piece unit, while the SX has a detached keyboard and more slots. The new $700 HX is a one-piece like the EX, only with one built-in 3½-inch drive and room for another. A unique feature of the HX is that it contains DOS 2.1 in ROM. The HX boots immediately and allows you to operate either from a DOS prompt or a special built-in menu system. The 1000TX, at $1,200, is actually more like an AT clone than an XT. Though it's housed in the same compact case as the SX, it uses an 8 MHz 80286 processor. Its expansion slots, however, are of the same short 8-bit variety as those of the SX, making the TX a kind of mini-AT hybrid.

Rounding out its new line, Tandy has added a 386 machine and a laptop. At $2,600 for the base system (no hard drive or monitor), the Model 4000 is an aggressively priced 16MHz 80386 machine, which, like IBM's Model 60, comes with a 1.4-meg 3½-inch floppy. The Tandy 1400LT is a fast XT-clone laptop, with 768K RAM, two built-in 3½-inch drives, and a sharp supertwist backlit LCD display. Though at 14 pounds it's not the lightest laptop around, the $1,600 price tag is pretty good for a full-featured portable with a state-of-the-art display.

Ironically, just as Tandy's product line seems to be well positioned, five of its key computer executives have gone over to Dell Computers, formerly known as PC's Limited. Although that company has so far sold its high-quality clones by mail-order only, it recently started to provide on-site service from Honeywell, which could make it a real contender for large corporate accounts. C

The standard equipment on a Laser 128 is optional on most computers

Take a look at the Laser 128 Apple®-compatible computer, and beginning with its built-in disk drive and 128K RAM of memory, you start to feel that this machine was designed with you in mind. The Laser 128 is ready-to-run – plug it in, insert your program and go. Everything is built-in for you.

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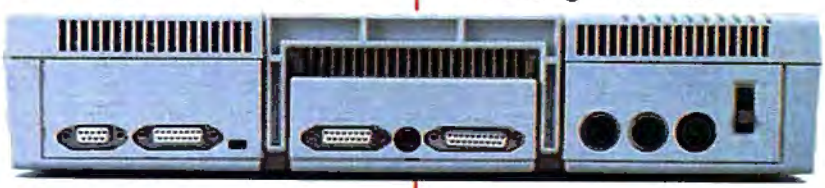
It's expandable, too. The Laser 128 includes an expansion slot to let the computer grow with your increasing demands.



Choose from the largest software library in the world. The Laser 128 runs Apple IIe and IIc software, which makes it nice for you and your family, because children can use the same programs at home that they learn on in school. The Laser 128 is a computer for the whole family.

The Laser 128 is priced to keep money in your pocket. The Laser is about half the price of an Apple, and is even less than a comparably equipped Commodore unit. You get a lot of computer for a little money.

Look for the attractive Laser packaging at a store near you. For more information on the Laser 128 and the name of your nearest dealer, contact Video Technology Computers, Inc., 400 Anthony Trail, Northbrook, IL 60062, or call (312) 272-6760.

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Fred D'Ignazio, Associate Editor

Black Boxes And Best Friends

My wife, my two kids, my cat, and I have just arrived in our new town of Lansing, Michigan. (That is, we've almost arrived. I'm writing this column in my hotel room just outside of town. But tomorrow night I'll be sleeping in my own bed in my new home.)

As I sit here thinking about all the things I have to do to get us settled, I can't help wishing I had my own personal black box—just like the new digital black boxes on passenger jetliners. Black boxes go out with every commercial airplane that takes off from every airport worldwide. They've become a necessary part of air transportation.

The normal black box doesn't furnish information unless something goes wrong. But I was thinking of a black box that would give me information throughout my move—a sort of travel buddy for me and my whole family.

My Best Friends

It was sad saying goodbye to all my friends in Alabama. I don't know when I'll ever see them again. I wished I could take them with me to Michigan the way I was taking my computer friends—my Apples, Tandys, Commodores, Ataris, and IBMs. The whole gang came with me—stacked to the ceiling inside my little red Toyota wagon.

Each night—in Nashville and Indianapolis—I unpacked my computers and carried them into my hotel room. I plugged them in and rejoiced when their little faces glowed and displayed their familiar greetings.

I'm a little crazy about computers, so I don't mind carrying them across state lines and lugging them in and out of hotel rooms. But wouldn't it be easier just to have a single black box to carry instead? Inside the box would be all the programs and data which you normally use, stored in solid-state or optical memory. Then, when you arrived at a motel, you would carry your little black box into the motel room and pop it into a keyboard-and-screen unit provided by the motel and bolted to the desk in the room. You would turn on the power, and instantly your favorite programs and your vital data would appear on the screen. You'd be ready to do a little word processing, play your favorite game, or sign onto a bulletin board and chat with your distant human friends.

The personal black box is an idea whose time has come because, let's face it, computers are everywhere. Every time I staggered into a hotel on our trip north, there was a terminal at the registration desk with a clerk busily tapping on its keys and peering into the computer's cantaloupe- or seaweed-colored screen. So why not a terminal in our rooms? And a black box that plugs into the terminal and personalizes it for each weary traveler who stumbles, semicomatose, into the room?

Considering how you feel after a grueling day of traveling, wouldn't it be nice to be greeted in a strange hotel room by your favorite computer program?

Lists Versus Advice

I hate lists. Lists leave me boggled and perplexed. Once a list is born, it takes on a perverse life of its own. As soon as I knock one item off a list, I find that two new items have quietly slipped into its place.

Moving is a time of lists: Lists of utilities to disconnect in your old home and utilities to connect in your new home. Lists of addresses to change. And a master list that spills over your lap and onto the floor: Pack your computer. Buy the cat her carsick pills. Get the kids' doctor and dentist records. Unpack the computer and print out the lists. Call the paper boy. Plan your route to your new home. Make reservations. Find a new doctor. Take your car in for a check-up. Repack the computer. Whew!

Enter the portable, black-box friend. It could replace all the lists with a simple artifical intelligence program that "knows" what it takes to move a family from one state to another. Instead of a list, the friend could ask you questions and offer you advice like: "Did you remember to pack the house plants in your car?" or "You might water them before leaving, then put them on the car floor on top of a plastic garbage bag to prevent spills."

It could suggest little things like that, because those little things are why a move can drive you crazy—even if you do remember them.

The friend could come with you on your trip. And you could plug it into hotel-room terminals, or maybe right into the dashboard of your car. It could show you a map of your trip on a small display screen built into the dash—it would display only the roads you are currently on, so as not to confuse you with the big picture. And, when you arrived at your new home, the friend could tell you how to find the electric company so you could get some power for your computer, or the car-parts store that carries a windshield wiper arm for your 11-year-old Toyota, or which is the nicest vet in town, since your 15-year-old cat has OD'd on carsick pills and is acting as if she has a terrible hangover.

Your black box could get you through a move and can be your best friend—at least until you find some human friends in your new town. ©

The Beginner's Page

C. Regena

Monthly Payments

Computers are especially helpful for calculations that you need to do repetitively. A calculator is often handier for quick calculations, but if you have a long formula that you use often, the computer might serve you better.

For example, my family and I have recently been trying to sell the house we used to live in. With all the "creative financing" schemes that buyers are using now, we seemed to be using loan payment calculations quite often. As long as I had the formula on paper, I could grab a calculator and figure out the payments. A computer, however, offers the ability to try many different combinations of numbers, without having to figure the loan-payment formula each time.

For example, let's say someone wants to borrow $80,000 on a 20-year loan. With 14 percent interest, what would the monthly payments be? Now what if the interest rate is changed to 12 or 11 percent? What if the loan is for $50,000? What if the loan is for 15 years? The computer can be very helpful in these "what if" situations—they make calculations quickly, producing seemingly instantaneous answers.

A Basic Model

Let's look at a simple program for finding monthly payments on a loan. You can use this program as an example for creating your own home applications programs. The program "Monthly Payments" is written in standard BASIC, so it runs on the Amiga, Apple II, Atari, Atari ST, Commodore 64/128, IBM PC/PCjr, and almost any other computer with BASIC.

Lines 130–270 simply print information about what the program does. You will also be able to use INPUT statements without error-trapping. After most of the INPUT statements in this program, I have checked that the amount entered is greater than 0. Even with this error checking, it is possible to enter outrageous numbers and get wild answers. If you wish, add more error-trapping, making sure that all numbers entered are meaningful to the program.

Lines 280–320 ask for the amount borrowed. Lines 330–370 ask for the number of years for the loan. Line 380 multiplies the number of years by 12 for the number of monthly payments.

Lines 390–410 ask for the interest rate in percent. Enter the number as you usually think of it—a yearly interest rate such as 12, 8.75, or 10 percent. Line 420 changes the entered rate from a percent to a decimal and calculates the actual rate per pay period. For example, 12 percent becomes the decimal .12; then, to convert to the monthly rate, it's divided by 12, resulting in .01.

Line 450 calculates a factor used in the compound interest formula. The ↑ character in that line is Commodore's symbol for exponentiation; for other computers, substitute a caret (^). Line 470 uses the interest factor to calculate the monthly payment. Line 480 rounds the monthly payment value to the nearest penny. Lines 500–560 repeat the given information and print the monthly payment.

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

Monthly Payments

```
100 REM COPYRIGHT 1987 COMPUTE
    ! PUBLICATIONS, INC. - ALL
    {SPACE}RIGHTS RESERVED.
110 REM MONTHLY PAYMENTS
112 PRINT "COPYRIGHT 1987":PRI
    NT "COMPUTE! PUBLICATIONS,
    {SPACE}INC."
114 PRINT "ALL RIGHTS RESERVED
    ."
120 PRINT "** MONTHLY PAYMENTS
    **"
130 PRINT
140 PRINT "YOU MAY ENTER A DOL
    LAR AMOUNT"
150 PRINT "OF MONEY FOR AMOUNT
    BORROWED,"
160 PRINT "SUCH AS 50000"
170 PRINT
180 PRINT "THEN ENTER THE NUMB
    ER OF YEARS"
190 PRINT "FOR THE LOAN, SUCH
    {SPACE}AS 15"
200 PRINT
210 PRINT "NEXT ENTER THE RATE
    OF INTEREST"
220 PRINT "FOR THE LOAN IN PER
    CENT,"
230 PRINT "SUCH AS 9.75"
240 PRINT
250 PRINT "THE COMPUTER WILL R
    ETURN"
260 PRINT "YOUR MONTHLY PAYMEN
    T."
270 PRINT
280 PRINT "AMOUNT BORROWED";:I
    NPUT P
290 IF P>0 THEN 320
300 PRINT "ENTER AMOUNT MORE T
    HAN ZERO."
310 GOTO 270
320 PRINT
330 PRINT "HOW MANY YEARS";:IN
    PUT Y
340 IF Y>0 THEN 370
350 PRINT "MUST BE MORE THAN Z
    ERO."
360 GOTO 320
370 N=12*Y
380 REM NUMBER OF PAYMENTS = 1
    2*Y
390 PRINT
400 PRINT "WHAT IS THE INTERES
    T RATE"
410 PRINT "IN PERCENT";:INPUT
    {SPACE}R
420 R2=R/1200
430 REM CONVERT PERCENT TO DEC
    IMAL
440 REM PER PAY PERIOD (MONTH)
450 F=(1+R2)↑N
460 REM CALCULATE INTEREST FAC
    TOR
470 M=P*(R2*F/(F-1))
480 M=INT(M*100)/100
490 REM CALCULATE MONTHLY PAYM
    ENT
500 PRINT:PRINT
510 PRINT "$";P;" BORROWED FOR
    "
520 PRINT Y;" YEARS AT ";R;" P
    ERCENT"
530 PRINT
540 PRINT "MONTHLY PAYMENT = $
    ";M
550 PRINT:PRINT:PRINT:PRINT:PR
    INT:PRINT
560 END
```

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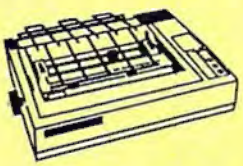

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Arlan R. Levitan

Christmas At The Phone Company

Christmas came early for the Bell Operating Companies (a.k.a. the local phone companies) this year. In September, Federal Judge Harold Greene ruled that the seven Bell phone companies which grew out of the Bell System's deregulation may set up facilities designed to carry online information. Although Greene's ruling did not restrain the operating companies from manufacturing and marketing communications equipment, he stopped short of granting the companies permission to set up their own information services.

Industry reaction to the ruling was mixed. Most commercial information services (which were spared the emergence of new competitors fueled from the deep coffers of telephone-service profits) maintained a cautiously optimistic public pose while privately wiping their collective brow.

On the other hand, public packet-switching network providers such as Telenet, GEnet, and Tymnet were not enthusiastic at the prospect of going toe-to-toe with rivals who will be either exempt from the FCC's proposed public phone-system access charges or from paying these charges by moving money from one pocket to another.

The packet switchers are said to be even more concerned about Pacific Telesys's as-yet-unannounced Project Victoria technology. Victoria is rumored to be planned for public introduction in the latter part of 1989, and it reportedly allows several high-speed (9600 bps) data transmission links to be mixed and decoded concurrently with voice traffic on a regular telephone line. The system is intended to make high-resolution graphics, videotex, and rapid information transfer available to the home user at reasonable cost. However, marketing plans include flat monthly fees rather than hourly access charges, so Bell-owned information services are needed. Since the Operating Companies will have to negotiate with independent service providers, the final rate structure is now up in the air.

Access Surcharges Inevitable?

One Federal Communications Commission lawyer holds little hope for the thousands of computer users who have taken the time to protest the proposed FCC rule changes that will add surcharges of up to $5 an hour in January 1988 for accessing commercial information services. According to Ruth Milkman, attorney for the FCC's Common Carrier Bureau, the surcharges will eventually be put in place, despite overwhelming public opposition.

Milkman addressed a meeting of the Videotex Industry Association of America last September in Washington, D.C. Attendees were reportedly unhappy with Milkman's presentation, which emphasized that the current exemption from access charges enjoyed by owners of networks used by information services was never intended to be permanent. Ms. Milkman admitted that the FCC has been swamped with letters protesting the surcharges, but added that grievances which take exception to the anticipated rules changes solely on the basis of their higher rates are likely to go unheeded by the Commission.

Milkman stated that the FCC feels the impact of the surcharges will be substantially less now than it would have been three years ago, when the exemption was granted. They reason that since 1200-baud access to commercial information services averaged over $20 in 1984, and is only about $10 now, computer owners who end up shelling out $15 an hour under the new rules will still be better off than they were three years ago.

Implementation of the FCC surcharges may be delayed for a month or so, due to an extension of the deadline for public comment on the access charges, but Milkman strongly implied that the Commission views imposition of the surcharges inevitable.

In a related move, rumor has it that the Internal Revenue Service is contemplating adopting logic similar to the FCC's when dealing with future tax hikes. Government spokespersons will state that they wanted to raise the rates a long time ago, and that we're all better off with the increases delayed until the present.

Tax Dollars At Work

The FCC, obviously in a cranky mood from being asked to defend its actions every 15 minutes, has turned its collective wisdom across the waters to the Persian Gulf. It seems that many of those reflagged Kuwaiti oil tankers are not equipped with FCC-approved radio and communications gear. The Commission has apparently been adamant that ships flying the stars and stripes acquire sanctioned equipment in spite of polite requests from the Justice and State Departments to get lost. The FCC's stubbornness in this matter has prompted more than one Washington pundit to suggest that the Commissioners be sent to personally examine mines in the Straits of Hormuz to insure that the explosive devices comply with FCC Class B emission specifications. ©

Bill Wilkinson

Crosswords And Home Computers

I recently attended a meeting of the ESCAPE user's group (of Santa Cruz, California) and had the pleasure of participating in a lively discussion of programming in general, and program design in particular. I must give John Pilge credit for starting the session off with an example program that I'm still thinking so hard about. I would like to share his tough nut with all of you.

Consider a simple acrostic square, such as this:

```
T  O  N
A  R  E
B  E  T
```

There are six interlocking words in the square, three vertically and three horizontally. The problem: Given a list of three-letter words, can you write a computer program that will create an acrostic square? Better yet, given a list of five-letter words, can your program use ten of those words to create a larger acrostic square?

John did, indeed, produce a program to perform that task, but when he gave it a list of several thousand five-letter words to work with, and then performed some speed measurements, he estimated that his Atari 800 computer would take 67 *years* to finish! What can be done to improve that time? The most obvious answer would seem to be to move up to a faster machine. Why not? An Atari ST might even be able to do the job in just a handful of years. Hmmm. . .not good enough yet? I didn't think so either.

So now we are into the meat of this month's column: How can we write programs to get the best possible performance out of our little beasts?

Speed Demons

For starters, John *did* write his program in BASIC. Now, as convenient as BASIC is, it is certainly not a language to use when you need speed, so let's consider using another language. Typically, compiled languages will run programs from 10 to 200 times faster than interpreted BASIC (depending on what compiler you use and what kind of program you are testing).

If you are ready to resort to assembly language, you can improve those numbers by an additional factor ranging from 2 to 20. Still, that means that even at *best*, a change of languages will get us an improvement of no more than, say, 400 to 1 over BASIC. So, 67 years becomes about two months. Sigh. I'm not sure I could do without my machine for that long.

Besides changing languages or computers, there are two ways to attack the problem of a too-slow program. The first is to examine your code carefully, looking for the little things that slow down the system. For example, most of us have learned that with Atari BASIC (and indeed, with most BASICs), you can improve performance markedly if you put FOR. . .NEXT loops at the beginning of your program. Yet sometimes, even that is not enough. As I mentioned once upon a time in an article about card shuffling, the only real solution might be to find another *method* to solve the problem.

Try the listing accompanying this article, as is. Note how quickly the program finds the acrostic squares. Then, run it twice more, removing lines 1430 and 1450, in turn, to see the effect of increasing the word list even a little bit. Now, imagine the effect of having thousands of words. Worse, imagine thousands of five-letter words. Scares you a little, doesn't it?

In the same vein, consider crossword puzzles. If five-square acrostics are a tough nut for computers, imagine how long it would take your Atari computer to generate a 12 × 12 crossword. Even today, there is no *real* crossword-generating program for any personal computer. (Yes, I am aware of *Crossword Magic*, but that program only *aids* crossword makers. It doesn't even come close to being able to generate puzzles by itself.) Yet, there are humans who can produce original crossword puzzles in a matter of hours or even minutes.

For you nonprogrammers, I hope I've shown you that computers can't do everything as well as humans. There is a not-too-hidden message here as well: Program design is very important. Yes, careful implementation is important (no one wants a buggy program, of course), but sometimes a good design can make the *real* difference, hopefully producing a program that can finish its task before you nod off with boredom.

For you programmers, here is a challenge: Can you come up with a better method? I would hope so. My version is fairly simplistic (probably much more so than John's program, which I have not seen) and not too hard to follow. I do have a sneaking hunch, though, that you won't improve the program too much if you stick to BASIC—not because BASIC itself is slow (although that doesn't help)—but because BASIC is so weak when it comes to data types and structures.

Foreign Languages

And where is this leading us? Into one of my favorite topics: computer languages. More specifically, I would like to explore the strengths and weaknesses of the various languages available for Atari computers (both eight-bit and ST). Beyond that, I would like to discuss some of the more fundamental programming topics. In particular, in next month's column we will begin looking at the advantages of struc-

tured data (and no, that's *not* the same as structured programs).

In the meantime, I'm going to be giving the acrostic squares problem some thought. Certainly, if you get any brilliant ideas for solving the acrostic squares problems, please let me know. You can write to me at P.O. Box 710352, San Jose, CA, 95171-710352. Or, you can contact me in one of the Atari forums on CompuServe. (I am active in the Atari eight-bit forum, especially since they introduced the Kyan/OSS/ICD special topics areas. My PPN is 73177,2714.) And please, if your solution is a lengthy one, consider sending a disk or uploading the program.

```
AO 10 REM COPYRIGHT 1987 COM
      PUTE! PUBLICATIONS, IN
      C.  ALL RIGHTS RESERVE
      D.
IP 20 PRINT "{CLEAR}COPYRIGH
      T 1987":PRINT "COMPUTE
      ! PUBLICATIONS, INC.":
      PRINT "ALL RIGHTS RESE
      RVED."
BP 30 FOR TT=1 TO 1200:NEXT
      TT:PRINT "{CLEAR}"
FJ 1000 REM THE HORIZONTAL W
        ORDS:
FK 1001 DIM H1$(3),H2$(3),H3
        $(3)
KK 1010 REM THE VERTICAL WOR
        DS:
IF 1011 DIM V1$(3),V2$(3),V3
        $(3)
NC 1020 REM A TEMPORARY AND
        MASTER WORD LIST
IA 1021 DIM T$(3),W$(3*100)
LP 1030 REM INITIALIZE THE M
        ASTER WORD LIST
MB 1040 FOR I=1 TO 1000000 S
        TEP 3
FK 1050 READ T$
HB 1060 IF T$<>"*" THEN W$(I
        )=T$:NEXT I
EN 1070 REM NOW BEGIN THE RE
        AL WORK
OL 1080 WCNT=I-3
OG 1090 FOR H1=1 TO WCNT STE
        P 3
OD 1100 H1$=W$(H1,H1+2)
OA 1110 FOR H2=1 TO WCNT STE
        P 3
ML 1120 IF H2=H1 THEN 1350
OJ 1130 H2$=W$(H2,H2+2)
OE 1140 FOR H3=1 TO WCNT STE
        P 3
FA 1150 IF H3=H2 OR H3=H1 TH
        EN 1330
OP 1160 H3$=W$(H3,H3+2)
FM 1170 V1$=H1$(1):V1$(2)=H2
        $(1):V1$(3)=H3$(1)
PE 1180 FOR V1=1 TO WCNT STE
        P 3
BA 1190 IF V1$<>W$(V1,V1+2)
        THEN NEXT V1:GOTO 13
        20
FM 1200 V2$=H1$(2):V2$(2)=H2
        $(2):V2$(3)=H3$(2)
OP 1210 FOR V2=1 TO WCNT STE
        P 3
AO 1220 IF V2$<>W$(V2,V2+2)
        THEN NEXT V2:GOTO 13
        20
GF 1230 V3$=H1$(3):V3$(2)=H2
        $(3):V3$(3)=H3$(3)
PD 1240 FOR V3=1 TO WCNT STE
        P 3
BF 1250 IF V3$<>W$(V3,V3+2)
        THEN NEXT V3:GOTO 13
        20
BJ 1260 PRINT "FOUND ONE!"
FH 1270 PRINT
CD 1280 PRINT ,H1$
CD 1290 PRINT ,H2$
BH 1300 PRINT ,H3$
FC 1310 PRINT
NN 1320 REM (TO HERE IF VN$
        NOT IN LIST)
AB 1330 REM (END OF 'IF H3=H
        2 ...' )
IC 1340 NEXT H3
AB 1350 REM (END OF 'IF H2=H
        1 ...' )
ID 1360 NEXT H2
ID 1370 NEXT H1
BC 1380 STOP
LB 1390 REM
DK 1400 REM THE WORDS!
KK 1410 REM
AF 1420 DATA ARE,BET,NET,ORE
        ,TAB,TON
AH 1430 DATA *
DJ 1440 DATA TOP,PET,TAP,POT
        ,TAN,PEN
AO 1450 DATA *
ON 1460 DATA LAP,LOP,CAP,COT
        ,CAT,CAN
BA 1470 DATA *                  ©
```

AmigaView

Sheldon Leemon

On The Cutting Edge

Three-dimensional graphics and animation are the hottest fields in computer graphics today. Three-dimensional programs allow you to display three-dimensional objects, seen from any angle and at any distance, on your two-dimensional computer screen. The Amiga's specialized hardware makes it a natural for such advanced graphics work, and as a result, a slew of new 3-D graphics and animation software for the Amiga has recently appeared.

The concept behind these packages is more or less the same. You first define one or more 3-D objects. This can be done using a coordinate system, where the corners of each edge are specified using numbers that denote their horizontal and vertical position, as well as their depth. Or, objects may be composed of a number of basic primitive shapes, such as cubes, cones, spheres, tubes, and pyramids. Three-dimensional objects may also be created by drawing two-dimensional ones and then "spinning" them as on a lathe, or by extruding them, a process similar to forcing a lump of modeling clay through a stencil.

Once an object is defined, you must decide where to position an imaginary camera. You can choose to look at the object from any side, from any distance, and from any angle. Finally, you set the lighting, placing one or more sources of illumination around the scene to achieve the proper effect. When these preparations are completed, the program draws the desired view of the object. This drawing may be as simple as a wire-frame view, depicted as a series of connected lines, or as complex as a ray-traced view that can display such details as shadows, reflections, refraction, and surface textures.

In addition to still images, some programs let you create a series of pictures in which the camera or the object (or both) move from scene to scene. This series of pictures can then be compressed into a file which contains only the changes that occur from frame to frame, and that can be played back at high speed, creating an animated movie a few seconds long. These scenes may be recorded serially on videotape to form longer scenes. Or, the entire animation may be recorded one frame at a time, using 16mm film or special video equipment.

New Software

Because 3-D animation is a complex field, and a relatively new one at that, there are many ways in which it may be approached. This fact is reflected in the diversity of 3-D software for the Amiga. Within a span of about two months, four new 3-D packages have appeared, each with a somewhat different emphasis. These programs are *Sculpt 3-D* from Byte by Byte, *Videoscape 3-D* from Aegis, *Forms in Flight* from Micro Magic, and *Silver* from Impulse.

Videoscape 3-D is the result of Alan Hasting's experimentation with using the Amiga to create short animated films, such as "Infinite Loop." Its object-creation facilities are by far the most primitive of any of the programs; though some object editing programs are included in the package, the manual suggests using graph paper to draw the object, and then creating a text file with the coordinates for the object. The motion of objects and camera are also controlled by text files. Color selection for the faces of the object are limited to a fixed palette. The drawing section of the program is geared more toward speed than to accuracy or detail. Despite these limitations, the program has been used to create many impressive animations. Though not the easiest to learn or use, it gets the job done.

Somewhat similar in orientation is the program *Forms in Flight*. Like *Videoscape*, it's geared toward producing frames quickly. It, however, has a much more sophisticated object creation facility, which allows the user to enter object coordinates, draw them freehand, or use existing library objects. It also includes tools to stretch, resize, spin, and extrude objects.

3-D In Thousands Of Colors

Sculpt 3-D and *Silver* both can draw objects using any Amiga graphics modes, including the 4096-color Hold and Modify (HAM) graphics mode. This allows them to depict a wide array of surface textures, as well as properties such as reflectivity and transparency. However, their object creation philosophies are totally different. *Silver* uses only a fixed set of primitive shapes with which to construct objects. As a result, objects may be created and drawn fairly quickly, at the price of some loss of control over detail. *Sculpt*, on the other hand, has a very sophisticated object creation facility which allows objects to be created point by point with the aid of a number of "power tools." Because of the level of detail which this enables, its drawing speed in its most detailed mode is slower than that of the other programs. How this will affect animation speed is somewhat uncertain, since the animation program, *Sculpt 3-D Animator*, has not been released at the time of this writing.

All this power has its price. Though all of these packages cost under $200, they will probably require extra RAM. *Forms in Flight* and *Silver* need a minimum of a 1 megabyte, while *Videoscape* and *Sculpt*, which can run on a 512K machine, really should have twice that for smooth operation. ©

Philip I. Nelson

BASIC File Dumper

A file dumper is the sort of tool that virtually every programmer needs sooner or later. What it does is display the contents of a disk file, showing every byte in both numeric and ASCII formats. That's useful any time you need to know precisely what a file contains. This month's program, written in *GFA BASIC*, lets you dump the contents of a file to either the screen or a disk file, pausing the screen display whenever you like.

The figure below shows a typical file dump. What we're looking at in this case is the word processor file containing this column, stored in *1ST Word* format. Notice how many extra bytes the file contains in addition to the printable characters. By studying this whole dump in detail, you could learn much about how *1ST Word* handles automatic line wrap and other formatting details.

Each line of the dump shows the contents of 16 bytes from the file. The line starts with a 4-digit hexadecimal number showing your position in the file. Next come 16 hex numbers showing the contents of 16 bytes. The 16 characters at the right end of the line show the ASCII equivalent for each byte. Control codes and unprintable characters are represented with a dot (.) character to avoid spoiling the display. If you don't like using hexadecimal numbers, you can easily change the program to use decimal instead (see below).

Using The Program

If you just want to take a quick peek at a file, choose the Screen option when the program begins. If you need to examine the file at length, choose the File option. The new file has the same base name as the original file, with a .HEX extension if you're in hex mode or a .DEC extension if you're not. Once the new file has been made, you can either make a hardcopy printout or load it into your favorite text editor and view it at your leisure.

While the file dump is in progress, you can pause it by pressing P if you are dumping to the screen (press any key to resume). Pressing any other key aborts the dump immediately, in either mode.

```
0000: 1F 30 36 36 30 31 30 33 30 33 30 35 36 36 0D 0A  .06601030305666..
0010: 1F 39 5B 2E 2E 2E 2E 7F 2E 2E 2E 2E 7F 2E 2E 2E  .9[.............
0020: 2E 7F 2E 2E 2E 2E 7F 2E 2E 2E 2E 7F 2E 2E 2E 2E  ................
0030: 7F 2E 2E 2E 2E 7F 2E 2E 2E 2E 7F 2E 2E 2E 2E 7F  ................
0040: 2E 2E 2E 2E 7F 2E 2E 2E 2E 7F 2E 2E 2E 2E 7F 2E  ................
0050: 2E 2E 2E 5D 0D 0A 0D 0A 53 54 1E 4F 75 74 6C 6F  ...]....ST.Outlo
0060: 6F 6B 0D 0A 0D 0A 50 68 69 6C 69 70 1E 49 2E 1E  ok....Philip.I..
0070: 4E 65 6C 73 6F 6E 0D 0A 0D 0A 42 41 53 49 43 1E  Nelson....BASIC.
0080: 46 69 6C 65 1E 44 75 6D 70 65 72 0D 0A 0D 0A 41  File.Dumper....A
0090: 1E 66 69 6C 65 1E 64 75 6D 70 65 72 1E 69 73 1E  .file.dumper.is.
00A0: 74 68 65 1E 73 6F 72 74 1E 6F 66 1E 74 6F 6F 6C  the.sort.of.tool
00B0: 1E 74 68 61 74 1E 76 69 72 74 75 61 6C 6C 79 1E  .that.virtually.
00C0: 65 76 65 72 79 1E 1C 70 72 6F 67 72 61 6D 6D 65  every..programme
00D0: 72 1E 0D 0A 6E 65 65 64 73 1E 73 6F 6F 6E 65 72  r...needs.sooner
00E0: 1E 6F 72 1E 6C 61 74 65 72 2E 1E 1C 57 68 61 74  .or.later...What
00F0: 1E 69 74 1E 64 6F 65 73 1E 69 73 1E 64 69 73 70  .it.does.is.disp
0100: 6C 61 79 1E 74 68 65 1E 63 6F 6E 74 65 6E 74 73  lay.the.contents
0110: 1E 6F 66 1E 1C 61 1E 0D 0A 64 69 73 6B 1E 66 69  .of..a...disk.fi
0120: 6C 65 2C 1E 64 69 73 70 6C 61 79 69 6E 67 1E 65  le,.displaying.e
0130: 76 65 72 79 1E 62 79 74 65 1E 69 6E 1E 6E 75 6D  very.byte.in.num
0140: 65 72 69 63 1E 61 6E 64 1E 41 53 43 49 49 1E 66  eric.and.ASCII.f
0150: 6F 72 6D 61 74 2E 1E 0D 0A 54 68 61 74 27 73 1E  ormat....That's.
0160: 1C 75 73 65 66 75 6C 1E 1C 61 6E 79 74 69 6D 65  .useful..anytime
0170: 1E 1C 79 6F 75 1E 6E 65 65 64 1E 74 6F 1E 6B 6E  ..you.need.to.kn
```

A file dump from a 1ST Word *word processing file.*

For Those Who Prefer Decimal

Hexadecimal numbers are often used in programming, but not everyone finds them useful. If you prefer decimal, you can easily change the program to suit your needs. The first non-remark line in the program contains the statement HEXFLAG=1. If you change the 1 to 0, all of the program's output is in decimal.

Other Languages

If you're programming in Pascal or C, converting this program to your language should be a straightforward matter. Most of the conversion is bread-and-butter work like converting to the correct FOR-loop syntax, declaring variables and procedures properly, and so forth. However, there are three *GFA BASIC* keywords that deserve special mention.

The first keyword, ALERT, provides a convenient way to call the GEM AES routine officially known as **form_alert**. The second keyword, FILESELECT, lets you call the AES routine known as **fsel_input**. Consult your manual for the proper way to call these AES routines in your language. The form of the call will be different, but you'll want to supply the same information to the routine. The last one is EDIT, which in *GFA BASIC* simply terminates the program and returns you to the editing screen. Replace EDIT with whatever is needed to terminate a program in your language.

If you're using another version of BASIC, you may need to add a line number at the beginning of each line. If your BASIC doesn't provide a way to call system routines, eliminate the lines beginning with ALERT and FILESELECT, and substitute INPUT statements. Replace EDIT with STOP or END.

GFA BASIC File Dumper

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

```
'←
' GFA BASIC File Examiner←
'←
' Reads any GEMDOS file and writes its content
s←
' in hexadecimal to the screen or a disk file.
←
'←
' To dump in decimal rather than hexadecimal,←
' change the 1 to a Ø in the following line.←
hexflag=1←
'←
num_bytes=16←
num_digits=4←
exten$=".HEX"←
IF hexflag=Ø THEN←
  num_bytes=14←
  num_digits=6←
  exten$=".DEC"←
ENDIF←
'←
' Offer initial options via GEM's form_alert d
ialog.←
ALERT 1,"Hex Dump!Enter name of file.",Ø,"Canc
el!Screen!File",button←
IF button=1 THEN  ! You cancelled, so let's...
←
  EDIT            ! quit.←
ENDIF←
IF button=3 THEN  ! You chose the File option.
..←
  flag=1          ! which we'll note for futur
  e reference.←
ENDIF←
' Otherwise, button=2, so we dump to the scree
n.←
'←
' Get a filename via GEM's fsel_input function
.←
' We must supply three strings.←
' The first string is the default path ("\*.*"
 in this case).←
' Second is the default filename (null string
in this case).←
' Third string is where GEM stores your choice
 (Infile$ in this case).←
FILESELECT "\*.*","",infile$←
IF infile$="\" OR LEN(infile$)=Ø THEN  ! You o
bviously want to...←
  EDIT                                 ! quit.
  ←
ENDIF←
'←
' Output file, if any, has same name with .HEX
 or .DEC extension.←
IF flag=1 THEN←
  otfile$=LEFT$(infile$,LEN(infile$)-4)+exten$
  ←
ENDIF←
'←
' Try to open file(s). Quit if we fail.←
myerr=Ø←
ON ERROR GOSUB handlerr←
OPEN "I",#1,infile$←
IF flag=1 THEN←
  OPEN "O",#2,otfile$←
ENDIF←
IF myerr=1 THEN  ! Discretion is the better pa
rt of valor.←
  ALERT 1,"A disk error has occurred!!Gotta go
  ...",Ø,"Cancel",button←
  CLOSE  ! Will the last one to leave turn out
   all the lights...←
  EDIT←
ENDIF←
ON ERROR←
' Still afloat. Let's proceed.←
count=Ø←
lin$=""←
b$=""←
offset=Ø←
GOSUB offset←
IF flag=1 THEN  ! Kindly inform the filedumper
s what's going on.←
  PRINT "Creating file: ";CHR$(34);←
  PRINT otfile$;←
  PRINT CHR$(34)←
ENDIF←
'←
' Main loop. Read source file and write hex co
ntents.←
WHILE NOT EOF(#1)←
  x=ASC(INPUT$(1,#1)+CHR$(Ø))←
  lin$=lin$+CHR$(x)←
  INC count←
  IF count<num_bytes THEN←
    ' We're building a line of bytes←
    GOSUB byte_out←
    IF count<num_bytes-1 THEN←
      GOSUB space_out←
    ENDIF←
  ELSE←
    ' We've reached the end of a line←
    GOSUB space_out←
    GOSUB byte_out←
    GOSUB space_out←
    GOSUB space_out←
    GOSUB ascii_out←
    lin$=""←
    ot$=CHR$(13)+CHR$(1Ø)←
    GOSUB both_out←
    GOSUB offset←
    count=Ø←
  ENDIF←
  ' Any key aborts in file mode.←
  ' Press "P" or "p" to pause display in scree
  n mode.←
  ' Any other key aborts in screen mode.←
  wimp$=INKEY$←
  IF wimp$<>"" THEN←
    IF (wimp$="p" OR wimp$="P") AND button=2 T
    HEN←
      wimp$=""←
      WHILE wimp$=""←
        wimp$=INKEY$←
      WEND←
    ELSE←
      CLOSE←
    ENDIF←
  ENDIF←
WEND←
' Pad out last line if it needs padding and we
're in screen mode.←
IF wimp$=""←
  CLOSE #1←
  cleanup:←
  fudge=Ø  ! Every program deserves a little←
  WHILE count<num_bytes←
    INC count←
    IF fudge>Ø THEN←
      GOSUB space_out←
    ENDIF←
    ot$="ØØ"←
    GOSUB both_out←
    INC fudge←
  WEND←
  GOSUB space_out←
  GOSUB space_out←
  GOSUB ascii_out←
  IF flag=1 THEN←
    CLOSE #2←
  ENDIF←
ENDIF←
' Main loop ends here.←
EDIT←
'←
PROCEDURE handlerr←
  myerr=1←
  RESUME NEXT←
RETURN←
'←
```

```
PROCEDURE byte_out<
  IF hexflag=0 THEN<
    ot$=STR$(x)<
    WHILE (LEN(ot$)<3)<
      ot$="0"+ot$<
    WEND<
    GOSUB both_out<
  ELSE<
    IF x<16 THEN<
      ot$="0"<
      GOSUB both_out<
    ENDIF<
    ot$=HEX$(x)<
    GOSUB both_out<
  ENDIF<
RETURN<
'<
PROCEDURE space_out<
  ot$=CHR$(32)<
  GOSUB both_out<
RETURN<
'<
PROCEDURE ascii_out<
  FOR k=1 TO num_bytes<
    x$=MID$(lin$,k,1)<
    IF x$<CHR$(33) OR x$>"z" THEN<
      ot$=CHR$(46)<
      GOSUB both_out<
    ELSE<
      ot$=x$<
      GOSUB both_out<
    ENDIF<
  NEXT k<
RETURN<
'<
PROCEDURE offset<
  offset$=HEX$(offset)<
  IF hexflag=0 THEN<
    offset$=STR$(offset)<
  ENDIF<
  WHILE LEN(offset$)<num_digits<
    offset$="0"+offset$<
  WEND<
  ot$=offset$+":"+CHR$(32)<
  GOSUB both_out<
  offset=offset+num_bytes<
RETURN<
'<
PROCEDURE both_out<
  IF flag=0 THEN<
    PRINT ot$;<
  ELSE<
    PRINT #2,ot$;<
  ENDIF<
RETURN<                                    @
```


Amiga SuperMenus

There are a number of problems with this article from the September issue (p. 89). The *SubMenu%* in the example syntax for the SMENU command should instead be *SubItem%* to conform with the following description. There are also two errors in Program 1. In the INITIALIZE subprogram definition on page 89, the second SHARED statement should begin **SHARED seLectimage%** rather than **SHARED image%**. (This mistake doesn't actually cause a problem because selectimage% is defined as 0.) In the SMENUOFF subprogram, the statement at the top of the third column on page 90 should read as follows:

```
IF PEEKL(ItemAdd + 22) > 0 AND
  PEEKL(ItemAdd + 22) < > PEEKL
  (ItemAdd + 18) THEN-
```

Fast Fractal Landscapes For IBM

Many readers with equipment combinations other than a genuine IBM PC and IBM color/graphics adapter card encountered a problem when using this program from the June issue (p. 88). Vertical spikes would appear in the display, leaving blank areas in the landscapes. We still have no simple patch for the program, but reader Derward McKinney has discovered an alternative solution. The problem does not occur if the machine language program is executed from the DEBUG utility provided with DOS. To use this approach, first run the BASIC program in the magazine to create the FRACLAND.COM file, then make a copy of the DEBUG.COM file on the same disk with FRACLAND.COM. (DEBUG.COM should be on one of your DOS master disks. For PC-DOS and most versions of MS-DOS, look on the *DOS Supplemental Programs* disk.)

To start the program, enter the following command at a DOS prompt:

```
debug fracland.com
```

When the DEBUG hyphen (-) prompt appears, type a G, and then press Enter. The program will begin running, and the fractal landscapes should appear without spikes. The only disadvantage to this approach is that your system may appear frozen when you exit Fast Fractal Landscapes, so you must turn the computer off and back on to reboot. @

Donald B. Trivette

All Sass Sal

Folks who don't own computers always claim there are no home applications worthy of their time and effort. Those of us with computers know differently. Aside from the obvious choices—best sellers like *Managing Your Money* and a score of word-processing programs—there are a number of nifty lesser home applications, some of which may have escaped your attention. This month, we'll look at two of my favorites.

Learn To Type

Typing Instructor II is the Rolls Royce of typing programs. Its nine sections cover everything you need to learn to type. The first section deals with posture and finger positions. The second section has 18 lessons that teach the key locations; here you begin actual exercises. Lesson one covers the letters *a, s,* and *l.* It's amazing how many words—even sentences—you can make from just those letters: *All sass a lass, alas all sass Sal,* and so on.

Each exercise consists of typing the letters, words, and sentences as they appear on the screen. When you make a mistake, the program doesn't beep and raise a lot of fuss; instead it quietly clears away your erroneous keystroke and waits for you to continue.

A Typing Test

Once you've gone through all the lessons and actually learned to type—with just an hour a day, you'll be typing in two weeks—you can progress to the typing tests. Having learned to type in high school, this is where I began. I picked the easiest material for my first test. Each one is about 18 lines and 180 words long. I was rather proud of my results until a high-school typing instructor told me that 35–40 words per minute (wpm) is the minimum a student needs to get out of his class.

Anyway, my score on the first test was 51 words per minute at 92 percent accuracy. But I would have done better if the program hadn't "taken-off" every time I used the backspace to correct an error. Corrections aren't allowed. I switched to more difficult material, a technical document, and my score fell to 40 words per minute at 80 percent accuracy. In defense, I confess I never learned the numbers across the top row of the keyboard and the program knew that. After each test it told me which keys I needed to work on—the numbers always headed the list.

The last section in *Typing Instructor II* teaches the mechanics of word processing on a computer. One feature I particularly like is the ability to select either the space bar or the enter key as the line-ending character. This means you can emulate a typewriter (which uses the enter key to end lines) or word-wrap on a word-processing program (which uses the space bar) for the tests.

Beat The Lobster

If you get tired of practice—and who doesn't—there's a game called Lobster Sea Adventure in which you try to type a line of words faster than a red lobster, which is sliding across the screen from left to right to devour them. You can set the lobster's speed from a snail-like 15 words per minute to an impossible 90 words per minute, and you can pick from easy material—without numbers or !#( )$%&—to difficult text.

The program can automatically record the progress on your ten most recent sessions and display the results on the screen or in a printout. It can do this for up to eight individual typists, so the whole family can learn together. *Typing Instructor II* is published by Individual Software, Foster City, CA. Available for $49.95, it runs on IBM PC, PCjr, and is available in 3½-inch format for the IBM PS/2.

An Intelligent Calculator

My second choice for overlooked software is an intelligent calculator called the *Lascaux1000.* This program can be installed to pop-up when you type a hot-key combination, or it can be run from the DOS-level each time you need it. The memory resident pop-up version uses more than 200K, so I recommend running *Lascaux1000* as a program.

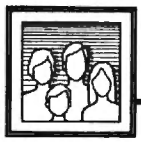
How can a calculator take up so much memory? This one has built-in constants and units, which is why it's such an agreeable thing to have around the house.

Using the *Lascaux1000* calculator, you do not have to know any conversion factors, just press the convert key and type the name of the desired unit. The calculator has scores of built-in units and the ability to add new ones.

The calculator has over a hundred built-in constants for everything from *pi* and *e* to Planck's constant and the speed of light. And you can add your own to the table. The program reports an error when calculations are performed with incorrect units: You cannot multiply cubic feet by the speed of light, for example. A paper tape display, which keeps the most recent 150 values, can be wound backward when it scrolls off the screen.

Lascaux1000 is available from Lascaux Graphics, 3220 Steuben Ave., Bronx, NY, 10467, and sells for $59.95. It runs on the IBM PC and compatibles with 320K memory.

Donald B. Trivette is the author of A Quick and Easy Guide to Dow Jones News/Retrieval, *published by Compute! Books.*



Computers and Society

David D. Thornburg, Associate Editor

Computer Users As Programmers—The Next Wave

I was once told that the reason the original TRS-80 computer was shipped with BASIC was that Radio Shack felt that computers were going to be purchased only by people who wrote their own programs. In the late 1970's this was a reasonable assumption. In the first place, computer users prior to this time were largely the creators or designers of their own programs. The very first personal computer kits came with no languages at all. The hobbyists who purchased these machines had to work with machine code until higher level languages became available.

When Radio Shack, Commodore, and Apple decided to sell computers to the general public, they chose BASIC as the most English-like language available at the time in the hopes that their customers could learn to create interesting programs on their own. This decision solved the chicken and egg problem by allowing the installed base of hardware to become large enough to support a fledgling software industry.

But the real growth in computer sales came when there was enough third-party software to support people's needs. The ready availability of word processors, spreadsheets, video games, and so on, allowed and encouraged computer use by people who had no interest in writing their own programs.

Not In BASIC

Interestingly, almost none of the commercial software was written in the BASIC language provided with the computer. Most of it was created in other languages and then compiled into an efficient form for distribution in the marketplace. There are two reasons for this. First, the implementations of BASIC provided with the early personal computers were too weak to take advantage of the computer's power. They were fine for the creation of simple programs, but not good enough for building industrial-strength software. One of the most spectacular examples of this was the BASIC shipped with the TI 99/4 that didn't even support the marvelous graphics and animation capabilities of this machine. The second reason that commercial software was not delivered in BASIC is that the user could examine and modify the program on his own. Many developers want to keep their source code private because it is virtually impossible to provide effective customer support when the customer can change the program.

As a result, two types of end users developed—those who enjoyed creating their own programs and those who saw the computer as a power tool for the mind and who had no intention of creating their own programs.

When Atari announced the 400 and 800 computers—the first popular PCs without built-in BASIC—some of us saw this as a sign of maturation in the marketplace. If some users wanted to create their own programs, languages were available. If other users didn't want to program themselves, they could buy commercial software to perform whatever tasks they wanted.

Appliance, Not Computer

The pinnacle of this view of computing came in 1984 when Apple introduced the Macintosh. While most people were struck by the technological prowess of this machine, there was another aspect of the Mac that distinguished it from its ancestors. It was the first computer to be successfully marketed as an appliance. Only one page of the thick instruction manual contained any technical information about the machine. The user was spared discussion of RAM and ROM and was instead encouraged to think of the computer in terms of the metaphors through which it interacted with its owner. And so the user learned about windows, icons, menus, and desktops, instead of RAM, ROM, FOR-NEXT loops, and the host of technical jargon that had successfully intimidated millions of potential computer users. It was for this reason that the Mac was called the "computer for the rest of us."

Instead of shipping a programming language with the machine, Apple solved the chicken and egg problem by including a word processing and graphics creation package instead. The value of the computer was seen in its responsiveness to the user's needs, not in its technological prowess. I, for one, thought that this marked the end of an era and the beginning of a new age of computing. The shipment of programming languages with computers appeared to have gone the way of hula hoops and white bucks.

I was wrong.

A New Direction

In August 1987, a scant three years after the introduction of the Mac, Apple announced that each new Macintosh was being shipped with a copy of *HyperCard*—"A personal toolkit that gives users the power to use, customize, and create new information types such as text, graphics, video, music, voice and animation." In other words, Apple decided to start shipping a programming language with the Macintosh rather than provide the user with core applications like word processors.

There are several rational explanations for this decision. First, Apple stopped including free word processing and graphics packages once there were good third-party programs on the market. This re-

flects Apple's commitment to the developer community by providing a level playing field.

The second explanation is more complex. While it is true that most computer users have no desire to create their own programs, many people want a great deal of flexibility in their programs. For many users, spreadsheets have become programming languages since they allow virtually unlimited flexibility with which the user can design and create his or her own applications. Relational database programs often provide even more flexibility, allowing users to create custom applications on their own without having to become programmers.

Such flexible environments have become indispensable to many computer owners, proving that the reluctance to program in BASIC was based more on BASIC's limitations than on a lack of desire of the user to tailor the computer to his or her unique needs.

With the inclusion of *HyperCard* (whose operation will be described next month), Apple has provided Mac users with a flexible programming environment that is powerful enough to meet the requirements of the developer community yet simple enough to allow end users to create their own programs or to modify programs written by others. However, this capability has its price. *HyperCard* requires at least 1 megabyte of RAM and two 800K disk drives. The user interface of *HyperCard* is designed to make it easy to use, and it facilitates the easy creation of programs. By providing the user with a rich repertoire of development tools, *HyperCard* applications tend to require much more memory than equivalent programs created from scratch using traditional programming languages like Forth or C.

Next month we'll take a closer look at *HyperCard* because it represents a direction for computer language development that will be felt across the broad spectrum of computers that occupy today's desks.

Dr. Thornburg welcomes letters from readers and can be reached at P.O. Box 1317, Los Altos, CA 94023. ©

SuperCount

Bert Halverson

If you've ever needed to know the number of words contained in an essay, story, report, or just about anything else you've written, then "SuperCount" fits the bill. Even if you're already using a utility like this, the speed and accuracy of this program may make you put your old word counter out to pasture. For the 128 or 64. A disk drive is required.

How many times have you needed to know the number of words you have left to write in a 500-word essay or in a 1200-word article? Or maybe you're just curious about the number of words in a document. If you ever need to know how many words a document contains, then "SuperCount," the program accompanying this article, will be a welcome addition to your writer's toolbox. Even if you already have a word-counting program, you may find you like SuperCount better. It offers lightning-fast speed coupled with amazing accuracy.

Why is SuperCount more accurate than most word-counting programs? Most programs give you only an approximate word count because they recognize the end of a word by hunting for spaces and periods. But what about words connected by dashes and ellipses (multiple periods), decimal points and commas in numbers, word processor format codes, and the like? SuperCount handles these situations just the way you would if you were counting by hand.

Speed is SuperCount's other virtue. On a 128 with a 1571 disk drive, it will count 10,000 words—60,000 bytes—in just over 30 seconds. (If you're using a 64, times will be longer because the 1541 drive is slower than the 1571.) Some BASIC word counters may take more than 20 minutes for the same task.

Note that SuperCount will accept only sequential (SEQ) files, but that should not be a problem: Most word processors which save text in program (PRG) format also let you save sequentially. In *SpeedScript*, for example, sequential text files can be created using the print-to-disk option (SHIFT–CTRL–P).

Getting Started

Using SuperCount is straightforward. Type it in, save a copy, load it, and type RUN. SuperCount is designed to run on either a 64 or 128, but please note the following: If you save the program with a 64, and later run it on a 128, you'll get syntax errors in lines 135 and 145. This happens because the 64 will not tokenize the FAST and SLOW commands properly. To correct this (in 128 mode), put the cursor anywhere in each of the problem lines and press RETURN. Then resave SuperCount. FAST and SLOW will

not be a problem, however, if you go the other way—if you save the program on a 128 and run it on a 64. So, if you're using a 128 and want to be able to use SuperCount in both 128 and 64 modes, be sure to type it in and save it in 128 mode.

When you run the program, you'll be asked for the name of the file you want to count and if you want numbers (addresses, ages, money, and so on) counted as words. A few seconds later your document's word count will be printed on the screen.

SuperCount provides a 100-percent-accurate word count, with one exception: Words containing embedded noncharacters, like *doll$rs* or *pre-natal*, will count as two words. But if the symbols come at either end of the word, or if the string is a number containing commas, the word count will be correct. SuperCount also recognizes apostrophes and can tell the difference between a period and a decimal point.

The program isolates a word by skipping over leading and trailing noncharacters. This takes care of spaces, dashes, quotes and so on, even if there are several in a row. When the program finds a word's first character, control is passed to a routine which looks for anything that signals the end of the word. Then the counter (memory addresses 253 and 254) is incremented, and the process starts over, unless the end of file has been reached.

Period Or Decimal?

Decimal points pose a special challenge in logic. In an early version of the program, they caused a count error because SuperCount thought the "period" meant the end of a word. For example, $7,777.77 was counted as two words.

The problem was to teach SuperCount to distinguish between a period and a decimal point. A decimal point would be treated like any other character, but a period would signal the end of the word and increment the counter.

What SuperCount needed to do when it found a period was to check the previous byte. If that previous byte was a number, then the period was really a decimal point and could be ignored. If not, it was determined to be a period and signaled the end of the word. A period at the end of the number could be deciphered as a decimal and thus ignored, too, since the next byte would be a space or some other noncharacter which would increment the counter.

But how could SuperCount know what the previous byte was, when it was erased each time through the read loop?

The solution was to store each byte in an unused data register until the next pass and then, whenever a period was encountered, to check the stored character. If it was a number, then the period was really a decimal point.

Program Notes

When you run SuperCount, it drops the top of BASIC to 8990, pokes a short ML (machine language) program into memory starting at 9000, and clears locations 251–254 in zero page for use as data buffers.

SuperCount is relatively short and simple because it calls the system subroutines CHKIN, CLRCH, and BASIN for the tedious chores of handling data channels and reading the disk. Files are opened and closed the easy way, too—from BASIC.

If you have a 128 and want to print a copy of the disassembled code, run the program to load the data. Then type the following:

```
OPEN 4,4:CMD 4:MONITOR
```

You are now in MONITOR mode. Nothing happens on the screen. Now type

```
D 2328 2391
```

When the cursor reappears, exit the monitor with the X command and type

```
PRINT#4:CLOSE 4
```

SuperCount

```
EG 5 REM COPYRIGHT 1987 COMPUT
     E! PUBLICATIONS, INC.
     {2 SPACES}ALL RIGHTS RESE
     RVED.
XJ 6 PRINT"{CLR}COPYRIGHT 1987
     ":PRINT"COMPUTE! PUBLICAT
     IONS, INC."
QK 7 PRINT"ALL RIGHTS RESERVED
     ."
MX 8 FOR TT=1 TO 1500:NEXT
HC 10 IF DS$="" THEN POKE 55,3
     0:POKE 56,35:GOTO 20
JX 15 POKE 4626,30:POKE 4627,3
     5:REM LOWER BASIC
FC 20 U$=CHR$(145):L$=CHR$(157
     ):C$=CHR$(147):R$=CHR$(1
     3)
KB 25 S$="{10 SPACES}":REM 10
     {SPACE}SPACES
CE 30 GOSUB 110:GOSUB 130:GOSU
     B 115
SC 35 FOR X=251 TO 254:POKE X,
     0:NEXT:REM CLR BUFFERS
KH 40 GOSUB 140
XH 45 INPUT"FILE NAME";FL$
GD 50 OPEN 1,8,15:OPEN 2,8,2,"
     0:"+FL$+",SEQ,R"
RS 55 INPUT#1,E,E$:IF E THEN P
     RINT R$"ERROR"E"-- "E$:P
     RINT:GOTO 95
PD 60 PRINT"COUNT NUMBERS AS W
     ORDS? Y ";L$L$L$L$;:INPU
     T Y$
GK 65 IFY$="N" THEN PRINT:GOTO
      80
BJ 70 IFY$<>"Y" THEN PRINT U$;
     :GOTO 60
XB 75 POKE 251,48:POKE 252,218
     :GOTO 85:REM* LO-HI=0-9,
     A-Z
XX 80 POKE 251,65:POKE 252,218
     :REM* LO-HI=A,Z
CD 85 PRINT R$R$ "COUNTING..."
     :GOSUB130
EB 90 SYS 9000:GOSUB 110:PRINT
      PEEK(253)+256*PEEK(254)
     "WORDS"CHR$(7)
JM 95 CLOSE 2:CLOSE 1:GOSUB 14
     0
FE 100 IF DS$="" THEN POKE 55,
     0:POKE 56,160:END
FK 105 POKE 4626,0:POKE 4627,2
     55:END:REM RESTORE MEMO
     RY
QG 110 PRINT C$R$CHR$(18)" SUP
     ERCOUNT "R$:RETURN
GR 115 FOR X=9000 TO 9105:READ
      D:C=C+D:POKE X,D:NEXT
GX 120 IF C<>14084 THEN PRINT"
     ERROR IN DATA.":GOSUB 1
     40:END
GS 125 RETURN
XB 130 IF DS$="" THEN RETURN:R
     EM C64?
RP 135 FAST:RETURN:REM C128
RJ 140 IF DS$="" THEN RETURN
GB 145 IF PEEK(215)<128 THEN S
     LOW:REM 40-COL C128?
GX 150 RETURN
PJ 155 DATA 162,2,32,198,255,1
     60,0,24
QF 160 DATA 32,207,255,166,144
     ,224,64,208
DR 165 DATA 4,32,204,255,96,19
     7,251,144
QJ 170 DATA 238,201,57,176,3,7
     6,76,35
DB 175 DATA 201,65,144,227,197
     ,252,176,223
EE 180 DATA 168,24,32,207,255,
     166,144,224
GD 185 DATA 64,208,7,32,139,35
     ,32,204
AQ 190 DATA 255,96,201,39,240,
     234,201,44
SD 195 DATA 240,230,201,46,208
     ,11,192,48
AQ 200 DATA 144,7,192,57,176,3
     ,76,80
DG 205 DATA 35,168,197,251,144
     ,7,197,252
CE 210 DATA 176,3,76,81,35,32,
     139,35
MD 215 DATA 76,47,35,230,253,2
     08,2,230
RQ 220 DATA 254,96
```

Mystery Mania

David Leithauser

If you enjoy logic puzzles—especially those with an air of mystery—then "Mystery Mania" will challenge and entertain you for hours. In this game, you control the difficulty level, so there's something to bring out the Sherlock Holmes in almost everyone, from teens to accomplished detectives. Requires BASICA for the PC, GW-BASIC for compatibles, or Cartridge BASIC for the PCjr.

"Mystery Mania" is a game for sleuths of all ages. It generates 32,001 logic puzzles in the form of murder mysteries. After presenting you with all the necessary clues, you must deduce the identity of the murderer. There are five levels of difficulty, and you can even ask for hints if you need them. The lower levels—one, two, and three—are good for teens and beginners of all ages. The higher levels—four and five—are for seasoned detectives with some solutions to their credit.

Getting Started

Mystery Mania is written entirely in BASIC. To get started, type it in, save a copy on disk, and type RUN. The first thing the program asks is which mystery (0–32000) you want to solve. Type a number between 0 and 32000. Simply pressing the Enter key plays game number 0.

After you've selected the game number, the program asks which difficulty level—from 1 to 5—you want to use. Level 1 is easy, and is suitable for older children. Level 5 is very tough for beginners. Try starting at level 2 or 3 if you are not an experienced logic problem solver. For each number (0–32000), the program generates a slightly different game, depending on the difficulty level.

Next, the program asks if you want a printed copy of the story it is about to generate. It's a good idea to do this because you can then turn off the computer, work on the puzzle at your leisure, and come back later to see if you arrived at the correct solution. (Exactly how to do this will be explained later on.)

Solving A Mystery

After selecting the game number and the difficulty level, the program presents a short story explaining the nature of the crime. This story varies only a little from game to game. At the end of the story, the program tells you to press the space bar to see the clues for this scenario just described. When you press the space bar, you are given 14 clues to the identity of the murderer. These clues are different for each game.

Each of the clues are in the form of statements like "The suspect with red hair was wearing brown shoes." These statements enable you to determine the name of the murderer by a combination of direct deduction and the process of elimination. After you have read the clues, the program asks you to press the space bar to make an arrest.

When you press the space bar, a menu appears. The first five choices on the menu allow you to arrest any of the five suspects. If you arrest the correct suspect, you win the game and receive a promotion. If you arrest the wrong suspect, you're notified and asked if you want to see the solution.

The sixth choice on the menu allows you to quit the game without seeing the solution. With this option, you can turn the computer off and study a printed copy of the clues. When you think you've deduced the murderer's identity, you can run the program again and replay the same game by typing the same game number and difficulty level. After seeing the familiar story and clues, you'll return to the Arrest menu. Now you can select the suspect to arrest.

The seventh choice on the menu allows you to see the solution to the mystery. If you make this choice, the program will explain to you, step by step, how to deduce the identity of the murderer. You should choose this only if you are completely stumped, since it reveals the identity of the murderer.

Getting A Hint

The eighth choice (not available at level 1) is to get a hint. Each hint eliminates one suspect and explains

why. Then you're asked if you want another hint. If you respond by pressing Y, the program gives you another. If you respond by pressing N , you are returned to the menu and allowed to make an arrest.

If you ask for too many hints for your difficulty level, you will be given the final solution. At level 2, the program gives you one hint before it gives you the solution. At level 3, it gives you two hints, and so on.

When the game ends, the program asks you if you want to play again. Press Y to return to the beginning of the program. Press N to return to BASIC.

Mystery Mania

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

```
BD 10 ' Copyright 1987 COMPUTE!
      Publications, Inc. - All R
      ights Reserved
NA 20 DEFINT A-Z:DIM P$(9,10),M$
      (5,6),CL$(13),CG$(13),F$(4
      ),MP$(2),MW$(2)
EP 30 KEY OFF:COLOR 15,1,1:CLS
FK 40 PRINT SPC(40);:SW=POS(0)+3
      9:CLS:S$="Copyright 1987 C
      OMPUTE! Publ., Inc.":GOSUB
       1460:S$="All rights reser
      ved":GOSUB 1460:PRINT:PRIN
      T
GM 50 PRINT:PRINT:S$="PRESENTING
      ":GOSUB 1460:PRINT:S$=CHR$
      (201)+STRING$(15,205)+CHR$
      (187):GOSUB 1460:S$=CHR$(1
      86)+" MYSTERY MANIA "+CHR$
      (186):GOSUB 1460:S$=CHR$(2
      00)+STRING$(15,205)+CHR$(1
      88):GOSUB 1460
DI 60 PRINT:S$="The game that ge
      nerates murder mystery":GO
      SUB 1460:S$="logic problem
      s for you to solve":GOSUB
      1460:S$="Press space bar t
      o continue.":GOSUB 1470
CN 70 S$="This game can generate
       32001 different mysteries
      , numbered 0 to 32000. You
       can play the same game re
      peatedly by choosing the s
      ame number each time you p
      lay, or you can choose a d
      ifferent mystery each time
      .":GOSUB 1360
BG 80 PRINT:INPUT "Which mystery
       story (0-32000)";M:IF M<0
       OR M>32000 THEN PRINT "IN
      VALID ANSWER!":GOTO 80
DN 90 RANDOMIZE M
LI 100 FOR X=0 TO M MOD 99:Y=RND
       (1):NEXT X
JC 110 PRINT:S$="There are five
       difficulty levels, from 1
        to 5. Level 1 is easy, w
      hile level five would kee
      p Sherlock Holmes busy fo
      r a while. The different
      levels actually generate
      different games for the s
      ame number above.":GOSUB
      1360
LE 120 PRINT:PRINT "Difficulty l
      evel (1-5)?";
OK 130 S$=INKEY$:IF S$<"1" OR S$
      >"5" THEN 130
LN 140 PRINT S$:L=VAL(S$)
DK 150 PRINT:PRINT "Do you want
      hard copy of the story (Y
      /N)?";:GOSUB 1430:PR=YN:P
      RINT Y$
BJ 160 CLS
QN 170 ' Read in data
HA 180 FOR X=0 TO 9:FOR Y=0 TO 1
      0:READ P$(X,Y):NEXT Y:NEX
      T X
QJ 190 FOR X=0 TO 2:READ MP$(X):
      NEXT X:FOR X=0 TO 2:READ
      MW$(X):NEXT X
BG 200 ' Generate suspect names
EA 210 A=INT(RND(1)*11):B=INT(RN
      D(1)*11):V$=P$(0,A)+" "+P
      $(1,B):P$(0,A)="":P$(1,B)
      =""
PH 220 FOR X=1 TO 5
GI 230 A=INT(RND(1)*11):A$=P$(0,
      A):P$(0,A)="":IF A$="" TH
      EN 230
GD 240 B=INT(RND(1)*11):B$=P$(1,
      B):P$(1,B)="":IF B$="" TH
      EN 240
PD 250 M$(0,X)=A$+" "+B$
HK 260 NEXT X
GP 270 FOR X=0 TO 4:F$(X)=M$(0,X
      +1):NEXT X
BB 280 FOR X=0 TO 9:A=INT(RND(1)
      *5):B=INT(RND(1)*5):SWAP
      F$(A),F$(B):NEXT X
MJ 290 S$="Six men, "+V$+", "+F$
      (0)+", "+F$(1)+", "+F$(2)
      +", "+F$(3)+", and "+F$(4
      )+" were in "+MP$(INT(RND
      (1)*3))+" together. Sudde
      nly, the lights went out.
      ":GOSUB 1360
JF 300 S$="When the lights came
       back on, "+V$+" was found
       "+MW$(INT(RND(1)*3))+"."
      :GOSUB 1360
LM 310 PRINT:S$="The other detec
      tives have investigated.
      They have questioned the
      suspects, the witnesses,
      and people who know the s
      uspects. They have collec
      ted physical evidence (ha
      ir samples, fiber samples
      , etc.) from the crime sc
      ene.":GOSUB 1360
OB 320 ' Generate suspect data
LC 330 FOR P=1 TO 5
EB 340 A=INT(RND(1)*8+2):IF P$(A
      ,0)="" THEN 340
FB 350 M$(P,0)=P$(A,0):P$(A,0)="
      "
BJ 360 FOR Y=1 TO 5
BI 370 B=INT(RND(1)*9)+1:IF P$(A
      ,B)="" THEN 370
BJ 380 M$(P,Y)=P$(A,B):P$(A,B)="
      "
IL 390 NEXT Y
HO 400 M$(P,6)=P$(A,10)
BC 410 NEXT P
FJ 420 PRINT:S$="They have colle
      cted 14 clues, but have n
      ot been able to solve the
       crime. Therefore, they h
      ave called in the city's
      greatest homicide detecti
      ve. That's YOU! You will
      now be given the clues, a
      nd must solve the murder.
      ":GOSUB 1360
OD 430 ' Generate clues
DG 440 K$=M$(0,6-L+(L=3)-(L=4)):
      C$=M$(4,0)+" "+M$(4,6-L+(
      L=3)-(L=4))
KC 450 CL$(0)=M$(0,1)+" "+M$(2,0
      )+" "+M$(2,1)
LN 460 CL$(1)=M$(0,2)+" "+M$(5,0
      )+" "+M$(5,2)
PK 470 CL$(2)=M$(0,3)+" "+M$(1,0
      )+" "+M$(1,3)
LD 480 CL$(3)=M$(0,4)+" "+M$(3,0
      )+" "+M$(3,4)
FA 490 C1=(RND(1)<.5):IF C1<>0 O
      R L=1 THEN CL$(4)=M$(0,5)
      +" "+M$(1,0)+" "+M$(1,5)
      ELSE CL$(4)=M$(0,5)+" "+M
      $(4,0)+" "+M$(4,5)
LL 500 T$="The suspect who ":N$=
      " is not the one who "
DI 510 A1$=M$(2,0):A2$=M$(2,4):B
      1$=M$(4,0):B2$=M$(4,4):GO
      SUB 1500
PK 520 CL$(5)=T$+A1$+" "+A2$+" "
      +B1$+" "+B2$
EE 530 A1$=M$(1,0):A2$=M$(1,4):I
      F RND(1)<.5 THEN C1$=N$+M
      $(5,0)+" "+M$(5,2):GOTO 5
      60
HL 540 B1$=M$(5,0):B2$=M$(5,4)
CO 550 C1$=" "+B1$+" "+B2$
PG 560 CL$(6)=T$+A1$+" "+A2$+C1$
HI 570 A1$=M$(1,0):A2$=M$(1,4):B
      1$=M$(2,0):B2$=M$(2,4):GO
      SUB 1500
QK 580 NF=0:GOSUB 1510:CL$(7)=Q$
NE 590 A1$=M$(1,0):A2$=M$(1,2):B
      1$=M$(2,0):B2$=M$(2,2):GO
      SUB 1500
OK 600 GOSUB 1510:CL$(8)=Q$
JB 610 A1$=M$(2,0):A2$=M$(2,2):B
      1$=M$(4,0):B2$=M$(4,2):GO
      SUB 1500
PC 620 GOSUB 1510:CL$(9)=Q$
FF 630 A1$=M$(1,0):A2$=M$(1,5):B
      1$=M$(4,0):B2$=M$(4,5):GO
      SUB 1500
CB 640 GOSUB 1510:CL$(10)=Q$
JN 650 A1$=M$(1,0):A2$=M$(1,1):B
      1$=M$(4,0):B2$=M$(4,3):GO
      SUB 1500
EO 660 NF=1:GOSUB 1510:CL$(11)=Q
      $
JH 670 A1$=M$(2,0):A2$=M$(2,5):B
      1$=M$(3,0):B2$=M$(3,2):GO
      SUB 1500
FD 680 GOSUB 1510:CL$(12)=Q$
DK 690 CL$(13)="The murderer "+C
      $:S$="Press space bar to
      see clues.":GOSUB 1490
GP 700 ' Output clues
FF 710 FOR X=0 TO 13:CG$(X)=CL$(
      X):NEXT X
PJ 720 FOR X=0 TO 25:A=INT(RND(1
      )*14):B=INT(RND(1)*14):SW
      AP CG$(A),CG$(B):NEXT X
GG 730 S$="No two suspects have
      the same "+M$(1,6)+", "+M
      $(2,6)+", "+M$(3,6)+", "+
      M$(4,6)+" or "+M$(5,6)+".
      ":GOSUB 1360
CN 740 FOR X=0 TO 6:S$=CG$(X)+".
      ":GOSUB 1360:PRINT:NEXT X
KI 750 S$="Press space bar to co
      ntinue.":GOSUB 1490
MP 760 FOR X=7 TO 13:S$=CG$(X)+"
      .":GOSUB 1360:PRINT:NEXT
      X
JC 770 S$="Press space bar to ma
      ke an arrest.":GOSUB 1490
BN 780 ' Get player's solution
MJ 790 H=0:PR=0:CLS:PRINT:PRINT
       "     You may now":PRINT
EJ 800 FOR X=0 TO 4:PRINT MID$(S
      TR$(X+1),2,1)") Arrest "F
      $(X):NEXT X
LD 810 PRINT "6) Quit without se
```

```
      eing solution":PRINT "7)
      See solution to mystery"
QJ 820 IF L>1 THEN PRINT "8) Get
       a hint"
HP 830 PRINT:PRINT "Select numbe
      r of your choice. ";
LB 840 Y$=INKEY$:IF Y$<"1" OR Y$
      >"8" THEN 840
LD 850 IF L=1 AND Y$="8" THEN 84
      0
JK 860 PRINT Y$:V=VAL(Y$):PRINT
CB 870 IF V=6 THEN S$="Ending ga
      me. This was mystery #"+S
      TR$(M)+". Make a note of
       this so you can come back
       to this game later if yo
      u like.":GOSUB 1360:GOTO
      1230
PF 880 IF V=7 THEN 940
HE 890 IF V=8 THEN H=1:GOTO 940
LA 900 IF F$(V-1)=K$ THEN S$="Co
      rrect! Congratulations. Y
      ou have been promoted to
      chief of police.":GOSUB 1
      360:GOTO 1230
FK 910 S$="Sorry, you've arreste
      d the wrong suspect. Do y
      ou want to see the correc
      t solution (Y/N)?":GOSUB
      1360
PF 920 GOSUB 1430:IF YN=0 THEN 1
      230
KF 930 ' Explain solution and gi
      ve hints
DH 940 PR=0:PRINT:S$="Do you wan
      t hard copy of the explan
      ation (Y/N)?":GOSUB 1360:
      GOSUB 1430:PR=YN
BP 950 CLS
LA 960 S$=CL$(4)+".":IF C1<>0 OR
       L=1 THEN S$=S$+" "+CL$(1
      0)+". Therefore, "+M$(0,5
      )+" "+M$(4,0)+" "+M$(4,5)
      +"."
FA 970 GOSUB 1360
QM 980 IF L=1 THEN S$=CL$(13)+",
       so "+K$+" is the murdere
      r.":GOSUB 1360:GOTO 1230
FP 990 S$=CL$(13)+", so "+M$(0,5
      )+" is not the murderer."
      :GOSUB 1360
NF 1000 IF H=1 THEN PRINT:PRINT
       "Want another hint (Y/N)
      ?";:GOSUB 1430:PRINT Y$:
       IF YN=0 THEN 790
KA 1010 S$=CL$(5)+".":GOSUB 1360
      :S$=CL$(7)+".":GOSUB 136
      0:S$=CL$(6)+".":GOSUB 13
      60:S$="Therefore, one su
      spect "+M$(2,0)+" "+M$(2
      ,4)+", "+M$(4,0)+" "+M$(
      4,4)+", "+M$(1,0)+" "+M$
      (1,4)+", and"+C1$+".":GO
      SUB 1360
CN 1020 S$="But "+CL$(0)+", "+CL
      $(1)+", "+CL$(2)+", and
      "+M$(0,5)+" "+M$(4,0)+"
      "+M$(4,5)+".":GOSUB 1360
FF 1030 S$="Press space bar to c
      ontinue.":GOSUB 1490
PA 1040 S$="Therefore, that one
       suspect is "+M$(0,4)+".
      ":GOSUB 1360
PM 1050 IF L=2 THEN S$="Since "+
      M$(0,4)+" "+M$(4,0)+" "+
      M$(4,4)+", he is the mur
      derer.":GOSUB 1360:GOTO
      1230
KB 1060 S$="Since "+M$(0,4)+" "+
      M$(4,0)+" "+M$(4,4)+", h
      e is not the murderer.":
      GOSUB 1360
CA 1070 IF H=1 THEN PRINT "Want
       another hint (Y/N)?";:GO
      SUB 1430:PRINT Y$:IF YN=
      0 THEN 790
IK 1080 S$=CL$(8)+". "+CL$(9)+".
      ":GOSUB 1360:S$="Therefo
      re, one suspect "+M$(1,0
      )+" "+M$(1,2)+", "+M$(2,
      0)+" "+M$(2,2)+", and "+
      M$(4,0)+" "+M$(4,2)+".":
      GOSUB 1360
CM 1090 S$=CL$(0)+", "+CL$(2)+",
       "+M$(0,5)+" "+M$(4,0)+"
       "+M$(4,5)+", and "+M$(0
      ,4)+" "+M$(4,0)+" "+M$(4
      ,4)+".":GOSUB 1360:S$="T
      herefore, that one suspe
      ct is "+M$(0,2)+".":GOSU
      B 1360
DO 1100 IF L=3 THEN S$="Since "+
      M$(0,2)+" "+M$(4,0)+" "+
      M$(4,2)+", he is the mur
      derer.":GOSUB 1360:GOTO
      1230
BI 1110 S$="Since "+M$(0,2)+" "+
      M$(4,0)+" "+M$(4,2)+", h
      e is not the murderer.":
      GOSUB 1360
FE 1120 S$="Press space bar to c
      ontinue.":GOSUB 1490
BG 1130 IF H=1 THEN PRINT "Want
       another hint (Y/N)?";:GO
      SUB 1430:PRINT Y$:IF YN=
      0 THEN 790
GG 1140 IF C1 THEN S$=CL$(4)+"."
       ELSE S$=CL$(10)+". "+CL
      $(4)+". Therefore, "+M$(
      0,5)+" "+M$(1,0)+" "+M$(
      1,5)+"."
JF 1150 GOSUB 1360
DB 1160 S$=CL$(2)+", "+M$(0,4)+"
       "+M$(1,0)+", "+M$(1,4)+"
      , "+M$(0,2)+" "+M$(1,0)+
      " "+M$(1,2)+".":GOSUB 13
      60:S$="Therefore, "+M$(0
      ,1)+" is the one who "+M
      $(1,0)+" "+M$(1,1)+".":G
      OSUB 1360
OG 1170 S$="This means that "+M$
      (0,1)+" is not the suspe
      ct who "+M$(4,0)+" "+M$(
      4,3)+".":GOSUB 1360
BA 1180 S$="Since "+M$(0,5)+" "+
      M$(4,0)+" "+M$(4,5)+", "
      +M$(0,4)+" "+M$(4,0)+" "
      +M$(4,4)+", and "+M$(0,2
      )+" "+M$(4,0)+" "+M$(4,2
      )+", "+M$(0,3)+" must be
       the one who "+M$(4,0)+"
       "+M$(4,3)+".":GOSUB 136
      0
IL 1190 IF L=4 THEN S$="Since th
      e murderer "+C$+", "+K$+
      " is the murderer.":GOSU
      B 1360:GOTO 1230
LH 1200 S$="Since the murderer "
      +C$+","+M$(0,3)+" is not
       the murderer.":GOSUB 13
      60
IK 1210 IF H=1 THEN PRINT "Want
       another clue (Y/N)?";:GO
      SUB 1430:PRINT Y$:IF YN=
      0 THEN 790
HO 1220 S$="By process of elimin
      ation, "+K$+" is the mur
      derer.":GOSUB 1360
LA 1230 PRINT:PRINT "Do you want
       to play another game (Y
      /N)?":GOSUB 1430:IF YN=1
       THEN RUN ELSE PRINT:END
GF 1240 DATA Bill,David,John,Tom
      ,Fred,Larry,Brian,Jim,Ro
      bert,Jack,Marty
DD 1250 DATA Fox,Martin,Smith,Jo
      nes,Harrison,Craig,Davis
      ,Edison,Brown,Stevenson,
      Alberts
OH 1260 DATA has,black hair,no h
      air,red hair,blond hair,
      brown hair,white hair,gr
      ay hair,"","",hair color
BD 1270 DATA was wearing,a red s
      hirt,an orange shirt,a y
      ellow shirt,a green shir
      t,a blue shirt,a purple
      shirt,a white shirt,a bl
      ack shirt,"",color shirt
NL 1280 DATA owns,a red car,an o
      range car,a yellow car,a
       green car,a blue car,a
      purple car,a white car,a
       black car,a silver car,
      color car
PJ 1290 DATA is,5 feet tall,5 fe
      et 3 inches tall,5 feet
      6 inches tall,5 feet 9 i
      nches tall,6 feet tall,6
       feet 3 inches tall,"","
      ","",height
FG 1300 DATA weighs,140 pounds,1
      50 pounds,160 pounds,170
       pounds,180 pounds,190 p
      ounds,200 pounds,210 pou
      nds,220 pounds,weight
NF 1310 DATA was wearing,red sho
      es,white shoes,brown sho
      es,black shoes,tan shoes
      ,blue shoes,orange shoes
      ,"","",color shoes
ED 1320 DATA has a wife named,Su
      e,Joyce,Mary,Betty,Pam,C
      athy,Jill,Judy,Sally,wif
      e's first name
CF 1330 DATA was carrying,a red
      umbrella,an orange umbre
      lla,a yellow umbrella,a
      green umbrella,a purple
      umbrella,a white umbrell
      a,a black umbrella,"",""
      ,color umbrella
EN 1340 DATA a restaurant,an ele
      vator,a library,stabbed,
      strangled,shot
JE 1350 ' Print S$ to screen and
       printer
OH 1360 P=INSTR(S$," "):IF P=0 T
      HEN 1400
NH 1370 A1$=LEFT$(S$,P):S$=MID$(
      S$,P+1)
KJ 1380 PRINT A1$;:IF PR THEN LP
      RINT A1$;
QJ 1390 GOTO 1360
CN 1400 PRINT S$:IF PR THEN LPRI
      NT S$
IG 1410 RETURN
JM 1420 ' Get yes/no response
CH 1430 Y$=INKEY$:IF Y$<>"Y" AND
       Y$<>"y" AND Y$<>"N" AND
       Y$<>"n" THEN 1430
AF 1440 YN=0:IF Y$="Y" OR Y$="y"
       THEN YN=1
JC 1450 RETURN
JB 1460 PRINT TAB((SW-LEN(S$))/2
      );S$:RETURN
JF 1470 LOCATE 23,1:GOSUB 1460
KL 1480 IF INKEY$<>" " THEN 1480
       ELSE CLS:RETURN
BK 1490 LOCATE 24,1:PRINT TAB((S
      W-LEN(S$))/2);S$;:GOTO 1
      480
BI 1500 IF RND(1)<.5 THEN SWAP A
      1$,B1$:SWAP A2$,B2$:RETU
      RN ELSE RETURN
HM 1510 N$=" ":IF NF THEN N$=" i
      s not the one who "
CO 1520 Q$=T$+A1$+" "+A2$+N$+B1$
      +" "+B2$:RETURN
```

Blipper

Patrick Parrish

Add a professional touch to your BASIC programs with this short utility that adds a beeping and blinking cursor to Applesoft. The program runs on any Apple II-series computer under either DOS 3.3 or ProDOS.

Sound can bring life to any program. "Blipper" sounds a tone and blinks the cursor to grab the user's attention. It can be engaged at all times or turned on selectively for emphasis. Use it to enhance educational programs, business programs, and games.

Typing It In

Blipper is a machine language program in the form of a BASIC loader. Since it requires accurate typing, be sure to use "The Automatic Proofreader," found elsewhere in this issue, when you enter the program. After you've finished typing, save a copy to disk. Do *not* use the filename BLIPPER when saving the BASIC program—that name is reserved for the binary file that the BASIC program creates when it is run.

Load the program and type RUN. A machine language (ML) program is POKEd into memory and then written to disk. Once the ML program is created, you don't need the BASIC loader program again except to create new copies of the BLIPPER file. The machine language begins at location 903 ($387). This area of memory is not used by BASIC, but some other utilities may use it, making them incompatible with Blipper.

Once you have created the machine-language BLIPPER file, Blipper can be activated both in immediate mode and within your BASIC programs. In DOS 3.3, you execute it from immediate mode by typing

```
BRUN BLIPPER
```

Within a program, use the statement

```
PRINT CHR$(4);"BRUN BLIPPER"
```

For ProDOS, use the following statement in either immediate or program mode:

```
PRINT CHR$(4)"BLOAD BLIPPER"
:CALL903
```

With Blipper activated, type a few characters or list the program. Each character printed to the screen is preceded by the underline character and followed by a beep. Note that while Blipper is active, the left and right cursor keys act as delete keys.

A New Sound

Blipper allows you to change the pitch and the duration of the blip sound. To try out new sounds, simply POKE the value for pitch into location 974 and the value for the duration into 975. The range of legal values for both the pitch and duration is 1 to 255. A value of 1 yields the highest pitch or shortest duration, while 255 gives the lowest pitch or longest duration. The default value for the pitch is 100; for the duration, it's 79. The default numbers can be changed in the BASIC loader if you want to make your changes permanent (see the last two numbers in line 210 of the loader program).

By varying the duration of the tone, you also determine how long the blinking cursor stays on the screen. The BASIC command SPEED also has an effect on Blipper.

If you tire of Blipper's incessant blips and blinks, deactivate it with POKE 932,96. Blipper is also deactivated when you break out of a program or reset the computer. Reactivate it with POKE 932,32. By selectively deactivating and reactivating the routine, and by changing the pitch and duration of the sound, you can make your BASIC programs more appealing.

To change the character Blipper uses for its blinking cursor (currently an underline character), POKE the value of the ASCII code for the desired character, plus 128, into location 936.

How It Works

Blipper works essentially the same in both DOS 3.3 and ProDOS. The output vector that normally points to the character output routine (known as COUT1, located at 65008, or $FDF0) is changed to point to Blipper. Blipper prints an underline character, sounds a tone, backspaces to print a space, then backspaces to print the current character. Finally, it returns to BASIC.

Blipper

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

```
8E 10 REM COPYRIGHT 1987 COMPUTE
      ! PUBLICATIONS, INC.  ALL
      RIGHTS RESERVED.
C2 20 PRINT "COPYRIGHT 1987":PRI
      NT "COMPUTE! PUBLICATIONS,
       INC.":PRINT "ALL RIGHTS R
      ESERVED.":FOR X=1 TO 1200:
      NEXT
85 100 FOR I = 903 TO 975: READ
       A:X = X + A: POKE I,A: NE
      XT
DC 110 IF X < > 10352 THEN PRINT
        "ERROR IN DATA STATEMENT
      S.": STOP
DD 120 PRINT CHR$ (4)"BSAVE BLIP
      PER,A903,L73": END
ED 130 DATA 162,161,160,3,173,0,
      191,201
7A 140 DATA 76,208,7,142,48,190,
      140,49
03 150 DATA 190,96,134,54,132,55
      ,76,234
AE 160 DATA 3,96,32,240,253,32,7
      4,255
FE 170 DATA 169,223,32,240,253,1
      72,207,3
9F 180 DATA 174,206,3,173,48,192
      ,202,208
D8 190 DATA 253,136,208,244,169,
      136,32,240
AF 200 DATA 253,169,160,32,240,2
      53,169,136
E9 210 DATA 32,240,253,32,63,255
      ,96,100,79                C
```

Atari Trace

Norman Lin

Add a trace feature to Atari BASIC to help you debug your programs. It works in any graphics mode, constantly displaying the currently executing line number on an extra text line at the top of the screen. For all Atari eight-bit computers. Tape and disk versions are included.

Debugging a BASIC program can be a trying experience. To aid programmers, some versions of BASIC offer a trace command which prints line numbers to the screen as the program executes. "Atari Trace" goes one step further: It creates a special line at the top of the screen which constantly displays the line number being executed. This line remains in place, even when you clear the screen or change graphics modes.

Typing It In

There are two versions of Atari Trace—Program 1 for tape users, Program 2 for disk users.

If you have a tape system, turn off your computer, turn it back on, and immediately type this line in direct mode (without a line number):

```
POKE 128,60:POKE 129,33:NEW
```

Now, type in Program 1. After you've finished, save a copy of the program to tape.

These POKEs must also be entered every time you wish to load and use Atari Trace. After loading and running Program 1, type A=USR(7936) to start it.

If you have a disk drive, type in Program 2 and save a copy to disk. Before running Program 2, insert a disk containing the system files for DOS 2.0 or 2.5 (DOS.SYS and DUP.SYS) into the drive. Now, run Program 2, which will write an AUTORUN.SYS file to the disk. When the program is finished, turn off the computer and boot from the newly prepared disk.

Tracing Your Programs

When Atari Trace is operating, you'll notice a new line at the top of the screen. This contains the line number that BASIC is currently executing. (If BASIC is inactive, you'll see the number 32767.) This new line is separated from the rest of the screen by one blank scan line. Note that this line remains at the top of the screen, even when you change graphics modes; it's effectively independent of the screen. Try to move the cursor onto it; you'll see that you can't.

To test Atari Trace, type in a two- or three-line program. Now type RUN. If you were watching carefully, you should have seen a flurry of line numbers being displayed. Since the lines fly by so fast that you can't possibly see what is happening, I have provided a way to slow down the computer. Run the program again. This time, press and hold down the SHIFT key before you press RETURN. The program still executes, but much more slowly than last time. You'll see the line numbers go by at a much more leisurely pace. You can use the SHIFT key to slow down the program in sections of the program you're examining. Release SHIFT to breeze past sections that are working properly.

Atari Trace offers a good idea of what your program is doing at various points, but to make it really useful, you can insert PRINT statements at various sections of your programs so that you can keep track of critical variables.

Tracing is also useful when you want to find out how someone else's program works. Among other things, you can track when the program is going to subroutines or when a certain GOTO occurs.

Technical Considerations

You can alter the degree to which the computer slows when you hold the SHIFT key. To do this, POKE memory location 2 with numbers in the range 231–255. The higher the number, the shorter the pause. If the pause that occurs when you press the SHIFT key bothers you when you are entering programs lines, type POKE 2,255. This effectively eliminates the pause. To reset the pause to its default value, type POKE 2,231.

Atari Trace disables the BASIC command DOS, which is normally used to return to the operating system. If you wish to get to DOS, you must first disable Atari Trace. Do this by pressing SYSTEM RESET while holding down OPTION. You must now reboot to reactivate Atari Trace. If you press SYSTEM RESET without holding down OPTION, Atari Trace will remain activated if it was started from disk but will be disabled if it was started from tape. Tape users can reactivate Atari Trace after a reset with the command A=USR(7936).

Certain programs may conflict with Atari Trace. These include programs that use display list interrupts, vertical blank interrupts, or countdown timer routines. Since few BASIC programs use these features, incompatibitity should be rare.

Program 1: Atari Trace—Tape Version

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

```
MO 1 REM COPYRIGHT 1987 COMP
     UTE! PUBLICATIONS, INC.
      ALL RIGHTS RESERVED.
FP 2 PRINT "{CLEAR}COPYRIGHT
```

```
    1987":PRINT "COMPUTE!
    PUBLICATIONS, INC.":PRI
    NT "ALL RIGHTS RESERVED
    ."
BM 10 RESTORE :FOR I=7936 TO
     8507:READ A:POKE I,A:
    NEXT I:? "DONE.  TYPE
    A=USR(7936) TO ACTIVAT
    E.":END
PF 1000 DATA 104,165,12,141,
        132,31,165,13,141
AH 1010 DATA 133,31,169,131,
        133,12,169,31,133,13
        ,169,231,133,2,169
BD 1020 DATA 128,133,3,165,1
        0,141,8,33,165,11,14
        1,9,33,76,134
ML 1030 DATA 31,173,48,2,133
        ,0,173,49,2,133,1,16
        5,0,56,233
EB 1040 DATA 3,133,0,176,7,1
        65,1,56,233,1,133,1,
        160,0,169
KC 1050 DATA 112,145,0,200,1
        69,240,145,0,200,169
        ,66,145,0,169,20
BK 1060 DATA 200,145,0,169,3
        3,200,145,0,169,128,
        200,145,0,165,0
LI 1070 DATA 141,48,2,165,1,
        141,49,2,169,146,141
        ,0,2,169,32
FB 1080 DATA 141,1,2,169,64,
        141,14,212,162,32,16
        0,245,169,6,76
OI 1090 DATA 92,228,32,255,2
        55,173,31,208,201,3,
        208,28,173,132,31
DK 1100 DATA 133,12,173,133,
        31,133,13,173,8,33,1
        33,10,173,9,33
LD 1110 DATA 133,11,169,0,14
        1,68,2,76,116,228,16
        9,60,133,128,141
KL 1120 DATA 231,2,169,33,13
        3,129,141,232,2,169,
        207,141,40,2,169
NN 1130 DATA 31,141,41,2,169
        ,1,141,26,2,160,116,
        162,32,169,7
IK 1140 DATA 76,92,228,173,4
        8,2,133,0,173,49,2,1
        33,1,160,5
BB 1150 DATA 177,0,201,128,2
        40,3,32,40,31,169,7,
        133,10,169,33
GB 1160 DATA 133,11,169,0,14
        1,10,33,160,0,177,13
        8,141,15,33,200
BI 1170 DATA 177,138,141,16,
        33,32,64,32,162,0,18
        9,12,33,32,20
BF 1180 DATA 32,232,224,3,14
        4,245,169,1,141,26,2
        ,96,141,11,33
MK 1190 DATA 152,72,173,11,3
        3,74,74,74,74,9,16,3
        2,53,32,173
LA 1200 DATA 11,33,41,15,9,1
        6,32,53,32,104,168,1
        73,11,33,96
DO 1210 DATA 172,10,33,153,3
        7,33,200,238,10,33,9
        6,169,0,141,12
AN 1220 DATA 33,141,13,33,14
        1,14,33,162,15,248,1
        4,15,33,46,16
DN 1230 DATA 33,173,14,33,10
        9,14,33,141,14,33,17
        3,13,33,109,13
DA 1240 DATA 33,141,13,33,17
        3,12,33,109,12,33,14
        1,12,33,202,16
GC 1250 DATA 220,216,96,165,
        66,240,3,76,98,228,1
        73,15,210,41,8
HA 1260 DATA 240,3,76,98,228
        ,166,2,164,3,200,208
        ,253,232,208,248
JL 1270 DATA 76,98,228,72,15
        2,72,138,72,173,244,
        2,141,17,33,173
LP 1280 DATA 197,2,141,18,33
        ,173,198,2,141,19,33
        ,169,224,162,202
DN 1290 DATA 160,148,141,10,
        212,141,9,212,142,23
        ,208,140,24,208,169
DB 1300 DATA 203,141,0,2,169
        ,32,141,1,2,104,170,
        104,168,104,64
IK 1310 DATA 72,152,72,138,7
        2,173,17,33,172,18,3
        3,174,19,33,141
MO 1320 DATA 10,212,141,9,21
        2,140,23,208,142,24,
        208,169,146,141,0
KL 1330 DATA 2,169,32,141,1,
        2,104,170,104,168,10
        4,64,169,192,141
GE 1340 DATA 14,212,169,95,1
        41,34,2,169,228,141,
        35,2,76,95,228
FK 1350 DATA 96,0,0,0,0,0,0,
        0,0,0,0,0,0,0,0,0
LB 1360 DATA 0,0,0,0,0,0,0,0,0
        ,0,0,44,105,110,101,
        26
BN 1370 DATA 0,0,0,0,0,0,0,0,0
        ,0,0,0,0,0,0,0,0
JK 1380 DATA 0,0,0,0,0,0,0,0,0
```

Program 2: Atari Trace—Disk Version

```
MO 1 REM COPYRIGHT 1987 COMP
     UTE! PUBLICATIONS, INC.
       ALL RIGHTS RESERVED.
FP 2 PRINT "{CLEAR}COPYRIGHT
     1987":PRINT "COMPUTE!
     PUBLICATIONS, INC.":PRI
     NT "ALL RIGHTS RESERVED
     ."
FI 10 RESTORE :OPEN #1,8,0,"
      D:AUTORUN.SYS":FOR I=1
      TO 1.0E+97:TRAP 20:RE
      AD A:PUT #1,A:NEXT I
ED 20 CLOSE #1:? "DONE.":END

JN 1000 DATA 255,255,0,31,59
        ,33,104,165,12,141,1
        32,31,165,13,141
AH 1010 DATA 133,31,169,131,
        133,12,169,31,133,13
        ,169,231,133,2,169
BD 1020 DATA 128,133,3,165,1
        0,141,8,33,165,11,14
        1,9,33,76,134
ML 1030 DATA 31,173,48,2,133
        ,0,173,49,2,133,1,16
        5,0,56,233
EB 1040 DATA 3,133,0,176,7,1
        65,1,56,233,1,133,1,
        160,0,169
KC 1050 DATA 112,145,0,200,1
        69,240,145,0,200,169
        ,66,145,0,169,20
BK 1060 DATA 200,145,0,169,3
        3,200,145,0,169,128,
        200,145,0,165,0
LI 1070 DATA 141,48,2,165,1,
        141,49,2,169,146,141
        ,0,2,169,32
FB 1080 DATA 141,1,2,169,64,
        141,14,212,162,32,16
        0,245,169,6,76
OI 1090 DATA 92,228,32,255,2
        55,173,31,208,201,3,
        208,28,173,132,31
DK 1100 DATA 133,12,173,133,
        31,133,13,173,8,33,1
        33,10,173,9,33
LD 1110 DATA 133,11,169,0,14
        1,68,2,76,116,228,16
        9,60,133,128,141
KL 1120 DATA 231,2,169,33,13
        3,129,141,232,2,169,
        207,141,40,2,169
NN 1130 DATA 31,141,41,2,169
        ,1,141,26,2,160,116,
        162,32,169,7
IK 1140 DATA 76,92,228,173,4
        8,2,133,0,173,49,2,1
        33,1,160,5
BB 1150 DATA 177,0,201,128,2
        40,3,32,40,31,169,7,
        133,10,169,33
GB 1160 DATA 133,11,169,0,14
        1,10,33,160,0,177,13
        8,141,15,33,200
BI 1170 DATA 177,138,141,16,
        33,32,64,32,162,0,18
        9,12,33,32,20
BF 1180 DATA 32,232,224,3,14
        4,245,169,1,141,26,2
        ,96,141,11,33
MK 1190 DATA 152,72,173,11,3
        3,74,74,74,74,9,16,3
        2,53,32,173
LA 1200 DATA 11,33,41,15,9,1
        6,32,53,32,104,168,1
        73,11,33,96
DO 1210 DATA 172,10,33,153,3
        7,33,200,238,10,33,9
        6,169,0,141,12
AN 1220 DATA 33,141,13,33,14
        1,14,33,162,15,248,1
        4,15,33,46,16
DN 1230 DATA 33,173,14,33,10
        9,14,33,141,14,33,17
        3,13,33,109,13
DA 1240 DATA 33,141,13,33,17
        3,12,33,109,12,33,14
        1,12,33,202,16
GC 1250 DATA 220,216,96,165,
        66,240,3,76,98,228,1
        73,15,210,41,8
HA 1260 DATA 240,3,76,98,228
        ,166,2,164,3,200,208
        ,253,232,208,248
JL 1270 DATA 76,98,228,72,15
        2,72,138,72,173,244,
        2,141,17,33,173
LP 1280 DATA 197,2,141,18,33
        ,173,198,2,141,19,33
        ,169,224,162,202
DN 1290 DATA 160,148,141,10,
        212,141,9,212,142,23
        ,208,140,24,208,169
DB 1300 DATA 203,141,0,2,169
        ,32,141,1,2,104,170,
        104,168,104,64
IK 1310 DATA 72,152,72,138,7
        2,173,17,33,172,18,3
        3,174,19,33,141
MO 1320 DATA 10,212,141,9,21
        2,140,23,208,142,24,
        208,169,146,141,0
KL 1330 DATA 2,169,32,141,1,
        2,104,170,104,168,10
        4,64,169,192,141
GE 1340 DATA 14,212,169,95,1
        41,34,2,169,228,141,
        35,2,76,95,228
FK 1350 DATA 96,0,0,0,0,0,0,
        0,0,0,0,0,0,0,0,0
LB 1360 DATA 0,0,0,0,0,0,0,0,0
        ,0,0,44,105,110,101,
        26
BN 1370 DATA 0,0,0,0,0,0,0,0,0
        ,0,0,0,0,0,0,0,0
MM 1380 DATA 0,0,0,0,0,0,0,0,0
        ,224,2,225,2,1,31
```

Machine Language Routines

For The Commodore 64 And 128

Todd Heimarck and Patrick Parrish

One of the best ways to learn machine language (ML) is to study programs written by someone else. And if you're a seasoned ML expert, a collection of debugged and tested routines can be a valuable tool to have around. This excerpt from Machine Language Routines for the Commodore 64 and 128 *(COMPUTE! Books) features several techniques and algorithms that ML programmers can analyze and adapt for use in their own programs.*

Machine Language Routines for the Commodore 64 and 128 is like a dictionary; if you need to know how to write a specific routine, you can look it up and use the subroutine as it's written or modify it to suit your needs.

The book's 200 routines cover a multitude of techniques: character input/output, sprite control, hi-res graphics, sorting and searching, disk and printer routines, integer and floating-point math, ASCII conversions, random numbers, clock routines, custom characters, sound effects, interrupt-driven programs, and redirecting vectors.

Most of the programs were written for the Commodore 64, but within the comments are notes that list changes to make them work on the Commodore 128 in 128 mode. With the exception of a few routines such as the 80-column custom character generator for the 128, all programs will run on both computers.

A brief description of each routine is followed by a prototype outlining the steps taken. A more detailed explanation follows, discussing the techniques illustrated and the construction of the routine. Most of the routines include a framing program that shows you how to call the routine. The main routine appears in boldface type.

Assembling The Routines

The *Personal Assembly Language (PAL)* assembler for the 64 and the *Buddy-128* assembler were used to create the routines. Both are sold by Pro-Line Software (distributed in the United States by Spinnaker.) The LADS assembler from COMPUTE!'s *Second Book of Machine Language* is almost completely compatible with the *PAL* format. Readers who use other assemblers should note the conventions which follow.

Within equates, the equal sign assigns a numeric value (or an address) to a label. Equates are usually grouped together at the beginning of the source code. If your assembler sets up equates with the EQU pseudo-op, you'll have to make the appropriate substitution. For example, instead of CHROUT = $FFD2, type CHROUT EQU $FFD2.

If you're using a simple assembler (*Micromon* or *Supermon*, for example), you can't use labels or equates at all. For JMP and JSR instructions, look at the object code on the left. For example, C010 20 D2 FF JSR CHROUT would translate to JSR $FFD2. The address of the instruction is $C010, $20 is the opcode for JSR, and D2 FF is the address $FFD2 with the low byte first. For branch instructions, you'll have to look for the address of the label specified. If LOOP1 is on line $C11F and you see the instruction BEQ LOOP1, change it to BEQ $C11F.

The less-than (<) and greater-than (>) characters extract the low byte and high byte of a value. LDA #<LABEL represents loading the accumulator with the low byte of LABEL. Splitting up low bytes and high bytes is seen most often in sections that create a pointer in zero page.

The asterisk (*) represents the current program counter. The line *= 49152 tells *PAL* to start assembling at location 49152. Some assemblers use ORG instead of the asterisk. A semicolon (;) marks the beginning of a remark or comment. *PAL* ignores any text following a semicolon.

The pseudo-ops .BYTE, .WORD, and .ASC create tables or variables containing one-byte, two-byte, or ASCII values, respectively. They're usually associated with a label. The .BYTE and .WORD instructions default to decimal values. Hexadecimal numbers are marked by a dollar sign ($), binary numbers begin with a percent character (%).

Readers will find both the source files (in *PAL* format) and executable object files on the corresponding COMPUTE! Disk. To use the source files, you must own an assembler. To run the object files, you must use a 64 (or a 128 in 64 mode). Type LOAD *"filename"*,8,1 and SYS 49152. Note that one of the examples, the CUST80 routine, is written for 128 mode. To use it, BLOAD it and SYS 3072.

RNDBYT

Name
Generate a random one-byte integer value (0–255)

Description
Many programs, especially games and educational programs, require randomness. Often, what is called for is a one-byte random integer in the range 0–255. This routine lets you generate such a number from the random oscillations of the noise waveform.

Prototype
In an initialization routine (RDINIT):

1. Set voice 3 to a high frequency.
2. Select the noise waveform.
3. Turn off the SID chip volume and disconnect the output of voice 3.

In **RNDBYT** itself:

4. Take a random byte value from voice 3's random number generator (RANDOM) and return it in .A.

Explanation
In the example program, an interesting visual effect is created by repeatedly placing a random color value somewhere in the first 256 bytes of screen color RAM. Pressing any key exits the routine.

RNDBYT is actually a two-part routine. In the first part, labeled RDINIT, voice 3 of the SID chip is initialized so as to generate random numbers in RANDOM (location 54299). This is done by setting the high byte of the frequency register for voice 3 (FREHI3) to 255 and selecting the noise waveform by setting bit 7 of voice 3's control register (VCREG3). Since we don't want to actually hear the noise, we turn off the SID chip volume and disconnect the audio output of voice 3 by storing a 128 to SIGVOL, the volume and filter select register. Selecting a frequency value high byte of 255 insures that the values in RANDOM change very rapidly.

RDINIT need be accessed only once early in your main program. After that, you can take random values as needed from RANDOM. This is exactly what **RNDBYT** does, returning the random byte in the accumulator.

Routine

```
C000                GETIN       =     65508
; start of screen color memory
C000                COLRAM      =     55296
; voice 3 frequency control register (high byte)
C000                FREHI3      =     54287
; voice 3 control register
C000                VCREG3      =     54290
; volume and filter select register
C000                SIGVOL      =     54296
; oscillator 3/random number generator
C000                RANDOM      =     54299
;
; Generate a random byte value from SID chip voice 3.
; Put a random color anywhere in first 256 bytes of screen.
; Quit when any key is pressed.
; initialize SID voice 3 for random numbers
C000 20 13 C0 MAIN          JSR   RDINIT
; get a random byte for screen offset
C003 20 21 C0 LOOP          JSR   RNDBYT
; store offset in .Y
C006 A8                     TAY
; get random number for color byte
C007 20 21 C0               JSR   RNDBYT
; store color byte randomly in first quarter
C00A 99 00 D8               STA   COLRAM,Y
; check for a keypress
C00D 20 E4 FF               JSR   GETIN
; no keypress, so continue
C010 F0 F1                  BEQ   LOOP
; else, quit
C012 60                     RTS
;
; Routine to initialize SID voice 3 for random numbers
; set voice 3 frequency (high byte) to maximum
C013 A9 FF      RDINIT      LDA   #$FF
C015 8D 0F D4               STA   FREHI3
C018 A9 80                  LDA   #%10000000
; select noise waveform and start release for voice 3
C01A 8D 12 D4               STA   VCREG3
; turn off volume and disconnect output of voice 3
C01D 8D 18 D4               STA   SIGVOL
C020 60                     RTS
;
; RNDBYT returns a random byte value in .A.
; get single-byte random number
C021 AD 1B D4 RNDBYT        LDA   RANDOM
C024 60                     RTS
```

See also **RD2BYT** (Generate a random two-byte integer value using SID voice 3), **RDBYRG** (Generate a random one-byte integer value in a range), **RND1VL** (Generate a random floating-point number using BASIC's RND(1) function)

ERRRDT

Name
Change the ERROR vector

Description
ERRRDT redirects BASIC's ERROR vector to your own routine.

Prototype
Store the address of the custom error routine into the ERROR vector; then RTS.

Explanation
When an error occurs during a BASIC program, an indirect jump is taken through the ERROR vector at location 768. This vector normally points to the ROM routine which displays the appropriate one of the familiar BASIC error messages, such as SYNTAX ERROR, ILLEGAL QUANTITY ERROR, and so forth. In some cases, however, you may want to substitute a custom error message in place of the standard one. In this case, you can change the address in the ERROR vector to point to an error message routine of your own.

For example, when you type in BASIC programs that contain many numeric DATA statements being POKEd into memory, you'll frequently get an error that's difficult to pin down. If you accidentally include a number higher than 255 and run the program, you'll get the error message ?ILLEGAL QUANTITY IN LINE *xxx*. But the line given as *xxx* is the one containing the READ statement rather than the one with the errant data. The READ works just fine (it's legal to READ numbers greater than 255), but the POKE causes the problem.

The example program relies on **ERRRDT** to solve this problem. Ordinarily, the ERROR vector points to a routine that prints either a BASIC error message or the READY prompt. Using the .X register, this routine locates the error message in a table and then prints it. If you're in program mode, the number of the line that's currently being executed is taken from CURLIN (location 57 on the 64; 59 on the 128) and is printed as well.

ERRRDT changes the ERROR vector to point to our own custom error handler at EWEDGE. If an error other than an illegal quantity error occurs (.X <> 14), normal error handling will result. But if .X contains a 14 upon entry into EWEDGE—meaning an illegal quantity has occurred—the current DATA line number (CURLIN) will be stored into the current BASIC line (DATLIN) before the normal error handler will execute. And so, in our example above, instead of telling us that the error occurred in the line with the READ statement, with this routine in place, BASIC reports the actual DATA line containing the typo.

Of course, this routine fails to distinguish among the many possible sources of illegal quantity errors. If your program contains a POKE 251,257, for instance, the error message that results will erroneously point you to the last DATA line that was read. Because of this, you should limit the use of this wedge to BASIC programs that contain many numeric DATA statements—primarily BASIC loaders of ML object code.

Routine

```
; error vector
C000              ERRVEC      =     768
; ERRNOR = 19775 on the 128—normal
; error-service routine
C000              ERRNOR      =     58251
; CURLIN = 59 on the 128—current BASIC
; line being executed
C000              CURLIN      =     57
; DATLIN = 65 on the 128—current data
; line
C000              DATLIN      =     63
;
; Insert a custom error routine that looks for
; an illegal quantity error.
; Assume it occurs while reading data and
; report the data line number.
;
; ERRRDT points the ERRVEC vector to our
; routine.
; low byte first
C000  A9 0B       ERRRDT      LDA   #<EWEDGE
C002  8D 00 03                STA   ERRVEC
; then high byte
C005  A9 C0                   LDA   #>EWEDGE
C007  8D 01 03                STA   ERRVEC+1
; and exit the setup routine
C00A  60                      RTS
;
; Upon entry, .X contains the error number.
; We let the system handle
; all errors except the illegal quantity error
; (error 14).
; is it an illegal quantity error?
C00B  E0 0E       EWEDGE      CPX   #14
; if not, exit through the normal error handler
C00D  D0 08                   BNE   EXIT
; Otherwise, substitute the current data line
; for the current BASIC line.
; low byte first
C00F  A5 3F                   LDA   DATLIN
C011  85 39                   STA   CURLIN
; then high byte
C013  A5 40                   LDA   DATLIN+1
C015  85 3A                   STA   CURLIN+1
; and execute the normal error handler routine
C017  4C 8B E3    EXIT        JMP   ERRNOR
```

See also **DISRSR** (Disable RUN/STOP-RESTORE), **DISTOP** (Disable the STOP key by changing the STOP vector), **RSTVEC** (Restore all Kernal indirect vectors)

CUST80 (128 only)

Name

Custom characters for the 80-column screen

Description

Using the routine that writes to the 128's 80-column chip, **CUST80** redefines one character. This routine can easily be expanded to create an entirely new character set.

Prototype

1. Set up registers 18 and 19 of the VDC chip to point to the address of the letter *A* (uppercase/graphics mode).
2. Send eight bytes to register 31 to create the new character.

Explanation

The key to accessing the 80-column VDC chip is writing to locations $D600 and $D601, the gateway bytes (see **RE80CO** and **WR80CO** for more about the gateway bytes). The STRVDC routine at $0C26 below handles this task. First, the VDC register to be POKEd is stored in $D600. Next, we need to wait for bit 7 of $D600 to turn on. At that point, $D601 can be PEEKed or POKEd.

The VDC's uppercase/graphics character set starts at location $2000 within the VDC's private 16K of memory. The shape for the letter *A* is found at $2010. So, to change that shape, the routine must set up the address $2010 in registers 18 and 19. Note that, unlike most other addresses in the 128, in this case the high byte is stored ahead of the low byte. (This could be called a quirk of the VDC.) STRVDC is called twice—once to store a $20 into register 18, and once to store a $10 into 19.

When the POKE address has been established, the values to be sent there are stored in VDC register 31. The 80-column chip automatically increments the address, so it's not necessary to keep writing to registers 18 and 19. The character shape in the source code is stored in binary form, so the actual appearance can be seen. The letter *A* is replaced by a small *z* inside a box.

The character sets are stored in a rather unusual fashion. The first eight bytes ($2000–$2007) are the @ character. The next eight bytes are unused. The next eight ($2010–$2017) are the letter *A*, followed by eight more unused bytes. This pattern continues. If you're planning to store several consecutive custom characters, remember to skip eight bytes between shapes.

Note: Both character sets can be displayed at the same time. Attribute memory determines which set is used. (See **VDCCOL** for more information about attribute memory.) The second half of each character set

contains the reversed versions of the first 128 characters. These characters are what you see when you turn reverse mode on. Now, attribute memory can be changed to display a normal or a reverse character (again, see **VDCCOL**), which means that the reverse character shapes in the character set are redundant. It is actually possible to have four character sets in memory at the same time, a total of 512 characters. To reverse any of them, write to attribute memory (which gives you 512 more, reversed characters).

Routine

```
0C00              VDCADR    =     $D600
0C00              VDCDAT    =     $D601
0C00              VRMLO     =     19
; note the high byte is first, not second
0C00              VRMHI     =     18
0C00              VRDAT     =     31
; (internal memory for the VDC)
0C00              MEM4A     =     $2010
;
; high byte of character memory
0C00 A9 20        CUST80    LDA   #>MEM4A
; register 18
0C02 A2 12                  LDX   #VRMHI
; set up the register
0C04 20 26 0C               JSR   STRVDC
; low byte
0C07 A9 10                  LDA   #<MEM4A
; register 19
0C09 A2 13                  LDX   #VRMLO
; and store the value
0C0B 20 26 0C               JSR   STRVDC
;
0C0E A0 00                  LDY   #0
0C10 B9 1E 0C LOOP          LDA   CHAR,Y
; register 31
0C13 A2 1F                  LDX   #VRDAT
; store it
0C15 20 26 0C               JSR   STRVDC
; we have to move forward
0C18 C8                     INY
0C19 C0 08                  CPY   #8
0C1B D0 F3                  BNE   LOOP
; done
0C1D 60                     RTS
;
0C1E              CHAR      =     *
0C1E FF                     .BYTE %11111111
0C1F 81                     .BYTE %10000001
0C20 B5                     .BYTE %10110101
0C21 89                     .BYTE %10001001
0C22 91                     .BYTE %10010001
0C23 AD                     .BYTE %10101101
0C24 81                     .BYTE %10000001
0C25 FF                     .BYTE %11111111
;
0C26              STRVDC    =     *
; store .X in the address gate
0C26 8E 00 D6               STX   VDCADR
; and wait
0C29 AE 00 D6 WAITAD        LDX   VDCADR
; for bit 7 to click
0C2C 10 FB                  BPL   WAITAD
; store the data
0C2E 8D 01 D6               STA   VDCDAT
; and quit
0C31 60                     RTS
```

See also **ANIMAT** (Animation by alternating character sets), **CHRDEF** (Character redefinition), **RE80CO** (Read the 80-column video chip), **VDCCOL** (Write to 80-column video attribute memory), **WR80CO** (Write to the 80-column video chip)

INTMUS

Name
Interrupt-driven music

Description
With **INTMUS**, you can enhance any programs—especially games—by adding background music that runs automatically.

Prototype
Before entering this routine, set up a table of note values which index frequencies from FREQTB (NOTES), a table containing the relative durations for each note in NOTES (NDURTB), and a table of the two-byte frequencies needed for the tune (FREQTB).

In the initialization routine (**INTMUS**):

1. Disable IRQ interrupts before changing the IRQ interrupt vector.
2. Redirect the IRQ interrupt vector to the music-playing routine (MAIN).
3. Set a note counter (NOTENM) to zero.
4. Clear the SID chip with **SIDCLR** and set the appropriate parameters for the chip (volume and attack/decay).
5. Initialize a duration counter (DURATE) for the first pass through MAIN.
6. Reenable IRQ interrupts and RTS.

Then, in MAIN:

1. Decrement the duration counter.
2. If it decrements to zero, get a note to play. Otherwise, allow the note that's currently playing to continue by exiting through the normal IRQ interrupt handler.
3. Assuming the duration counter reaches zero, get the note number and index the next note's duration using it.
4. Adjust the time each note plays by multiplying its duration by some factor (here, 8).
5. Store the result in the duration counter.
6. Get a note from the NOTES table and use it to index the corresponding two-byte frequency value in FREQTB. Store the frequency taken from FREQTB into the frequency registers for voice 1.
7. Ungate, and then gate, the waveform (here, a sawtooth waveform).
8. Increment the note counter and determine if all notes have played. If not, continue playing the tune. Otherwise, reinitialize the note counter to start the tune over.

Explanation
The principle behind interrupt-driven music is that you let the IRQ interrupt generated every 1/60 second determine when and how long each note is played.

After redirecting the IRQ vector to a music-playing routine (MAIN), the SID chip is set up and several counters are initialized. One of these counts how many notes have been played (NOTENM) while the other keeps up with how long the current note has played (DURATE).

Once IRQ interrupts are reenabled, MAIN is accessed during each IRQ interrupt. The first time this happens, a note based on a reference value (in NOTES) is selected from a table of frequencies (FREQTB) and stored in the frequency register for voice 1. At the same time, a duration time for the note is taken from another table (NDURTB) and stored in the duration counter (DURATE). Before exiting, the pointer to the next note (NOTENM) is incremented and the current note starts playing.

Each time the IRQ returns to MAIN thereafter, the duration counter decrements. When it reaches zero, the next note from NOTES gets stored into the frequency register, DURATE is reset for this note's duration, and the cycle repeats itself. When all notes have played, NOTENM becomes zero, and the tune starts over again.

In setting up the note (NOTES) and frequency (FREQTB) tables, the same method used in **MELODY** is used here. Each number in NOTES references a two-byte frequency value in FREQTB. Again, the frequencies listed in FREQTB are taken from the table of notes in the programmer's reference guide for either the 64 or 128. Expand FREQTB to include whatever notes your song calls for. If you like, you can even have **NOTETB** generate a complete frequency table for you.

After you've worked out the relative time spent playing each note with the values in NDURTB, you'll need to adjust the overall tempo of the song. The three ASLs at $C02F, for the current song, increase the tempo by a factor of eight. For each tune you play, you may need to add or take away one or more of these (ASLs) before the song sounds right.

Routine

```
; vector to IRQ interrupt routine
C000            IRQVEC    =    788
; IRQNOR = 64101 on the 128
C000            IRQNOR    =    59953
; starting address for the SID chip
C000            FRELO1    =    54272
; voice 1 high frequency
C000            FREHI1    =    54273
; voice 1 control register
C000            VCREG1    =    54276
; voice 1 attack/decay register
C000            ATDCY1    =    54277
; SID chip volume register
C000            SIGVOL    =    54296
;
; Set up an IRQ interrupt to play background music.
; disable IRQ interrupts to change the vector
C000 78         INTMUS    SEI
; store the low byte of the IRQ wedge
C001 A9 24                LDA  #<MAIN
C003 8D 14 03             STA  IRQVEC
; and the high byte
C006 A9 C0                LDA  #>MAIN
C008 8D 15 03             STA  IRQVEC+1
C00B A9 00                LDA  #0
; set pointer to first note in table
C00D 8D A1 C0             STA  NOTENM
; clear the SID chip
C010 20 A2 C0             JSR  SIDCLR
; set the volume to maximum
C013 A9 0F                LDA  #15
C015 8D 18 D4             STA  SIGVOL
; set attack/decay
C018 A9 1A                LDA  #$1A
C01A 8D 05 D4             STA  ATDCY1
C01D A9 01                LDA  #1
; initialize duration counter for first pass
C01F 8D A0 C0             STA  DURATE
; with vector changed, reenable IRQ interrupts
C022 58                   CLI
C023 60                   RTS
;
; MAIN actually plays the music.
; see if current note has finished playing
C024 CE A0 C0 MAIN        DEC  DURATE
; if not, allow it to finish
C027 D0 36                BNE  EXIT
; index to NOTES
C029 AE A1 C0             LDX  NOTENM
; get the note's duration from a table
C02C BD 7B C0             LDA  NDURTB,X
; multiply by 8 so each note lasts eight times longer
C02F 0A                   ASL
C030 0A                   ASL
C031 0A                   ASL
; and store it into the counter
C032 8D A0 C0             STA  DURATE
; get index for FREQTB
C035 BD 62 C0             LDA  NOTES,X
; double it since FREQTB contains two-byte addresses
C038 0A                   ASL
; to index FREQTB
C039 AA                   TAX
; get low byte of note's frequency
C03A BD 94 C0             LDA  FREQTB,X
; store it in voice 1
C03D 8D 00 D4             STA  FRELO1
; get high byte of note's frequency
C040 BD 95 C0             LDA  FREQTB+1,X
; store it in voice 1
C043 8D 01 D4             STA  FREHI1
; ungate sawtooth waveform
C046 A9 20                LDA  #%00100000
C048 8D 04 D4             STA  VCREG1
; gate waveform
C04B A9 21                LDA  #%00100001
C04D 8D 04 D4             STA  VCREG1
; increase note counter
C050 EE A1 C0             INC  NOTENM
C053 AD A1 C0             LDA  NOTENM
; determine if all notes have played
C056 C9 19                CMP  #NMNOTE
; if not, then continue
C058 90 05                BCC  EXIT
C05A A9 00                LDA  #0
; if yes, start again with first note
C05C 8D A1 C0             STA  NOTENM
; exit through normal IRQ interrupt handler
C05F 4C 31 EA EXIT        JMP  IRQNOR
;
; table of note indexes
C062 02 02 04 NOTES       .BYTE 2,2,4,4,5,5,4,5,5,4,3,2
C06E 03 02 02             .BYTE 3,2,2,4,2,1,0,0,0,0,1,1,2
; number of notes
C07B            NMNOTE    =    * - NOTES
; table of note durations
C07B 02 06 02 NDURTB      .BYTE 2,6,2,6,4,3,1,2,2,1,
                                1,2,1,1,4,2
C08B 01 02 03             .BYTE 1,2,3,1,2,2,1,2,12
; table of two-byte frequency values
C094 C3 10 EF FREQTB      .WORD 4291,5103,5728,6812,
                                7647,8583
; duration counter
C0A0 00         DURATE    .BYTE 0
; note number counter
C0A1 00         NOTENM    .BYTE 0
;
; Clear the SID chip.
; fill with zeros
C0A2 A9 00      SIDCLR    LDA  #0
; as the offset from FRELO1
```

```
C0A4 A0 18              LDY   #24
; store zero in each SID chip address
C0A6 99 00 D4 SIDLOP    STA   FRELO1,Y
; for next lower address
C0A9 88                 DEY
; fill 25 bytes
C0AA 10 FA              BPL   SIDLOP
; we're done
C0AC 60                 RTS
```

See also **BEEPER** (Emit a beep sound), **BELLRG** (Emit a bell sound), **EXPLOD** (Produce an explosion sound), **MELODY** (Tune player), **NOTETB** (Create a table of standard frequencies: eight octaves of 12 notes each), **SIDCLR** (Clear the SID chip), **SIDVOL** (Set the SID chip volume register), **SIRENS** (Produce a siren sound)

MULSHF

Name

Multiply two unsigned integer values using bit shifts

Description

MULSHF is a little more complex—and more difficult to understand—than the routines that multiply with successive additions (**MULAD1** and **MULAD2**), but it's much faster if you have large numbers to multiply.

Prototype

1. Start with the two numbers to be multiplied in B1 and B2 (16 bits each).
2. Store zeros in the 32 bits of TOTAL.
3. Copy B2 to WORK, a temporary storage area.
4. Store the number of bits to shift in COUNTR.
5. Shift WORK to the left.
6. If the carry flag is clear, skip step 7.
7. If it's set, add B1 to TOTAL.
8. Decrement the counter. If not zero, multiply TOTAL by two with right shifts.
9. If it is zero, exit. Otherwise, branch back to step 5.

Explanation

An expanded diagram of multiplying two four-bit numbers may be helpful:

```
B1              1110
B2              1011
                ----
S4              1110
S3             1110
S2            0000
S1           1110
             --------
TOTAL        10011010
```

Start with the TOTAL equal to zero. Shift B2 to the left, and a one appears in the carry flag. That means it's time to add B1 to the total, which becomes S1 (00001110). There's more, so shift the total to the left (00011100). Shift B2 left again. This time there's a zero, so skip the addition, but shift TOTAL left again to become subtotal 2—S2 (00111000). Shift B2 left again, and carry is set; so add 1110 (01000110) and shift it left (10001100). Finally, shift B2 the final time, and carry is set, so add one more time (10011010), but don't shift the total to the left because it's the last addition.

By the same logic, multiplying 16-bit numbers requires 16 shifts. B1 and B2 each have 16 bits, so the total needs 32 bits. Note in the example above that multiplying two 4-bit numbers yields an 8-bit result.

Routine

```
; four bytes
C000 A0 03      MULSHF  LDY   #3
; zero out TOTAL
C002 A9 00              LDA   #0
; store it
C004 99 5C C0 ZOUT      STA   TOTAL,Y
; count down
C007 88                 DEY
; and loop back
C008 10 FA              BPL   ZOUT
; copy B2 to WORK
C00A AD 58 C0           LDA   B2
C00D 8D 5A C0           STA   WORK
C010 AD 59 C0           LDA   B2+1
C013 8D 5B C0           STA   WORK+1
; there are 16 shifts, so
C016 A9 10              LDA   #16
; set up a counter
C018 8D 55 C0           STA   COUNTR
;
; shift the low byte
C01B 0E 5A C0 MULLP     ASL   WORK
; into the high byte
C01E 2E 5B C0           ROL   WORK+1
; if the bit is off, skip the add
C021 90 1D              BCC   BIGSHF
; clear carry before add
C023 18                 CLC
; low byte
C024 AD 56 C0           LDA   B1
; add to TOTAL (low)
C027 6D 5C C0           ADC   TOTAL
; store it
C02A 8D 5C C0           STA   TOTAL
; second byte of four
C02D AD 57 C0           LDA   B1+1
; add it
C030 6D 5D C0           ADC   TOTAL+1
; store it
C033 8D 5D C0           STA   TOTAL+1
; if carry clear, branch forward
C036 90 08              BCC   BIGSHF
; else add 1 to third byte
C038 EE 5E C0           INC   TOTAL+2
; if not zero, skip the fourth
C03B D0 03              BNE   BIGSHF
; else, get the fourth
C03D EE 5F C0           INC   TOTAL+3
;
; count down
C040 CE 55 C0 BIGSHF    DEC   COUNTR
; shift it if there's more
C043 D0 01              BNE   SHIFIT
; else, quit
C045 60                 RTS
; multiply by 2
C046 0E 5C C0 SHIFIT    ASL   TOTAL
C049 2E 5D C0           ROL   TOTAL+1
C04C 2E 5E C0           ROL   TOTAL+2
C04F 2E 5F C0           ROL   TOTAL+3
; repeat it again
C052 4C 1B C0           JMP   MULLP
C055 00         COUNTR  .BYTE 0
C056 7D 00      B1      .BYTE 125,0
C058 58 02      B2      .BYTE 88,2
C05A 00 00      WORK    .BYTE 0,0
C05C 00 00 00 TOTAL     .BYTE 0,0,0,0
```

See also **MULAD1** (Multiply two numbers with successive adds), **MULAD2** (Multiply two numbers with repeated addition: optimized version), **MULFP** (Multiply two floating-point numbers) ©

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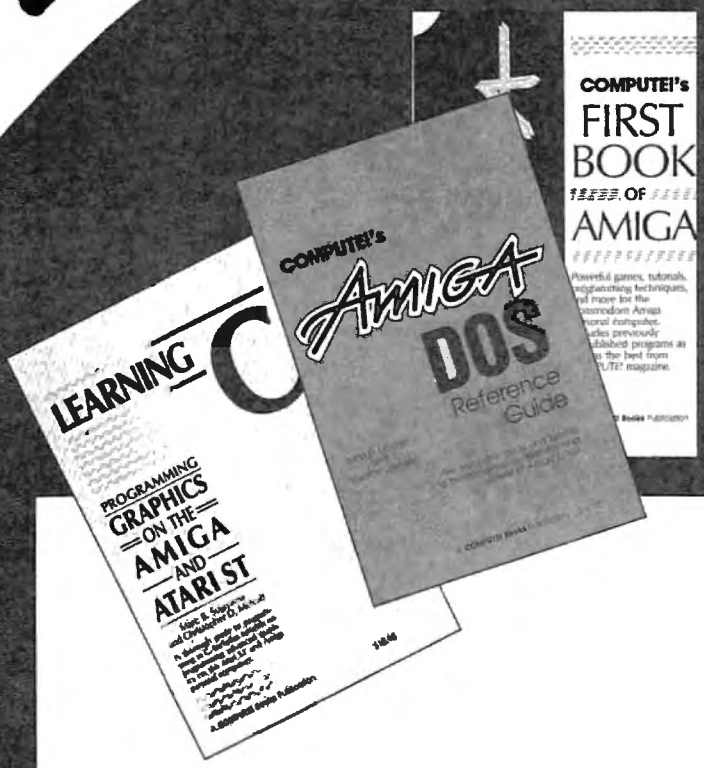

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The Elementary Amiga
Part 1

Jim Butterfield

The Commodore Amiga comes with excellent documentation. The manuals take you gently through the first steps with careful descriptions and ample illustrations. But they don't tell you everything. This series will reveal some of the more interesting and less obvious aspects of the Amiga.

If you don't yet have an Amiga, there are a few features, and pitfalls, of which you should be aware. You undoubtedly have seen the marvelous graphics and have heard the superb sound of the Amiga. Perhaps you think of these as the essence of the machine. They are important, but there are other significant things. Perhaps the most profound is *multitasking*—the ability to have several programs, or *tasks*, running at the same time. That's rare in microcomputers, and it's very useful once you get used to it: Can you imagine running a bulletin board in one window while writing a letter (or a program) in another?

In the list of Amiga features, we should also note the high processing speed, the easy interface to peripheral devices such as printers, and the huge shareware and public domain software library that has already come into existence.

There are some limitations that may concern you, however. The Amiga, although a bargain by technical price/performance standards, is not the lowest priced computer in the marketplace. The Amiga's processing speed is fast, but its input/output rates—especially to screen windows—are relatively sluggish. And if your idea of fun is to chop around inside a machine that has simple architecture, the Amiga is not for you. Its inner structure is quite complex, and you'll have a good deal of study ahead of you before you can take the simplest foray into the Amiga's inner space.

Your Amiga will be much more flexible and powerful with two disk drives and at least 512K of memory (only the Amiga 1000 offers less than 512K in its standard configuration). Two drives are far more useful than one. You'll find that the Workbench system disk must be in one of the drives for many operations. Without a second drive, you'll be swapping this disk in and out a great deal. You can copy much of the Workbench disk into RAM if you wish (the Amiga is very flexible), but then you're cutting into your RAM space for programs.

Multitasking gobbles up memory, so the more RAM you have to start with, the more you can do. Don't let your experience with eight-bit microcomputers mislead you: 64K is a lot of memory on the Commodore 64, Atari 800, or Apple II; but on the Amiga it's hardly worth counting.

If you can make contact with a user group, do so. There's a huge amount of public domain software available. So much, in fact, that you'll need help sorting through it all. For example, there's a series of programs available as catalogued disks called the Fred Fish disks. These can be obtained from user groups, from dealers, or from Fred Fish himself (345 Scottsdale Road, Pleasant Hill, CA 94523, $10 per disk). There are over 100 of these so far, with typically 20 programs per disk.

The Workbench

The manual, *Introduction to the Amiga*, that comes with the computer does a nice job of showing you how to use the Workbench. By the time you finish the tutorial, you should know how to click, double-click, select a menu, size a window, drag a window, and do many other tasks along this line. There are a few things, however, that went unmentioned or were vague.

First, it's very important to back up your disks. This is especially vital on soft logic machines like the Amiga. Much of the computer's operating system software is on disk, not in ROM. If your Workbench disk ever becomes corrupted, your computer will effectively be brain damaged. Keep your original system disks somewhere safe. Do *everything* on backup disks.

By the way, you're going to be using disks like crazy. Start with at least a box of ten. If someone offers you a bargain on a quantity of 50, don't be shy—you'll use them.

As you go through the Workbench, opening a disk, then opening a drawer within that disk, and so on, you may be surprised at the subtlety of the Workbench's file

handling. Drag a file from one disk to another, and you make a copy. Drag a file from one part of a disk to another—say, from one drawer to another—and you move it. Drag a file out of its window, to an empty area on the Workbench screen, and it stays there. Don't worry—the computer keeps careful records about where files originate. If need be, your Amiga will ask you to reinsert the appropriate disk when the wandering file is accessed again.

Using The Workbench

When the Workbench loads from disk, the drive runs for a while before the Workbench screen appears. Let it do so; don't rush in with the mouse until everything settles down. If you jump in too quickly, the computer becomes busy with two different jobs at the same time. It can handle it—multitasking is part of what the Amiga is about. But you'll waste a good deal of time (and make a good deal of noise) as the disk drive's read head goes back and forth from one track to another. Although this will not hurt the disk drive, it is best to wait it out.

There's often more on a disk than what you see in the disk's window. The Workbench only shows icons for those files that have *info* files associated with them. To see the rest, you'll need to go to the Command Line Interface (CLI). Both info files and the CLI will be discussed in Part 2 of this series.

If you drag something into the Trashcan, it's not actually deleted, so you do not free any disk space. That's because you're allowed to sort through the contents of the Trashcan. If you change your mind about discarding something, drag it back out of the can and put it wherever it belongs. If you're sure you will never want that item again, select the Trashcon icon, go to the Disk menu and choose the Empty Trash option. All items in the Trashcan directory are discarded, and the disk space is reclaimed.

Here's another way to throw away files: Select the item that you want to throw away, go to the Workbench menu, and choose the Discard option. This deletes the file and reclaims the disk space right away, so be careful.

Why is there an Empty drawer on the Workbench disk? To give you something to copy when you need a new drawer. To make a new drawer, select the Empty drawer, go to the Workbench menu and select the Duplicate option. Now, use the Rename option in the Workbench menu to give it the name of your choice. This new drawer may be dragged anywhere on the disk—even within another drawer.

After you've moved an icon to a desired place within a window, fix it in place by calling Snapshot on the Special menu. If you're redecorating a window and have moved several things around, log all of their new positions by performing *multiple selection*—select each item while holding down the shift key—before choosing Snapshot.

Preferences

Double-click the Preferences icon to invoke this activity. Most of the options are well described in the manual, but a few features are worth noting.

The first time you use the system, be sure to select Change Printer and set up the type of printer you are using. Click on the Save button when you're finished to make this change permanent.

On the Amiga 1000, you're asked to use Preferences to set the date and time. This seems to be unnecessary work, but it's a good idea if you want your files properly dated. On other models of the Amiga, the date and time is set for you automatically.

It's fun to customize the mouse pointer. While in Preferences, click Edit Pointer and draw your own. Maybe you'd like to add your initials to the tail of the pointer or to draw a personalized icon. Remember that the pointer has a hot spot—the actual place on the pointer where action takes place—which you can place by using the Set Point box. Try to pick a logical place for this, so that the user (you) won't be confused while using this pointer: the tip of a finger, the nose of an airplane, the bullseye of a target.

Info

If you select an icon, and then choose Info on the Workbench menu, you'll get a lot of information. There are five types of icons, and the information you get is related to the type. The types are:

Disk. These are the physical disks that you put into a drive. The ramdisk, if it appears as an icon, is also treated as a disk. When you select Info on a disk, you get the disk's name, its capacity, and how much disk space is currently being used.

Drawer. You might think of a drawer as a filing cabinet. It may contain a number of things (including, perhaps, other drawers).

Trashcan. A special type of drawer. It can contain things, but this drawer has special properties.

Tool. A tool is what we would call a program. So when we double-click a tool, we run a program.

Project. This is data to be used by a program tool. In the case of Amiga Basic, for example, the program you write is considered by the interpreter to be data.

Projects are especially interesting, because they may be attached to certain tools. When you double-click a tool icon, the program selected loads and runs. If you double-click on a project icon, the computer loads the default tool, starts the program, and then loads the project file into the program as data. For example, double-clicking a text file causes a listing or word processing program to be called in to handle the file.

You can change the default tool entry, and sometimes you may need to do so. The most common problem is that when you copy a project to a new disk, the name of the default tool is no longer correct. With Info, you can correct it.

You'll seldom need to do anything with the Tool Types field. It supplies extra information about the selected icon. On Notepad files, for example, the Tool Types field displays the information FILETYPE=notepad.

Farewell To Workbench

Workbench is good for the casual user who doesn't need to learn any special commands. But to gain more understanding and control out of the Amiga, you'll need to move on to CLI. We'll do that in next month's installment. C

Atari Persistent Ramdisk

Robert Berry

This recoverable ramdisk can survive just about any catastrophe short of a power loss. It requires a 130XE (or 800XL with memory upgrade to 128K) and DOS 2.5.

If you have an Atari 130XE (or expanded-memory 800XL) you've probably found much use for the ramdisk program that comes with DOS 2.5. It makes assembling and compiling much faster, and it places the DOS menu just where you want it—in RAM. "Atari Persistent Ramdisk" keeps the advantages you've grown accustomed to, and it adds a new feature: the ability to reset the computer without losing the contents of the ramdisk. You can even switch cartridges and find that your ramdisk files are unaffected.

Typing It In

Persistent Ramdisk is a machine language program in the form of a BASIC loader. Carefully type it in and save a copy to disk before you run it.

To create a disk with the Persistent Ramdisk on it, format a disk normally. Copy the DOS 2.5 files DOS.SYS and DUP.SYS to the disk with the WRITE DOS FILES option. Now load the Persistent Ramdisk program. Insert the new disk in the drive and type RUN. A new file named RAMDISK.COM will be written to the disk. The next time you boot the computer using this disk, you'll see the message *Setting Up Persistent Ramdisk . . . Please Wait.* Use the new ramdisk the same way you normally use the DOS 2.5 ramdisk.

Once you have created the RAMDISK.COM file, you can copy it onto other formatted DOS 2.5 disks using the COPY FILE option on the DOS menu. This saves you the trouble of having to run the BASIC program more than once. Note that the enhanced ramdisk file has the same name as the original ramdisk program that comes with DOS 2.5. Be sure to keep a copy of the original ramdisk program on your DOS 2.5 master disk.

New Features

On Atari XL and XE models, the SYSTEM RESET button causes a complete reset, called a cold reset. This lets you recover from more lock-ups than the older 400s and 800s, which performed only a partial, or warm, reset. However, since SYSTEM RESET does not clear memory, lock-ups still occasionally occur. The only solution to lock-ups like these is to switch power to the computer off and back on. Unfortunately, you lose your ramdisk when you do this. Persistent Ramdisk provides a new feature to perform a simulated cold start without erasing the ramdisk. To do this, hold down the HELP key when you press SYSTEM RESET. (When you do this, be sure the drive contains a disk with a copy of Persistent Ramdisk.)

Using Persistent Ramdisk, many shortcuts are possible. For instance, if you're working on a machine language subroutine for use in a BASIC program, you can assemble it with the MAC/65 assembler or Atari Assembler cartridge to the ramdisk. Then you can pull the assembler cartridge out and press RESET. As long as you have a Persistent Ramdisk disk in the drive, your ML file will be intact when you boot up in BASIC.

[Ed. Note: Although changing cartridges with the power on is a practice used by many programmers, Atari claims that inserting or removing cartridges with the power on may damage your computer or the cartridge. Follow this practice at your own risk.]

Avoiding Interference

As useful as Persistent Ramdisk can be, it is not perfect for every situation. It uses part of page 1 (the stack) for the routine which handles the SYSTEM RESET key. You should test Persistent Ramdisk with each environment you use. One program that interferes with Persistent Ramdisk is MAC/65's DDT debugger. If you're going to use DDT, don't use Persistent Ramdisk.

The *AtariWriter* cartridge thinks that it has encountered an error when the new RAMDISK .COM begins to load. The screen turns red, but the ramdisk is setup

as usual. The screen turns blue once the ramdisk has been initialized, so this minor problem can be ignored.

Persistent Ramdisk is short, taking up two less sectors than the original ramdisk. You should be able to find many uses for the program.

Persistent Ramdisk

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 COMP
     UTE! PUBLICATIONS, INC.
       ALL RIGHTS RESERVED.
BF 6 ? "{CLEAR}COPYRIGHT 198
     7";:PRINT "COMPUTE! PUBL
     ICATIONS, INC.";:PRINT "
     ALL RIGHTS RESERVED."
LP 8 FOR TT=1 TO 1500:NEXT T
     T
FE 10 ? "{CLEAR}Insert disk
     to write new RAMDISK.C
     OM{4 SPACES}file to, p
     ress RETURN.";?
HB 20 IF PEEK(764)<>12 THEN
     20
CL 30 TRAP 100
LA 40 OPEN #1,8,0,"D:RAMDISK
     .COM"
BC 50 FOR A=1 TO 755:READ B:
     T=T+B:PUT #1,B:NEXT A
DE 60 CLOSE #1:IF T<>70097 T
     HEN ? "{BELL}Error in
     DATA statements!!!":EN
     D
ME 70 ? "Now reboot with thi
     s disk. Press START  t
     o reboot or BREAK to g
     o back to{6 SPACES}BAS
     IC.":POKE 764,255
PC 80 IF PEEK(53279)=6 THEN
     A=USR(58487)
AK 90 GOTO 80
JI 100 ? "{BELL}Error - ";PE
     EK(195)
NI 110 STOP
MN 1000 DATA 255,255,0,1,13,
     1,32,255,255,173
AD 1010 DATA 220,2,201,17,24
     0,1,96,76,119,228
EK 1020 DATA 0,48,251,48,0,0
     ,68,56,58,155
MJ 1030 DATA 68,56,58,42,46,
     42,155,68,49,58
MD 1040 DATA 68,85,80,46,83,
     89,83,155,68,56
MC 1050 DATA 58,77,69,77,46,
     83,65,86,155,32
MJ 1060 DATA 32,68,85,80,32,
     32,32,32,32,83
PD 1070 DATA 89,83,125,29,29
     ,29,29,29,29,127
DK 1080 DATA 83,101,116,116,
     105,110,103,32,117,1
     12
DF 1090 DATA 32,80,101,114,1
     15,105,115,116,101,1
     10
JJ 1100 DATA 116,32,82,65,77
     ,100,105,115,107,155
MH 1110 DATA 155,155,32,32,3
     2,32,32,32,32,32
PN 1120 DATA 32,32,32,32,32,
     80,108,101,97,115
ME 1130 DATA 101,32,119,97,1
     05,116,46,46,46,155
BC 1140 DATA 169,64,141,1,1,
     141,159,48,169,21
NI 1150 DATA 141,2,1,141,160
     ,48,169,0,141,12
PN 1160 DATA 24,133,12,169,1
     ,141,16,24,133,13
OA 1170 DATA 173,10,7,9,128,
     141,10,7,169,255
EN 1180 DATA 133,8,32,255,25
     5,162,80,169,3,157
MN 1190 DATA 66,3,169,6,157,
     68,3,169,48,157
IJ 1200 DATA 69,3,169,6,157,
     74,3,169,0,157
DE 1210 DATA 75,3,32,86,228,
     48,117,169,1,141
KL 1220 DATA 0,48,169,0,141,
     1,48,162,80,169
PG 1230 DATA 5,157,66,3,169,
     128,157,68,3,169
II 1240 DATA 5,157,69,3,169,
     1,157,72,3,157
OL 1250 DATA 73,3,32,86,228,
     238,1,48,173,129
MD 1260 DATA 5,201,32,208,42
     ,32,254,48,173,0
EM 1270 DATA 48,201,1,240,20
     8,76,252,48,247,49
AM 1280 DATA 27,49,160,2,185
     ,128,5,201,32,240
AG 1290 DATA 8,201,48,144,10
     ,201,91,176,6,200
BA 1300 DATA 192,13,208,236,
     96,169,0,141,0,48
ON 1310 DATA 96,162,80,169,1
     2,157,66,3,32,86
ML 1320 DATA 228,173,0,48,20
     1,1,208,20,173,1
PP 1330 DATA 48,201,1,240,13
     ,76,104,50,162,80
ON 1340 DATA 169,12,157,66,3
     ,32,86,228,169,1
ME 1350 DATA 141,240,2,162,0
     ,169,11,157,66,3
AF 1360 DATA 169,48,157,68,3
     ,169,48,157,69,3
MC 1370 DATA 169,68,157,72,3
     ,169,0,157,73,3
BA 1380 DATA 32,86,228,169,0
     ,141,240,2,162,80
PK 1390 DATA 169,254,157,66,
     3,169,2,157,68,3
MB 1400 DATA 169,48,157,69,3
     ,169,0,157,74,3
OL 1410 DATA 157,75,3,32,86,
     228,162,80,169,3
PH 1420 DATA 157,66,3,169,13
     ,157,68,3,169,48
IN 1430 DATA 157,69,3,169,4,
     157,74,3,169,0
JB 1440 DATA 157,75,3,32,86,
     228,16,3,76,79
CA 1450 DATA 50,162,80,169,7
     ,157,66,3,169,205
CP 1460 DATA 157,68,3,169,50
     ,157,69,3,169,255
ON 1470 DATA 157,72,3,157,73
     ,3,32,86,228,162
CC 1480 DATA 80,169,12,157,6
     6,3,32,86,228,162
PK 1490 DATA 80,169,3,157,66
     ,3,169,13,157,68
MK 1500 DATA 3,169,48,157,69
     ,3,169,8,157,74
LC 1510 DATA 3,169,0,157,75,
     3,169,56,141,14
FF 1520 DATA 48,32,86,228,16
     2,80,169,11,157,66
BN 1530 DATA 3,169,248,49,20
     4,50,205,157,68,3
CE 1540 DATA 169,50,157,69,3
     ,32,86,228,162,80
CA 1550 DATA 169,12,157,66,3
     ,32,86,228,162,80
MF 1560 DATA 169,3,157,66,3,
     169,24,157,68,3
MB 1570 DATA 169,48,157,69,3
     ,169,8,157,74,3
PA 1580 DATA 169,0,157,75,3,
     32,86,228,162,80
CH 1590 DATA 169,11,157,66,3
     ,169,137,157,72,3
BK 1600 DATA 169,21,157,73,3
     ,32,86,228,162,80
CH 1610 DATA 169,12,157,66,3
     ,32,86,228,169,56
NI 1620 DATA 141,63,21,162,0
     ,169,11,157,66,3
DL 1630 DATA 169,0,157,72,3,
     157,73,3,169,125
DP 1640 DATA 32,86,228,169,0
     ,133,8,96,162,80
JF 1650 DATA 169,3,157,66,3,
     169,6,157,68,3
MP 1660 DATA 169,48,157,69,3
     ,169,6,157,74,3
PA 1670 DATA 169,0,157,75,3,
     32,86,228,162,80
PP 1680 DATA 169,5,157,66,3,
     169,128,157,68,3
JE 1690 DATA 169,5,157,69,3,
     169,1,157,72,3
BB 1700 DATA 157,73,3,32,86,
     228,173,129,5,201
AN 1710 DATA 32,208,23,162,2
     ,189,128,5,221,35
GH 1720 DATA 48,208,211,232,
     224,13,240,3,76,171
EH 1730 DATA 50,169,56,141,6
     3,21,162,80,169,12
PJ 1740 DATA 157,66,3,32,86,
     228,76,79,50,226
JK 1750 DATA 2,227,2,116,48
```

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Total Disk Menu

Scott Rickman

With this program, long cryptic disk commands are a thing of the past. Now you can load, run, scratch, rename, and even protect and unprotect disk files—all from an easy-to-use menu. For the Commodore 64.

As anyone who has ever used a Commodore 1541 disk drive with their 64 knows, the disk operating system (DOS) commands can be difficult to remember and use. For example, to simply scratch a file you have to enter the command **OPEN 15,8,15,"S0:*filename*" :CLOSE 15**. And believe it or not, scratch is one of DOS's simplest commands.

"Total Disk Menu" offers menu-driven access to four of the most commonly used DOS commands: load, run, scratch, and rename. You can also protect and unprotect files from accidental deletion—a feature not available in standard Commodore DOS.

Typing It In

Since Total Disk Menu is written in machine language, you must enter it using the "MLX" machine language entry program found elsewhere in this issue. When MLX asks for starting and ending addresses, respond with these values:

Starting address: 0801
Ending address: 1318

Type in the program. Before leaving MLX, be sure to save a copy to disk.

Getting Started

Load and run Total Disk Menu as you would a BASIC program. A title screen appears. At this point, place the disk of your choice into the disk drive addressed as device 8, and press a key. At the top left of the screen, the program lists the disk's name, ID number, and DOS version number (normally 2A). Next, the computer reads in the names of all files on the disk, listing the first ten to the screen.

If your disk contains more than ten programs, the space bar allows you to flip through each group of ten files (a page). The current page and total number of pages is displayed in the upper right corner of the screen.

This program separates files into two different categories: loadable and nonloadable. Loadable files are always program files, and may be loaded or run. Filenames for loadable files are displayed on the screen normally. Nonloadable files can be sequential, relative, or user files. Nonloadable files are listed with a space preceding their filename.

Besides being loadable or nonloadable, files may also be protected (see below). A protected file is listed in reverse type. All files shown on the screen have a corresponding number 0–9. To specify a file, you must refer to it by its number.

Using The Program

Every command in this program is accessed by a single keypress. So that you won't have to memorize anything, Total Disk Menu displays your options on the screen at all times.

Here's a list of Total Disk Menu's options and corresponding keypresses:

Key	Function
L	Load program
R	Run program
S	Scratch file
N	Rename file
P	Protect file
U	Unprotect file
Space	Next page of ten files
f1	Introduce a new disk (restart program)
f2	Exit program
f8	Abort current operation

Load program. This option simply loads a program file into memory. To choose a file, enter the corresponding number (0–9). Because Total Disk Menu is located in the BASIC workspace from $0801 to $1311, loading BASIC programs, and certain machine language programs, causes the menu program to abort. Remember: Only program files may be loaded or run.

Run program. This option allows you to run any program file on disk. In order to properly run a machine language file, the beginning of the file must also be its entry point—the SYS address. When selected, you are asked to enter the number that corresponds to the file that you wish to run.

Scratch file. To delete a file from the disk, select this option. As with Load and Run, you must select the file to be scratched by entering its corresponding number.

reName. This option lets you rename files. After pressing N, select the file to be renamed. Next, you are prompted for the file's new name. Enter the name and press RETURN.

Protect. Although not directly supported by Commodore DOS, files can be protected from the scratch command. This option does

just that. When Protect is selected, you are asked if you wish to protect the whole disk. Answer Y or N. If you do not protect the entire disk, you must specify which file you wish to protect by entering the appropriate number. Protected files are displayed in the menu in reverse type.

Unprotect. This option is the opposite of the Protect option. As with Protect, you are asked if you wish to unprotect the whole disk. Answer positively by pressing Y, or press N and select a single file. Once a file is unprotected, it may be deleted normally with the Scratch option.

Space. Pressing the space bar lists the next page of ten programs to the screen. In order to perform an operation on a file, the file must be currently listed on the screen. If your disk contains ten or fewer programs, the space bar does nothing.

f1. Pressing f1 forces the program to read in a new disk's information. You must press f1 anytime you put a different disk in the drive.

f2. Press this to exit the program and return to BASIC. Because Total Disk Menu erases itself from memory, you must load the program again if you wish to rerun it.

f8. This is your escape key. This key allows you to abort any of Total Disk Menu's commands. So, if you accidentally press S for scratch, you can press f8 to return to the menu.

Total Disk Menu

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

```
0801:0C 08 00 00 9E 20 32 38 2B
0809:36 31 00 00 00 24 00 00 11
0811:0B 02 12 B0 60 60 60 60 1A
0819:60 60 60 60 60 60 60 60 29
0821:60 60 60 AE 00 0B 03 12 B4
0829:7D 92 54 4F 54 41 4C 20 7C
0831:44 49 53 4B 20 4D 45 4E E3
0839:55 12 7D 00 0B 04 AD 60 4C
0841:60 60 60 60 60 60 60 60 51
0849:60 60 60 60 60 60 BD 92 46
0851:00 12 06 42 59 00 0D 08 B7
0859:53 43 4F 54 54 20 52 49 24
0861:43 4B 4D 41 4E 00 0C 0A 38
0869:4F 52 4C 41 4E 44 4F 2C A1
0871:46 4C 4F 52 49 44 41 00 A4
0879:05 10 12 49 4E 53 45 52 83
0881:54 20 44 49 53 4B 20 41 2A
0889:4E 44 20 50 52 45 53 53 7C
0891:20 41 4E 59 20 4B 45 59 73
0899:92 00 00 1C 4E 41 4D 45 0C
08A1:3A 0D 49 44 3A 0D 44 56 64
08A9:3A 0D 12 50 52 45 53 53 03
08B1:92 2D 12 52 92 55 4E 2F 73
08B9:12 4C 92 4F 41 44 2F 12 B8
08C1:50 92 52 4F 54 45 43 54 70
08C9:2F 12 55 92 4E 50 52 4F 71
08D1:54 45 43 54 0D 20 20 20 54
08D9:20 20 20 12 53 92 43 52 E4
08E1:41 54 43 48 2F 52 45 12 F3
08E9:4E 92 41 4D 45 2F 12 53 21
08F1:50 41 43 45 92 3D 4E 45 A2
08F9:58 54 20 50 41 47 45 0D 13
0901:0D BF BF BF BF BF BF 20 1A
0909:12 46 49 4C 45 53 92 20 60
0911:BF BF BF BF BF BF BF BF 23
0919:BF BF BF 20 12 46 55 4E 97
0921:2E 20 4B 45 59 53 92 20 6D
0929:BF BF BF BF 0D 0D 30 2E 2A
0931:0D 31 2E 0D 32 2E 0D 33 44
0939:2E 0D 34 2E 0D 35 2E 0D B5
0941:36 2E 0D 37 2E 0D 38 2E 53
0949:0D 39 2E 0D 0D BF BF BF 6D
0951:BF BF BF BF BF BF BF BF 63
0959:BF BF BF BF BF BF BF BF 6B
0961:BF BF BF BF BF BF BF BF 73
0969:BF BF BF BF BF BF BF BF 7B
0971:BF BF BF BF 0D 00 1A 00 E3
0979:50 41 47 45 20 20 20 20 23
0981:4F 46 00 13 07 BF 00 13 48
0989:08 BF 20 12 46 31 92 3D 0E
0991:4E 45 57 20 44 49 53 4B 42
0999:00 13 09 BF 20 12 46 32 95
09A1:92 3D 45 4E 44 20 41 4E 4D
09A9:44 20 4E 45 57 00 13 0A EE
09B1:BF 20 12 46 38 92 3D 41 1A
09B9:42 4F 52 54 20 43 4F 4D 4A
09C1:4D 41 4E 44 00 13 0B BF FA
09C9:00 13 0C BF 00 13 0D BF 44
09D1:BF BF BF 20 12 46 49 4C 36
09D9:45 20 54 59 50 45 53 92 87
09E1:20 BF BF BF BF 00 13 0E 1A
09E9:BF 00 13 0F BF 20 31 2E 3E
09F1:12 50 52 4F 54 45 43 54 F2
09F9:45 44 20 46 49 4C 45 92 C0
0A01:00 13 10 BF 20 32 2E 20 1E
0A09:43 41 4E 27 54 20 42 45 38
0A11:20 4C 4F 41 44 45 44 00 06
0A19:13 11 BF 00 13 12 BF 00 53
0A21:00 00 00 00 00 00 00 52 87
0A29:55 4E 00 4C 4F 41 44 00 48
0A31:50 52 4F 54 45 43 54 00 11
0A39:55 4E 50 52 4F 54 45 43 54
0A41:54 00 53 43 52 41 54 43 A1
0A49:48 00 52 45 4E 41 4D 45 77
0A51:00 4E 4F 20 47 4F 00 12 6E
0A59:57 48 49 43 48 20 4F 4E 38
0A61:45 92 3F 00 4E 45 57 20 FA
0A69:4E 41 4D 45 3F 00 57 48 E3
0A71:4F 4C 45 20 44 49 53 4B 24
0A79:3F 00 4E 45 57 0D 00 23 5D
0A81:00 55 31 3A 30 32 20 30 6F
0A89:30 20 31 38 20 30 31 00 8B
0A91:55 32 3A 30 32 20 30 30 C9
0A99:20 31 38 20 30 31 00 42 9B
0AA1:2D 50 3A 30 32 20 30 39 56
0AA9:38 00 00 00 00 00 00 00 D9
0AB1:00 00 00 00 00 00 00 00 C5
0AB9:00 00 00 00 00 00 00 20 ED
0AC1:CF FF CA E0 00 D0 F8 20 7A
0AC9:CF FF 20 D2 FF 88 C0 00 9A
0AD1:D0 F5 60 A9 93 20 D2 FF 35
0AD9:A0 00 B1 FB 20 D2 FF C8 49
0AE1:C0 00 D0 02 E6 FC B1 FB 1B
0AE9:C9 00 D0 F0 C8 C0 00 D0 26
0AF1:02 E6 FC B1 FB C9 00 F0 73
0AF9:20 85 02 C8 C0 00 D0 02 F5
0B01:E6 FC B1 FB AA 84 FF A4 CB
0B09:02 18 20 F0 FF A4 FF C8 94
0B11:C0 00 D0 02 E6 FC 4C DB 61
0B19:0A C8 C8 C0 00 D0 02 E6 B9
0B21:FC 98 18 65 FB 90 02 E6 42
0B29:FC 85 FB 60 A9 00 8D 21 2E
0B31:D0 8D 20 D0 A9 0E 8D 86 4B
0B39:02 A9 08 85 FC A9 0F 85 46
0B41:FB 20 D4 0A 20 E4 FF C9 F6
0B49:00 F0 F9 20 D4 0A A0 00 EC
0B51:B9 00 13 99 E8 07 C8 C0 F5
0B59:14 D0 F5 A9 08 20 B1 FF 2B
0B61:A9 6F 20 93 FF A9 49 20 BE
0B69:A8 FF 20 AE FF 20 88 12 66
0B71:C9 01 F0 B8 A9 02 A2 08 F8
0B79:A0 02 20 BA FF A9 01 A2 5B
0B81:0E A0 08 20 BD FF 20 C0 B8
0B89:FF 20 88 12 C9 01 F0 9C AA
0B91:A2 02 20 C6 FF 18 A0 05 90
0B99:A2 00 20 F0 FF A2 8E A0 5C
0BA1:10 20 C0 0A 18 A0 03 A2 6C
0BA9:01 20 F0 FF A2 02 A0 02 C6
0BB1:20 C0 0A 18 A0 03 A2 02 23
0BB9:20 F0 FF A2 01 A0 02 20 F4
0BC1:C0 0A A2 59 20 CF FF CA AF
0BC9:E0 00 D0 F8 A9 90 85 FC 91
0BD1:A9 00 85 FB 85 FD A2 00 96
0BD9:A0 00 E8 20 B7 FF C9 00 B0
0BE1:D0 67 20 CF FF C9 55 10 1D
0BE9:15 A0 1F E0 08 D0 04 A2 D2
0BF1:00 A0 1D 20 CF FF 88 C0 26
0BF9:00 D0 F8 4C D9 0B 85 02 30
0C01:A5 FB 29 F0 18 4A 4A 4A E7
0C09:4A 09 B0 A8 A5 FC 85 FE 54
0C11:A5 02 91 FD 20 CF FF 20 EE
0C19:CF FF A0 00 20 CF FF 91 FE
0C21:FB C8 C0 10 D0 F6 A0 0D 33
0C29:E0 08 D0 04 A0 0B A2 00 84
0C31:20 CF FF 88 C0 00 D0 F8 76
0C39:A5 FB 69 0F C9 A0 D0 04 B7
0C41:E6 FC A9 00 85 FB 4C D9 CF
0C49:0B A9 02 20 C3 FF A9 00 05
0C51:85 99 A5 FB C9 00 F0 23 5A
0C59:48 A8 A9 A0 A2 00 86 FB 1D
0C61:91 FB C8 C0 A0 D0 F9 68 0B
0C69:4A 4A 4A 4A 09 B0 A8 A9 2D
0C71:00 91 FB C8 C0 BA D0 F9 86
0C79:4C 7E 0C C6 FC 18 A0 25 F3
0C81:A2 00 20 F0 FF A5 FC C9 58
0C89:8F D0 03 4C 2D 0B 18 E9 72
0C91:8E 8D FF 02 C9 0A 30 0A 55
0C99:AA A9 31 20 D2 FF 8A 18 5D
0CA1:E9 09 29 0F 09 30 20 D2 23
0CA9:FF A9 20 20 D2 FF A9 00 1C
0CB1:85 FB A9 90 85 FC A9 01 3E
0CB9:8D 86 02 A2 08 A0 02 18 83
0CC1:20 F0 FF A5 FC 85 FE A9 26
0CC9:92 20 D2 FF A9 00 85 FD E3
0CD1:8A 18 E9 07 09 B0 A8 B1 F0
0CD9:FD 48 29 F0 C9 C0 D0 05 2F
0CE1:A9 12 20 D2 FF 68 A8 A9 21
0CE9:20 48 98 29 0F C9 02 F0 5E
0CF1:07 68 20 D2 FF A9 00 48 C7
0CF9:A0 00 B1 FB 20 D2 FF C8 6D
0D01:C0 10 D0 F6 68 20 D2 FF 72
0D09:A5 FB 69 10 85 FB E8 E0 F1
0D11:12 D0 AA A9 92 20 D2 FF 13
0D19:18 A2 00 A0 1F 20 F0 FF 4D
0D21:A9 02 8D 86 02 A5 FC 69 B4
0D29:01 29 0F C9 0A 30 0A 48 F9
0D31:A9 31 20 D2 FF 68 18 E9 59
0D39:09 09 30 20 D2 FF A9 20 2C
0D41:20 D2 FF 20 E4 FF C9 52 2F
0D49:F0 35 C9 4C F0 34 C9 50 63
0D51:F0 33 C9 55 F0 32 C9 53 76
0D59:F0 31 C9 4E F0 30 C9 85 B7
0D61:F0 2F C9 89 F0 51 C9 20 12
0D69:D0 D9 E6 FC AD FF 02 09 89
0D71:90 C5 FC F0 07 A9 00 85 58
0D79:FB 4C B7 0C 4C AF 0C 4C E1
0D81:26 0F 4C A6 0F 4C 13 10 46
0D89:4C 1A 10 4C 35 0E 4C 92 24
0D91:0E 4C 2D 0B A9 0F 20 C3 A9
0D99:FF A2 14 E8 18 A0 00 20 D0
0DA1:F0 FF A9 20 20 D2 FF C8 80
0DA9:C0 23 D0 F8 E0 17 D0 EB 87
0DB1:A9 00 85 FB 4C B7 0C A0 0B
0DB9:00 B9 7B 0A 99 77 02 C8 C9
0DC1:C9 00 D0 F5 A9 04 85 C6 69
0DC9:00 A9 0A 85 FE 98 48 18 EA
0DD1:A2 15 A0 00 20 F0 FF 68 C3
0DD9:A8 B1 FD 20 D2 FF C8 C9 68
0DE1:00 D0 F6 A9 0D 20 D2 FF 38
0DE9:A0 58 B1 FD 20 D2 FF C8 95
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0DF1:C9 00 D0 F6 A9 20 20 D2 5B
0DF9:FF 20 E4 FF C9 8C F0 94 AF
0E01:C9 30 30 F5 C9 3A 10 F1 BC
0E09:29 0F 85 FF 0A 0A 0A 0A C4
0E11:48 A0 00 85 FB B1 FB C9 3A
0E19:A0 D0 04 68 4C 95 0D 20 B3
0E21:D2 FF C8 B1 FB C0 10 D0 AE
0E29:F6 A9 0D 20 D2 FF A9 00 B8
0E31:85 FB 68 60 A0 43 20 CA 3F
0E39:0D AA A5 FF 09 B0 A8 B1 49
0E41:FB 29 F0 C9 C0 D0 03 4C FB
0E49:95 0D A9 08 20 B1 FF A9 9A
0E51:6F 20 93 FF A9 53 20 A8 23
0E59:FF A9 30 20 A8 FF A9 3A BA
0E61:20 A8 FF 86 FB A0 00 B1 34
0E69:FB 99 50 70 20 A8 FF A9 48
0E71:A0 91 FB C8 C0 10 D0 EF 26
0E79:20 AE FF 20 88 12 C9 01 74
0E81:D0 0C A0 00 B9 50 70 91 9E
0E89:FB C8 C0 10 D0 F6 4C 95 7F
0E91:0D A0 4B 20 CA 0D 85 FB 59
0E99:A9 00 85 99 A0 65 B1 FD D0
0EA1:20 D2 FF C8 B1 FD C9 00 28
0EA9:D0 F6 A0 00 C0 10 F0 09 31
0EB1:A9 A0 99 AB 0A C8 4C AD 72
0EB9:0E A9 08 20 B1 FF A9 6F 9A
0EC1:20 93 FF A9 52 20 A8 FF D1
0EC9:A9 30 20 A8 FF A9 3A 20 90
0ED1:A8 FF A0 00 20 CF FF C9 60
0ED9:0D F0 0E C0 10 F0 F5 99 50
0EE1:AB 0A C8 20 A8 FF 4C D5 25
0EE9:0E A9 3D 20 A8 FF A9 30 E9
0EF1:20 A8 FF A9 3A 20 A8 FF 86
0EF9:A0 00 B1 FB 99 50 70 20 6B
0F01:A8 FF B9 AB 0A 91 FB C8 BC
0F09:C0 10 D0 EE 20 AE FF 20 70
0F11:88 12 C9 01 D0 0C A0 00 39
0F19:B9 50 70 91 FB C8 C0 10 E3
0F21:D0 F6 4C 95 0D A0 28 20 A3
0F29:CA 0D 48 A5 FF 09 B0 A8 81
0F31:B1 FB 29 0F C9 02 F0 04 79
0F39:68 4C 95 0D A9 02 A2 08 C4
0F41:A0 02 20 BA FF 68 AA A9 80
0F49:10 A4 FC 20 BD FF 20 C0 29
0F51:FF A2 02 20 C6 FF 20 CF A0
0F59:FF 85 FD 20 CF FF 85 FE 23
0F61:A9 02 20 C3 FF A9 00 85 41
0F69:99 A2 01 A5 FE C9 08 D0 77
0F71:1E A5 FD C9 01 D0 18 A0 80
0F79:00 B9 28 0A 99 77 02 C8 23
0F81:C0 03 D0 F5 A9 0D 99 77 66
0F89:02 A9 04 85 C6 A2 00 8A 37
0F91:48 A9 02 A2 08 A0 01 20 8D
0F99:BA FF A9 07 48 A9 E8 48 BD
0FA1:A9 00 4C D5 FF A0 2C 20 76
0FA9:CA 0D 48 A5 FF 09 B0 A8 02
0FB1:B1 FB 29 0F C9 02 F0 04 F9
0FB9:68 4C 95 0D A9 02 A2 08 45
0FC1:A0 02 20 BA FF 68 AA A9 01
0FC9:10 A4 FC 20 BD FF 20 C0 A9
0FD1:FF A2 02 20 C6 FF 20 CF 21
0FD9:FF 85 FD 20 CF FF 85 FE A3
0FE1:A9 02 20 C3 FF A9 00 85 C1
0FE9:99 A9 02 A2 08 A0 01 20 8E
0FF1:BA FF A5 FE C9 07 B0 0C E9
0FF9:C9 A0 90 08 A9 00 20 D5 1B
1001:FF 4C 95 0D A9 00 48 A9 3F
1009:07 48 A9 E8 48 A9 00 4C B7
1011:D5 FF A9 C0 85 02 4C 1E 48
1019:10 A9 80 85 02 A2 16 A0 7B
1021:00 18 20 F0 FF A0 00 B9 96
1029:6F 0A 20 D2 FF C8 C0 0B 64
1031:D0 F5 20 E4 FF C9 59 F0 54
1039:0B C9 4E F0 67 C9 8C D0 76
1041:F1 4C 95 0D 85 FF 20 D2 30
1049:FF A9 0D 20 D2 FF A9 0A 6B
1051:85 FE A9 00 85 FD A0 31 BF
1059:A5 02 C9 C0 F0 02 A0 39 1C
1061:B1 FD C9 00 F0 07 20 D2 C9
1069:FF C8 4C 61 10 A9 49 20 35
1071:D2 FF A9 4E 20 D2 FF A9 0B
1079:47 20 D2 FF A9 90 85 FE 39
1081:A0 B0 B1 FD C9 00 F0 16 7A
1089:29 0F 05 02 91 FD C8 C0 99
1091:BA D0 EF E6 FE A5 FE 29 65
1099:0F CD FF 02 D0 E2 20 62 89
10A1:12 4C C8 10 A0 31 A5 02 0F
10A9:C9 80 D0 02 A0 39 20 CA FD
10B1:0D 48 20 62 12 A5 FF 09 C4
10B9:B0 A8 B1 FB 29 0F 05 02 E3
10C1:91 FB 85 02 68 85 FB A9 75
10C9:01 8D B0 02 A2 30 C9 0A 77
10D1:30 04 E9 0A A2 31 8E 8E 6E
10D9:0A 8E 9D 0A 09 30 8D 8F AA
10E1:0A 8D 9E 0A 20 18 12 A9 0E
10E9:01 8D B1 02 20 A7 11 20 26
10F1:F2 11 8D B2 02 A9 02 8D F4
10F9:B3 02 8D B1 02 20 A7 11 32
1101:20 F2 11 48 29 F0 C9 00 37
1109:D0 04 68 4C 64 11 A5 FF 19
1111:C9 59 D0 0E 20 A7 11 68 93
1119:29 0F 05 02 20 05 12 4C D9
1121:64 11 68 AD B3 02 69 03 1D
1129:8D B1 02 A0 00 20 A7 11 A9
1131:20 F2 11 D1 FB D0 2C EE C9
1139:B1 02 C8 C0 10 D0 EE AD 29
1141:B3 02 8D B1 02 20 A7 11 7B
1149:A9 08 20 B1 FF A9 62 20 EC
1151:93 FF A5 02 20 A8 FF 20 D5
1159:AE FF 20 3D 12 20 75 12 B8
1161:4C 95 0D AD B3 02 18 69 CA
1169:20 90 8C 20 3D 12 AD B2 93
1171:02 18 C9 FF F0 03 4C CA CA
1179:10 A5 FF C9 59 D0 06 20 E3
1181:75 12 4C 95 0D A0 00 B9 6A
1189:52 0A 20 D2 FF C8 C0 05 32
1191:D0 F5 A2 00 A0 00 C8 C0 45
1199:FF D0 FB E8 E0 FF D0 F4 9B
11A1:20 75 12 4C 95 0D AD B1 26
11A9:02 A2 00 C9 7C 30 06 E8 AB
11B1:E9 64 4C AC 11 48 8A 09 FD
11B9:30 8D A7 0A 68 A2 00 C9 84
11C1:0A 30 06 E8 E9 0A 4C C0 15
11C9:11 48 8A 09 30 8D A8 0A 7B
11D1:68 09 30 8D A9 0A A9 08 1A
11D9:20 B1 FF A9 6F 20 93 FF 36
11E1:A2 00 BD A0 0A 20 A8 FF 39
11E9:E8 E0 0A D0 F5 20 AE FF 94
11F1:60 A9 08 20 B4 FF A9 62 0D
11F9:20 96 FF 20 A5 FF 48 20 B1
1201:AB FF 68 60 AA A9 08 20 3A
1209:B1 FF A9 62 20 93 FF 8A 3B
1211:20 A8 FF 20 AE FF 60 A9 51
1219:08 20 B1 FF A9 6F 20 93 5E
1221:FF A2 00 BD 82 0A 20 A8 EE
1229:FF E8 E0 0E D0 F5 20 AE D1
1231:FF 20 88 12 C9 01 D0 03 86
1239:4C 95 0D 60 A9 08 20 B1 EF
1241:FF A9 6F 20 93 FF A2 00 A1
1249:BD 91 0A 20 A8 FF E8 E0 EB
1251:0E D0 F5 20 AE FF 20 88 AF
1259:12 C9 01 D0 03 4C 95 0D A7
1261:60 A9 08 20 B1 FF A9 F2 F6
1269:20 93 FF A9 23 20 A8 FF 08
1271:20 AE FF 60 A9 08 20 B1 B6
1279:FF A9 6F 20 93 FF A9 49 31
1281:20 A8 FF 20 AE FF 60 A9 C1
1289:08 20 B4 FF A9 6F 20 96 32
1291:FF A0 00 20 A5 FF 99 00 40
1299:70 C8 C9 0D D0 F5 20 AB 7C
12A1:FF AD 00 70 C9 30 D0 0E F6
12A9:AD 01 70 C9 31 F0 04 C9 AE
12B1:30 D0 03 A9 00 60 A2 18 FB
12B9:A0 00 18 20 F0 FF A0 00 FB
12C1:B9 00 70 C9 0D F0 07 20 C7
12C9:D2 FF C8 4C C1 12 A9 00 DE
12D1:85 02 A2 00 A0 00 C8 C0 E4
12D9:FF D0 FB E8 E0 FF D0 F4 DD
12E1:E6 02 A5 02 C9 03 D0 EA B5
12E9:A2 18 A0 00 18 20 F0 FF 9C
12F1:A0 00 A9 20 20 D2 FF C8 B2
12F9:C0 1E D0 F8 A9 01 60 A6 68
1301:AE E8 86 2D A4 AF C8 84 56
1309:2E 68 C9 00 F0 03 6C FD 04
1311:00 00 00 00 00 00 00 00 37
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Karma
For The Amiga

Todd Heimarck and Rhett Anderson

This colorful two-player strategy game demonstrates the power of the Amiga hardware and Amiga Basic; 512K required.

Imagine that you have the power to make people very happy. Perhaps you're a vice president in charge of awarding college scholarships. Or you're a billionaire who enjoys giving someone ten thousand bucks. Or maybe you just have a nice smile.

Paradoxically, while you're being altruistic and are dispensing gifts to a grateful and increasingly happy world, you're greedy, too. You want to gain the approbation and adoration of the beneficiaries of your largesse. You want people to like you.

Unfortunately, there's another philanthropist who has the same power as you. While you're dispensing your gifts and making people happy, your opponent is doing the same thing. You're locked in a popularity contest from which only one victor will emerge.

"Karma" is a two-player strategy game in which you and your opponent struggle for territory. Four different scenarios—each with a different goal—are included. Players take turns using the mouse to add happiness to households. When a certain level of happiness builds up, an explosion takes place. When one of the players achieves an explosion, that player captures all of the surrounding regions. Karma is easy to play, but difficult to win.

Getting Started

Karma is written in Amiga Basic. Type it in and save a copy to disk. When you're ready to play the game, run it. When you play, you'll first be asked to choose one of the four karmic variations: Capture All, Four Corners, Two Pies, and 2500 Points. Game play is identical for each game, although the goal is different. To select a game, press one of the number keys (1–4) from the keyboard or the numeric keypad. The standard game is Capture All, which you select by pressing the 1 key.

Levels Of Happiness

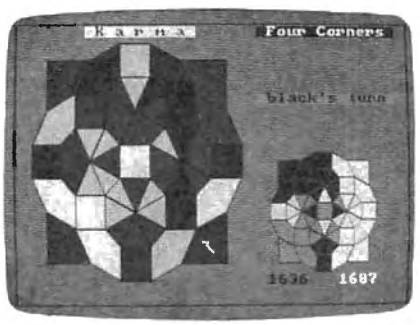
The screen is divided into three parts: the big map, the small map, and the scoreboard. The small map shows you which player owns which territories. The big map on the left contains the most important information—it tells you the relative levels of happiness within each household in the city of Karma:

Level	Mood	Color
1	Gloomy	Deep Blue
2	Content	Deep Purple
3	Pleased	Maroon
4	Joyous	Red
5	Ecstatic	Bright Red

The black player moves first; white, second. During your turn, you may move the mouse pointer to any household on the big map, but the household must be on your side. Click the left button once (you may have to hold down the button for a microsecond or two to make sure the click registers).

Whichever block you select will instantly increase one step in happiness. A blue transforms to purple, purple becomes maroon, and so on.

It may strike you that you're not gaining a lot of popularity if you can give happy points only to the households that are already on your side. You click the mouse pointer on your followers and your opponent clicks on his or her followers. How do you move into neutral (or unfriendly) territory? Good question.



"Karma," an unique two-player strategy game for the Amiga.

The Power Of Gossip

The levels of glee stop at ecstatic; there is no more blissful state. That's because ecstasy has a curious effect on the citizens of Karma. When their happiness hits level five, they immediately tell all of their next-door neighbors. This is known as a *gossip explosion*. Three things happen: The ecstatic household drops back down to a lower level of glee (one, two, or three, depending on the type of house). But at the same time, each of the neighbors jumps up one level in happiness. The neighbors also move over to your side. If you watch the two maps, you'll see the happy colors change on the big map. You'll

also see your own color spread outward on the smaller map.

Player	Color
Player 1	Black
Player 2	White
Neutral	Gray

As the game begins, a majority of cells are neutral, but once a household is converted to one side or the other, it can never again become neutral.

You win and lose games by controlling strategically located joyous households. If you click on a red piece, it affects all of the neighboring pieces. If a neighbor is also joyous, it explodes. It's fairly common to see long strings of chain reactions as gossip spreads through a block of neighbors and gradually affects every house in the city.

As you plan your strategy, remember this: If you own a joyous Karmalite, color red, and your own Karmalite lives next door to another joyous Karmalite on your enemy's side, either one of you can capture both of them (plus all of their neighbors).

From Condos To Suburbs

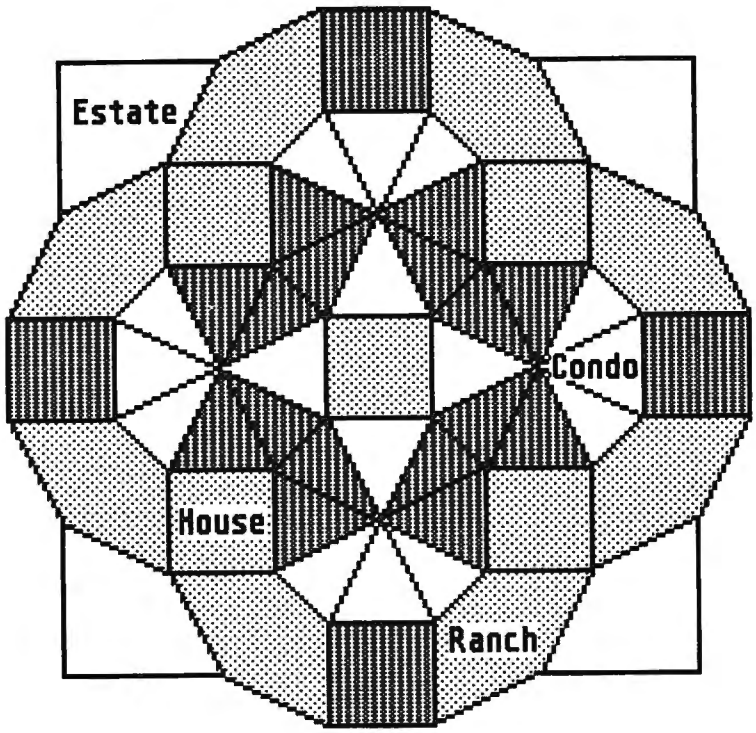
The city of Karma offers elegant living arranged as four types of dwelling units:

Unit	Points	Min. Happiness
Condos	3	Content/2
Houses	4	Gloomy/1
Ranches	4	Gloomy/1
Estates	2	Pleased/3

The condos appear on the screen as four pie-shaped units of eight wedge-shaped condos. Each condo has three neighbors and is worth three points. A group of eight condos looks circular like a pie and is commonly referred to as a *condo pie.*

Houses and ranches have four neighbors and a value of four. There are nine houses, which are square in shape. The house at the very top of the city is connected with the house on the southern edge. Likewise, the east and west houses are neighbors. The eight ranches are the five-sided shapes on the fringe of Karma. Each ranch borders on two houses, one condo, and an estate.

In the outer corners, you'll see the four estates. They have only two neighbors (both of which are ranches) and are worth two points.



The four types of properties in "Karma."

Scoring And Winning

At the end of each turn, both players are awarded popularity points according to which households they've swayed to their sides. The points accumulate as the game progresses. If you control 12 condos, 3 houses, a ranch, and 2 estates, you'll gain 56 points: $(12 \times 3) + (3 \times 4) + (1 \times 4) + (2 \times 2)$.

Underneath the score is a second number that indicates how many households are on your side. If this number dwindles to zero, the game automatically ends, because you can only click on households you currently own. If you don't own any, you can't make a move.

In the first three games, the points are irrelevant, except to provide the loser with some consolation in the case that he or she loses while leading in points. The fourth game (2500 points) is just what you might think. The first person to reach 2500 wins.

In game 1 (Capture All), the goal is to send your opponent packing. As soon as one player has no more friendly households, the game ends.

Game 2 (Two Pies) takes a little less time, since the purpose is to capture two complete eight-unit condo pies. There are four condo blocks, so you might believe a tie—two blocks each—could happen, but it's impossible. Say player 1 made a move that yielded complete control of two blocks (16 condos) and that the other player also owned two blocks at the end of the turn. Player 2 can't capture any cells during player 1's turn, so for a tie to occur, player 2 would have had to own two complete blocks before player 1 started his or her turn. But in that case, player 2 would have won the game before player one moved the mouse. Ties are impossible.

In the Four Corners game (game 3), your aim is to capture all four corner estates. Each corner has only two neighbors, so this is a game where defense is crucial. Once you control a corner, you can—and should try to—hold on to it for as long as you can.

Strategies And Tactics

The joyous households are on the verge of exploding with gossip, so watch them. At the beginning of

Karma, you may want to set off several strategic explosions, in order to gain more territory to develop.

In the middle game, push a few isolated cells (households in an unhappy neighborhood) up to the red level, and then leave them as an investment in the future. There's nothing worse than setting off a chain reaction that leaves the board in a situation where your opponent simply replies with another chain reaction that decimates your troops. If you have nothing but blues, you can't do much to get back.

The final few moves are crucial. You'll often see a city where one move creates a small chain reaction, while another move removes your opponent from play.

Although reds are primed to explode, maroons will often receive gossip from two directions. If three reds are immediate neighbors, all three will explode. If a maroon is next to two of the reds, it will receive gossip from two directions and will also explode.

Karma

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

```
'Copyright 1987
'COMPUTE! Publications, Inc.
'All Rights Reserved.

DEFINT a-z:DEFSNG r,g,b
DIM sides(52),xcord(52,5),ycord(52,5),numadjacen
ts(52),neighbors(52,3)
DIM owner(52),renter(52),update(52),start(20),xf
ind(52),yfind(52)
DIM r(15),g(15),b(15),ToDo(100)
gamenum=1

RANDOMIZE TIMER

SCREEN 1,320,200,4,1:WINDOW 3,"",(0,0)-(311,186)
,16,1:WINDOW OUTPUT 3

newgame:

COLOR 1,0:CLS:score(1)=10:score(2)=10
COLOR 1,2:LOCATE 8,13:PRINT"     Karma     "
COLOR 1,0:PRINT:PRINT"  Copyright 1987 Compute!
Publ., Inc."
PRINT"          All Rights Reserved"
PRINT:PRINT:COLOR 1,2
PRINT"               Choose game.             ":C
OLOR 0,1:PRINT

PRINT "            1. Capture All             "
PRINT "            2. Four Corners            "
PRINT "            3. Two Pies                "
PRINT "            4. 2500 Points             "

GetAKey:
a$=INKEY$:IF a$="" THEN GetAKey
IF a$<"1" OR a$>"4" THEN GetAKey
gamenum=VAL(a$):LOCATE 21,19:PRINT " "a$" "

RESTORE findpoints
FOR i=0 TO 52
 READ x,y:xfind(i)=x*10:yfind(i)=y*10
NEXT i

RESTORE Karma
FOR i=0 TO 52
 READ sides(i)
 FOR ii=0 TO sides(i)-2
  READ xc,yc
  xcord(i,ii)=xc*12
  ycord(i,ii)=yc*12
 NEXT ii
 READ numadjacents(i)
 FOR ii=0 TO numadjacents(i)-1
  READ neighbors(i,ii)
 NEXT ii
NEXT i

RESTORE thecoLors
FOR i=0 TO 15
 READ r,g,b:r(i)=r/100:g(i)=g/100:b(i)=b/100
 PALETTE i,r(i),g(i),b(i)
NEXT i

thecoLors:

DATA 50,40,30
DATA 16,16,16
DATA 0,0,0
DATA 0,5,40
DATA 25,5,30
DATA 50,5,20
DATA 75,5,10
DATA 100,5,0
DATA 100,55,0
DATA 30,30,30
DATA 0,0,0
DATA 70,70,70
DATA 0,0,0
DATA 0,0,0
DATA 0,0,0
DATA 0,0,0

COLOR 1,0:FOR i=0 TO 24:PRINT:NEXT i

LOCATE 1,8:COLOR 10,11:PRINT" K a r m a "
COLOR 11,10:LOCATE 1,25

IF gamenum=1 THEN PRINT " Capture All "
IF gamenum=2 THEN PRINT " Four Corners "
IF gamenum=3 THEN PRINT " Two Pies "
IF gamenum=4 THEN PRINT " 2500 Points "

RESTORE start
FOR i=0 TO 19
 READ start(i)
NEXT i

start:
DATA 4,13,5,14,11,15,23,33,24,34,25,35,18,8,30,2
0,37,36,39,38

FOR i=0 TO 52
 owner(i)=0:renter(i)=0:update(i)=0
NEXT i

FOR i=0 TO 19
 owner(start(i))=(i AND 1)+1:renter(start(i))=1
NEXT i

FOR i=0 TO 52
 GOSUB DoOne
NEXT i

pLayer=2:pLay$(1)="black":pLay$(2)="white"

game:

pLayer=3-pLayer
LOCATE 7,25:COLOR 9+pLayer,9:PRINT " ";pLay$(pLa
yer);"'s turn "

Loop:

WHILE MOUSE(0)=0:WEND
x=MOUSE(1):y=MOUSE(2):hue=POINT(x,y)
IF hue<3 OR hue>8 THEN Loop
PALETTE 15,r(hue),g(hue),b(hue)
PAINT (x,y),15,2

which=-1
FOR i=0 TO 52
 IF POINT(xfind(i),yfind(i))=15 THEN which=i
NEXT i
IF which<0 THEN STOP
```

```
IF owner(which)<>pLayer THEN PAINT (x,y),hue,2:G
OTO Loop
 
SOUND WAIT
SOUND 130,10,,0:SOUND 130.5,10,,2
SOUND RESUME
 
FOR reaL=0 TO 1 STEP .02
 h=hue:r=reaL
 PALETTE 15,r(h)+.25*r,.05,b(h)-.1*r
NEXT reaL
 
MaxToDo=0
 
again:
 
renter(which)=renter(which)+1
IF renter(which)+1>numadjacents(which) THEN 
 FOR i=0 TO numadjacents(which)-1
  MaxToDo=MaxToDo+1:t=neighbors(which,i):ToDo(Ma
xToDo)=t
  REM  PAINT (xfind(t),yfind(t)),POINT(xfind(t),
yfind(t))+1,2
 NEXT i:SOUND WAIT:SOUND 200+which*16,1,,0:SOUND
 200+which*8,1,,2:SOUND RESUME 
 renter(which)=renter(which)-numadjacents(which)
 
END IF 
 
i=which
IF owner(i)=3-pLayer THEN score(3-pLayer)=score(
3-pLayer)-1
IF owner(i)<>pLayer THEN score(pLayer)=score(pLa
yer)+1
owner(i)=pLayer:GOSUB DoOne:SOUND 200+6*which,.1
5,80,1
IF score(1)=0 OR score(2)=0 THEN gameover
IF MaxToDo<>0 THEN which=ToDo(MaxToDo):MaxToDo=M
axToDo-1:GOTO again
 
WHILE MOUSE(0)<0:WEND
 
IF gamenum=2 AND ((owner(0) AND owner(1) AND own
er(2) AND owner(3))<>0) THEN gameover
IF gamenum=3 THEN
 win1=0:win2=0
 FOR j=0 TO 3
  garbage=owner(j*8+4)
  FOR k=1 TO 7
   garbage=owner(j*8+4+k) AND garbage
  NEXT k
  IF garbage=1 THEN win1=win1+1
  IF garbage=2 THEN win2=win2+1
 NEXT j
 IF win1>=2 OR win2>=2 THEN gameover
END IF   
FOR j=1 TO 2
 FOR i=0 TO 52
  IF owner(i)=j THEN points(j)=points(j)+numadja
cents(i)
 NEXT i
NEXT j
LOCATE 23,25:COLOR 10,0:PRINT points(1)
LOCATE 23,32:COLOR 11,0:PRINT points(2)
IF gamenum=4 AND (points(1)>2499 OR points(2)>24
99) THEN gameover
 
GOTO game
 
SCREEN CLOSE 1
 
GOTO doIt
 
END
 
DoOne:
 
si2=sides(i)-2:COLOR 7-(numadjacents(i)-renter(i
)),0
AREA (xcord(i,si2)+12,ycord(i,si2)+12)
FOR ii=0 TO si2
 AREA (xcord(i,ii)+12,ycord(i,ii)+12)
NEXT ii
AREAFILL
COLOR 2,1
PSET (xcord(i,si2)+12,ycord(i,si2)+12)
FOR ii=0 TO si2
 LINE -(xcord(i,ii)+12,ycord(i,ii)+12)
NEXT ii
 
DoOne2:
 
si2=sides(i)-2:COLOR owner(i)+9,1
AREA (xcord(i,si2)/2+202,ycord(i,si2)/2+90)
FOR ii=0 TO si2
 AREA (xcord(i,ii)/2+202,ycord(i,ii)/2+90)
NEXT ii
AREAFILL
COLOR 1,1
PSET (xcord(i,si2)/2+202,ycord(i,si2)/2+90)
FOR ii=0 TO si2
 LINE -(xcord(i,ii)/2+202,ycord(i,ii)/2+90)
NEXT ii
RETURN
 
gameover:
FOR i=0 TO 52
 GOSUB DoOne2
NEXT i 
FOR i=0 TO 40
 FOR j=0 TO 3
  SOUND RND*i*10,2,,j
 NEXT j
NEXT i  
FOR i=40 TO 0 STEP -1
 FOR j=0 TO 3
  SOUND RND*i*10,2,,j
 NEXT j
NEXT i  
FOR i=0 TO 10000:NEXT i
RUN
 
Karma:
 
DATA 5, 1,1, 4,1, 3,3, 1,4
DATA 2, 43,44
DATA 5, 10,1, 13,1, 13,4, 11,3
DATA 2, 45,46
DATA 5, 11,11, 13,10, 13,13, 10,13
DATA 2, 40,47
DATA 5, 1,10, 3,11, 4,13, 1,13
DATA 2, 41,42
DATA 4, 6,2, 8,2, 7,4
DATA 3, 5,11,39
DATA 4, 8,2, 9,3, 7,4
DATA 3, 4,6,45
DATA 4, 9,3, 9,5, 7,4
DATA 3, 5,7,50
DATA 4, 9,5, 8,6, 7,4
DATA 3, 6,8,19
DATA 4, 8,6, 6,6, 7,4
DATA 3, 7,9,52
DATA 4, 6,6, 5,5, 7,4
DATA 3, 8,10,29
DATA 4, 5,5, 5,3, 7,4
DATA 3, 9,11,49
DATA 4, 5,3, 6,2, 7,4
DATA 3, 4,10,44
DATA 4, 9,5, 11,5, 10,7
DATA 3, 13,19,50
DATA 4, 11,5, 12,6, 10,7
DATA 3, 12,14,46
DATA 4, 12,6, 12,8, 10,7
DATA 3, 13,15,36
DATA 4, 12,8, 11,9, 10,7
DATA 3, 14,16,47
DATA 4, 11,9, 9,9, 10,7
DATA 3, 15,17,51
DATA 4, 9,9, 8,8, 10,7
DATA 3, 16,18,21
DATA 4, 8,8, 8,6, 10,7
DATA 3, 17,19,52
DATA 4, 8,6, 9,5, 10,7
DATA 3, 7,12,18
DATA 4, 6,8, 8,8, 7,10
DATA 3, 21,27,52
```

```
DATA 4, 8,8,.9,9, 7,10
DATA 3, 17,20,22
DATA 4, 9,9, 9,11, 7,10
DATA 3, 21,23,51
DATA 4, 9,11, 8,12, 7,10
DATA 3, 22,24,40
DATA 4, 8,12, 6,12, 7,10
DATA 3, 23,25,37
DATA 4, 6,12, 5,11, 7,10
DATA 3, 24,26,41
DATA 4, 5,11, 5,9, 7,10
DATA 3, 25,27,48
DATA 4,5,9, 6,8, 7,10
DATA 3, 20,26,31
DATA 4, 3,5, 5,5, 4,7
DATA 3, 29,35,49
DATA 4, 5,5, 6,6, 4,7
DATA 3, 9,28,30
DATA 4, 6,6, 6,8, 4,7
DATA 3, 29,31,52
DATA 4, 6,8, 5,9, 4,7
DATA 3, 27,30,32
DATA 4, 5,9, 3,9, 4,7
DATA 3, 31,33,48
DATA 4, 3,9, 2,8, 4,7
DATA 3, 32,34,42
DATA 4, 2,8, 2,6, 4,7
DATA 3, 33,35,38
DATA 4, 2,6, 3,5, 4,7
DATA 3, 28,34,43
DATA 5, 12,6, 14,6, 14,8, 12,8
DATA 4, 14,38,46,47
DATA 5, 6,12, 8,12, 8,14, 6,14
DATA 4, 24,39,40,41
DATA 5, 0,6, 2,6, 2,8, 0,8
DATA 4, 34,36,42,43
DATA 5, 6,0, 8,0, 8,2, 6,2
DATA 4, 4,37,44,45
DATA 6, 9,11, 11,11, 10,13, 8,14, 8,12
DATA 4, 2,23,37,51
DATA 6, 3,11, 5,11, 6,12, 6,14, 4,13
DATA 4, 3,25,37,48
DATA 6, 0,8, 2,8, 3,9, 3,11, 1,10
DATA 4, 3,33,38,48
DATA 6, 1,4, 3,3, 3,5, 2,6, 0,6
DATA 4, 0,35,38,49
DATA 6, 4,1, 6,0, 6,2, 5,3, 3,3
DATA 4, 0,11,39,49
DATA 6, 8,0, 10,1, 11,3, 9,3, 8,2
DATA 4, 1,5,39,50
DATA 6, 11,3, 13,4, 14,6, 12,6, 11,5
DATA 4, 1,13,36,50
DATA 6, 12,8, 14,8, 13,10, 11,11, 11,9
DATA 4, 2,15,36,51
DATA 5, 3,9, 5,9, 5,11, 3,11
DATA 4, 26,32,41,42
DATA 5, 3,3, 5,3, 5,5, 3,5
DATA 4, 10,28,43,44
DATA 5, 9,3, 11,3, 11,5, 9,5
DATA 4, 6,12,45,46
DATA 5, 9,9, 11,9, 11,11, 9,11
DATA 4, 16,22,40,47
DATA 5, 6,6, 6,8, 8,8, 8,6
DATA 4, 8,18,20,30

findpoints:

DATA 4,4, 16,5, 16,15, 4,15
DATA 10,4, 11,5, 11,6, 11,7, 10,8, 9,7, 8,6, 9,5

DATA 13,8, 14,9, 15,10, 15,11, 13,11, 12,11, 12,
10, 12,8
DATA 10,11, 11,12, 11,13, 11,15, 10,15, 9,14, 8,
13, 8,12
DATA 6,8, 7,9, 8,10, 8,11, 6,11, 5,11, 5,10, 5,8

DATA 17,10, 10,17, 3,10, 10,3
DATA 13,16, 7,16, 4,13, 4,7, 7,3, 12,3, 16,7, 16
,12
DATA 6,13, 6,6, 13,6, 13,13
DATA 10,10
```

©

GET And PUT Graphics Commands For Atari

Bernard Cozier

BASIC and assembly language programmers alike will appreciate the two new graphics commands, GET and PUT. With these commands, any rectangular region can be captured from the screen and moved to any other screen location. Four demonstration programs are included to help you get started. For all Atari eight-bit computers. Joystick required for demo programs.

Although the Atari was designed nearly ten years ago, its graphics system is still widely respected. It was one of the first computers to have independently movable screen objects (known on other computers as *sprites*). Although the Atari's objects (called *player/missiles*) are useful, they do have some limitations. First, each of the four players are only eight pixels wide; the four missiles are each two pixels wide. Also, each player/missile is limited to one color.

"GET and PUT Graphics Commands" overcomes these limitations by letting you save and restore graphics directly on the graphics screen in any mode. For example, you can use the PLOT and LINE commands to draw a dolphin, then use GET to save the picture in memory. Now, you can put as many copies of the dolphin on the screen as you like. You can even make it swim across the screen. The new commands are similar to the graphics GET and PUT commands in the IBM and Amiga versions of Microsoft BASIC.

I've included versions of GET And PUT for both BASIC and machine language programmers.

Using The Program

Atari BASIC users should type in Program 1. The program contains a machine language program in the form of DATA statements, so be sure to use the "Atari Proofreader," found elsewhere in this issue, when you enter the program. Save a copy of Program 1 to tape or disk before attempting to run it. As it is listed, the program does nothing when it is run—it is simply a skeleton around which you can build your own programs. Programs 2–5 are demo programs to help you get started. To use them, load Program 1. Then, add the lines from one of the four demo programs. When you finish, save a copy of the complete program and then type RUN. The best way to learn how to use the new routines is by studying and modifying these demos.

Demo 1 (Program 2) uses PLOT and DRAWTO to draw a large box. When the box appears, use a joystick to move it around the screen. Demo 2 (Program 3) draws a face. Hold down the joystick trigger to animate it. Demo 3 (Program 4) shows how you can use GET And PUT to make windows on the text screen. Demo 4 (Program 5) demonstrates the collision register, described below. Program 5 includes a number of special graphics characters. Be sure to refer to the "Guide to Typing In Programs" article elsewhere in this issue for information on typing these characters. In particular, there are two inverse-video spaces between the CTRL-G and CTRL-F in line 33.

Calling GET And PUT

Since the new commands are written in machine language, they're accessed with BASIC's USR function. The syntax for GET is

```
D=USR(ADR(GP$)+GET,X,Y,WIDTH
,LENGTH,BYTES PER
ROW,ADR(IMAGE$))
```

The syntax for PUT is

```
D=USR(ADR(GP$)+PUT,X,Y,WIDTH
,LENGTH,BYTES PER
ROW,ADR(IMAGE$),CMD)
```

These commands are lengthy, so let's step through them parameter by parameter.

ADR(GP$)+GET Or ADR(GP$)+PUT

BASIC's ADR function is used to find the address of the string that holds the machine language GET/PUT routines. Note: Since both routines have the same starting address, the +GET and +PUT are

not strictly necessary (both are initialized to 0 at the start of the program). However, it makes it much easier to debug your programs if you can tell at a glance which statements do a PUT and which do a GET.

X

This is the horizontal byte offset from the left side of the screen for the object you wish to GET or PUT. For text mode, this works out to be the number of characters from the left side of the screen. For GTIA graphics modes (9–11), divide the number of pixels by 2 to find X. For four-color graphics modes (3, 5, and 7), divide by 4. For two-color modes (4, 6, and 8), divide by 8.

Since you can only GET and PUT to byte locations, horizontal movement may be a little choppy in certain graphics modes. For example, in mode 7, you must divide by 4 to find X. If you GET an image in mode 7, you can can put it down only at every fourth pixel. Anything that moves across the screen will jump four pixels at a time. There are a few solutions to this problem. First, you may decide that the motion is acceptable for your application. Second, you may use vertical motion instead (vertical motion can always be done pixel by pixel). Finally, you can use PLOT and DRAW to redraw your shape four times, horizontally offset by a pixel each time. Each time you draw your picture, use GET to store it in a different variable. Now you can achieve smooth horizontal movement by PUTting all four images into the same place, then going to the next X location repeating the process. The four PUTs each move the entire image one pixel; then you reset to the first picture and move by one byte. This process is known as *preshifting*. It is commonly used on computers such as the Apple II and the Atari ST to achieve smooth animation.

Y

This is the vertical starting point for the image that you wish to PUT or GET.

WIDTH

This is the width in bytes of the image you wish to GET or PUT. In two-color modes, every eight pixels make up one byte. In four-color modes, four pixels make up a byte. In GTIA modes, two pixels make up a byte. Be sure that you use a large enough number to get your entire picture.

LENGTH

This is the number of pixels of your image height.

BYTES PER ROW

This is the number of bytes per row in the graphics mode that you're using. Here's a list of the most popular graphics modes and the proper value for this variable:

Graphics Mode	Bytes Per Row
0	40
1	20
2	20
3	10
4	10
5	20
6	20
7–11	40
12	40
13	40
14	20
15	40

Note that graphics modes 12–15 are available only on XL and XE models.

ADR(IMAGE$)

Strings are the best way to hold image data. Be sure to dimension your string to the proper size and clear it out before using it. (For a fast way to clear out a string, see line 20 in Program 2.) The size of the string should be WIDTH * LENGTH.

CMD

CMD (for CoMmanD) is used only for PUT operations. When CMD is set to 0, the image you are placing on the screen overwrites everything that was on the screen in that area. When CMD is set to 1, an overlay is done instead—background objects show through any holes in your picture.

Finally, the value returned by the GET/PUT function (assigned to the variable D in the example line above) is a way to test for collisions. When you perform a GET, this value will be 1 if the area you grabbed contained a picture, 0 if this area was blank. If you are performing a PUT operation, this value will be 1 if there was a picture in the area *before* the PUT took place.

Assembly Language GET And PUT

Machine language programmers can also take advantage of GET and PUT. Use Program 6 as a skeleton for your own programs. To use the routine, just store the values in the proper variables and execute a JSR GET or JSR PUT. The following table shows how the assembly language variables compare to the BASIC ones.

Assembly Language	BASIC
XLSB, XMSB	X
YLSB, YMSB	Y
WIDTH	WIDTH
LENGTH	LENGTH
BYTESLSB, BYTESMSB	BYTES PER ROW
IMAGELSB, IMAGEMSB	ADR(IMAGE$)
CMD	CMD

Many of the variables are broken up into LSB (Least Significant Byte) and MSB (Most Significant Byte) in assembly language. See your assembler's manual for ways to break up a number into high-byte/low-byte form.

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

Program 1: GET And PUT

```
OP 1000 REM D=USR(ADR(GP$)+
        GET,X,Y,WIDTH,LENGTH
        ,BYTES PER ROW,ADR(I
        MAGE$))
AJ 1010 REM D=USR(ADR(GP$)+
        PUT,X,Y,WIDTH,LENGTH
        ,BYTES PER ROW,ADR(I
        MAGE$),CMD)
GG 1015 REM COPYRIGHT 1987 C
        OMPUTE! PUBLICATIONS
        , INC.(3 SPACES)ALL
        RIGHTS RESERVED
EE 1020 DIM GP$(244):FOR I=1
         TO 244:READ CODE:GP
        $(I,I)=CHR$(CODE):NE
        XT I:LET GET=0:LET P
        UT=0:RETURN
FE 1021 DATA 104,56,233,6,13
        3,227,104,133,215,10
        4,133,214,104,133,21
        7,104
NN 1022 DATA 133,216,104,104
        ,133,218,104,104,133
        ,219,104,133,221,104
        ,133,220
BB 1023 DATA 104,133,223,104
        ,133,222,165,227,201
        ,0,240,4,104,104,133
        ,224
AI 1024 DATA 169,0,133,212,1
        33,213,165,88,24,101
        ,214,133,225,165,89,
        101
CJ 1025 DATA 215,133,226,162
        ,0,228,216,240,32,16
        5,225,24,101,220,133
        ,225
```

```
GM 1026 DATA 165,226,101,221
        ,133,226,165,216,56,
        233,1,133,216,165,21
        7,233
PL 1027 DATA 0,133,217,169,0
        ,201,0,240,220,228,2
        17,240,6,169,0,201
DG 1028 DATA 0,240,214,162,1
        ,160,0,196,218,240,8
        1,165,227,201,1,208
JE 1029 DATA 55,165,224,201,
        1,208,22,177,222,201
        ,0,240,10,177,225,20
        1
CA 1030 DATA 0,240,4,169,1,1
        33,212,177,222,201,0
        ,240,20,165,224,201
CM 1031 DATA 1,240,10,177,22
        5,201,0,240,4,169,1,
        133,212,177,222,145
PL 1032 DATA 225,200,169,0,2
        01,0,240,191,177,225
        ,201,0,240,6,169,1
AF 1033 DATA 133,212,177,225
        ,145,222,169,0,201,0
        ,240,229,228,219,240
        ,35
PC 1034 DATA 160,0,165,222,2
        4,101,218,133,222,16
        5,223,105,0,133,223,
        165
FE 1035 DATA 225,24,101,220,
        133,225,165,226,101,
        221,133,226,232,169,
        0,201
DI 1036 DATA 0,240,191,96
```

Program 2: Demo 1

```
OC 5 REM COPYRIGHT 1987 COMP
     UTE' PUBLICATIONS, INC.
      ALL RIGHTS RESERVED.
GF 8 PRINT "{CLEAR}COPYRIGHT
      1987":PRINT "COMPUTE!
     PUBLICATIONS, INC.":PRI
     NT "ALL RIGHTS RESERVED
     ."
BD 10 GOSUB 1000:GOSUB 2000
LD 20 DIM A$(20*48):A$=CHR$(
     0):A$(20*48)=CHR$(0):A
     $(2)=A$
BI 30 GRAPHICS 7+16:SETCOLOR
      0,3,0:SETCOLOR 1,0,15
     :SETCOLOR 2,8,0
HP 40 COLOR 1:PLOT 0,0:DRAWT
     O 79,0:DRAWTO 79,47:DR
     AWTO 0,47:DRAWTO 0,0:C
     OLOR 2:DRAWTO 79,47:PL
     OT 79,0:DRAWTO 0,47
LA 45 COLOR 3:PLOT 0,23:DRAW
     TO 79,23:PLOT 39,0:DRA
     WTO 39,47
EG 50 D=USR(ADR(GP$)+GET,0,0
     ,20,48,40,ADR(A$))
CL 60 X=0:Y=0
PK 80 S=STICK(0):X=X+DX(S):Y
     =Y+DY(S)*2:X=X+(X<0)-(
     X>20):Y=Y+2*(Y<0)-2*(Y
     >48)
OP 85 D=USR(ADR(GP$)+PUT,X,Y
     ,20,48,40,ADR(A$),0):G
     OTO 80
GF 2000 DIM DX(15),DY(15):FO
        R I=1 TO 15:READ COD
        E:DX(I)=CODE:NEXT I:
        RETURN
IA 2010 FOR I=1 TO 15:READ C
        ODE:DY(I)=CODE:NEXT
        I:RETURN
KD 2020 DATA 0,0,0,0,1,1,1,0
        ,-1,-1,-1,0,0,0,0,0
KE 2030 DATA 0,0,0,0,1,-1,0,
        0,1,-1,0,0,1,-1,0
```

Program 3: Demo 2

```
OC 5 REM COPYRIGHT 1987 COMP
     UTE! PUBLICATIONS, INC.
      ALL RIGHTS RESERVED.
GF 8 PRINT "{CLEAR}COPYRIGHT
      1987":PRINT "COMPUTE!
     PUBLICATIONS, INC.":PRI
     NT "ALL RIGHTS RESERVED
     ."
FK 10 DIM A$(3*10*40):A$=CHR
     $(0):A$(3*10*40)=CHR$(
     0):A$(2)=A$
HB 20 GOSUB 1000:I=0:GOTO 65
GD 30 GRAPHICS 7:SETCOLOR 2,
     8,0:COLOR 3
EG 40 PLOT 9,9:PLOT 0,0:DRAW
     TO 39,0:DRAWTO 39,P*5+
     1:DRAWTO 19,P*5+1:DRAW
     TO 19,40-P*5:DRAWTO 39
     ,40-P*5:DRAWTO 39,39
JF 50 DRAWTO 0,39:DRAWTO 0,0
HK 60 D=USR(ADR(GP$)+GET,0,0
     ,10,40,40,ADR(A$)+(I-1
     )*10*40)
JG 65 I=I+1
HB 70 IF I=1 THEN P=2:GOTO 3
     0
HE 71 IF I=2 THEN P=3:GOTO 3
     0
HH 72 IF I=3 THEN P=4:GOTO 3
     0
BL 80 GRAPHICS 7:SETCOLOR 2,
     8,0:X=14:Y=19:I=1:DI=1
ED 90 D=USR(ADR(GP$)+PUT,X,Y
     ,10,40,40,ADR(A$)+(I-1
     )*10*40,0)
JE 100 IF STRIG(0)<>0 THEN 1
     00
BJ 110 I=I+DI
PD 120 IF DI=1 THEN IF I=3 T
     HEN DI=-1:GOTO 140
QK 130 IF DI=-1 THEN IF I=1
     THEN DI=1
FH 140 FOR DE=1 TO 30:NEXT D
     E:GOTO 90
```

Program 4: Demo 3

```
KB 0 GOTO 8
BB 1 IF PEEK(764)<>255 THEN
     POKE 764,255:FLAG=1:GOT
     O 30:RETURN
BC 2 RETURN
OC 5 REM COPYRIGHT 1987 COMP
     UTE! PUBLICATIONS, INC.
      ALL RIGHTS RESERVED.
GF 8 PRINT "{CLEAR}COPYRIGHT
      1987":PRINT "COMPUTE!
     PUBLICATIONS, INC.":PRI
     NT "ALL RIGHTS RESERVED
     ."
DP 10 DIM A$(20*12*5)
BE 20 GOSUB 1000:FLAG=0
DE 30 GRAPHICS 0
FJ 35 POKE 82,2:POKE 752,0:?
      :? "ENTER DELAY (1-50
     0)";:INPUT N:IF N>500
     OR N<1 THEN 35
CB 37 ? CHR$(125):POKE 752,1
     :POKE 82,0
ED 38 IF FLAG=1 THEN 110
MP 40 POSITION 0,0:? "{Q}
     {18 R}{E)":FOR I=1 TO
     10:? "|{18 SPACES}|":NE
     XT I
LB 50 POSITION 0,11:? "{Z}
     {18 R}{C}"
NC 55 POSITION 1,7:? " Just
     an example":POSITION 1
     ,8:? " of how it's don
     e"
OI 60 FOR I=0 TO 4:POSITION
     1,5:? " THIS IS WINDOW
      #";I+1:D=USR(ADR(GP$)
     +GET,0,0,20,12,40,ADR(
     A$)+I*20*12):NEXT I
PM 110 FOR I=0 TO 4:D=USR(AD
       R(GP$)+PUT,I*4.98,I*2
       .98,20,12,40,ADR(A$)+
       I*20*12,0):FOR DE=1 T
       O N:GOSUB 1:NEXT DE:N
       EXT I
```

Program 6: Assembly Language Skeleton

```
10 ;Copyright 1987, COMPUTE' Publications, Inc. All rights reserved.
1000 XLSB =  214
1010 XMSB =  215
1020 YLSB =  216
1030 YMSB =  217
1040 WIDTH = 218
1050 LENGTH = 219
1060 BYTESLSB = 220
1070 BYTESMSB = 221
1080 IMAGELSB = 222
1090 IMAGEMSB = 223
1100 CMD =   224
1110      *=  $FFFF   ;Place your program's beginning assembling address here
1120      JMP BEGIN
1130 GET LDA #0
1140      JMP GP
1150 PUT LDA #1
1160 GP  STA 227
1170      .BYTE 169,0,133,212,133,213,1
1180      .BYTE 214,133,225,165,89,101,215,133,226,162
1190      .BYTE 0,228,216,240,32,165,225,24,101,220
1200      .BYTE 133,225,165,226,101,221,133,226,165,216
1210      .BYTE 56,233,1,133,216,165,217,233,0,133
1220      .BYTE 217,169,0,201,0,240,220,228,217,240
1230      .BYTE 6,169,0,201,0,240,214,162,1,160
1240      .BYTE 0,196,218,240,81,165,227,201,1,208
1250      .BYTE 55,165,224,201,1,208,22,177,222,201
1260      .BYTE 0,240,10,177,225,201,0,240,4,169
1270      .BYTE 1,133,212,177,222,201,0,240,20,165
1280      .BYTE 224,201,1,240,10,177,225,201,0,240
1290      .BYTE 4,169,1,133,212,177,222,145,225,200
1300      .BYTE 169,0,201,0,240,191,177,225,201,0
1310      .BYTE 240,6,169,1,133,212,177,225,145,222
1320      .BYTE 169,0,201,0,240,229,228,219,240,35
1330      .BYTE 160,0,165,222,24,101,218,133,222,165
1340      .BYTE 223,105,0,133,223,165,225,24,101,220
1350      .BYTE 133,225,165,226,101,221,133,226,232,169
1360      .BYTE 0,201,0,240,191,96
1370 ; Begin your assembly language program at line 1400
1380 ; To use the routine, just store your values into the appropriate variables
 and do a 'JSR GET' or 'JSR PUT'
1390 BEGIN
```

```
MK 120 FOR I=0 TO 4:D=USR(AD
      R(GP$)+PUT,20-I*4.98,
      I*2.98,20,12,40,ADR(A
      $)+I*20*12,0):FOR DE=
      1 TO N:GOSUB 1:NEXT D
      E
CF 125 NEXT I:GOTO 110
```

Program 5: Demo 4

```
OC 5 REM COPYRIGHT 1987 COMP
     UTE! PUBLICATIONS, INC.
     ALL RIGHTS RESERVED.
GF 8 PRINT "{CLEAR}COPYRIGHT
     1987":PRINT "COMPUTE!
     PUBLICATIONS, INC.":PRI
     NT "ALL RIGHTS RESERVED
     ."
BO 10 GOSUB 1000:GOSUB 2000
JL 20 DIM A$(4*3),B$(4*3):A$
     =CHR$(0):A$(4*3)=CHR$(
     0):A$(2)=A$:B$=A$
HH 30 GRAPHICS 0:POKE 82,0:P
     OKE 752,1
DI 31 POSITION 0,0:? " {Q}
     {E} "
BM 32 POSITION 0,1:? " || "
HD 33 POSITION 0,2:? "{G}■
     {F}"
OB 34 D=USR(ADR(GP$)+GET,0,0
     ,4,3,40,ADR(A$))
JB 35 ? CHR$(125)
NC 40 POSITION 0,0:? "{Q}
     {37 R}{E}"
FN 50 FOR I=1 TO 22:POSITION
      0,I:? "|":POSITION 39
     ,I:? "|";:NEXT I
EL 60 POSITION 0,23:? "{Z}
     {37 R}{C}";
JE 70 FOR I=0 TO 40:POSITION
      INT(RND(0)*37)+1,INT(
     RND(0)*21)+1:? "{T}":N
     EXT I
OJ 80 X=17:Y=9:D=USR(ADR(GP$
     )+PUT,X,Y,4,3,40,ADR(A
     $),1)
EP 90 S=STICK(0):IF S=15 THE
     N 90
PP 100 D=USR(ADR(GP$)+PUT,X,
     Y,4,3,40,ADR(B$),0):X
     =X+DX(S):Y=Y+DY(S):D=
     USR(ADR(GP$)+GET,X,Y,
     4,3,40,ADR(B$))
OF 110 D=USR(ADR(GP$)+PUT,X,
     Y,4,3,40,ADR(A$),1):I
     F D=0 THEN 90
AF 120 D=USR(ADR(GP$)+PUT,X,
     Y,4,3,40,ADR(B$),0):X
     =X-DX(S):Y=Y-DY(S):D=
     USR(ADR(GP$)+GET,X,Y,
     4,3,40,ADR(B$))
LB 130 D=USR(ADR(GP$)+PUT,X,
     Y,4,3,40,ADR(A$),1):G
     OTO 90
EL 2000 DIM DX(15),DY(15):FO
     R I=1 TO 15:READ COD
     E:DX(I)=CODE:NEXT I
IA 2010 FOR I=1 TO 15:READ C
     ODE:DY(I)=CODE:NEXT
     I:RETURN
KD 2020 DATA 0,0,0,0,1,1,1,0
     ,-1,-1,-1,0,0,0,0
KE 2030 DATA 0,0,0,0,1,-1,0,
     0,1,-1,0,0,1,-1,0
```

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Apple Kaleidoscope

Danny Faught

Turn your computer into an electronic kaleidoscope with these four programs. Each short program illustrates the techniques behind creating mesmerizing computer graphics, and a helpful tutorial discussion is included. Even if you don't own an Apple, the concepts and sample programs presented here can be used on almost any computer.

Kaleidoscope programs are not only entertaining to watch, but they provide excellent examples of how to generate computer graphics. Here, we offer four different kaleidoscope programs for the Apple that produce interesting high-resolution (hi-res) graphics. We'll discuss how each design is created and how the programs may be modified to run on other computers.

Four-Image Reflections

The first two examples divide the screen into four sections, creating a three-mirror kaleidoscope pattern.

The first example is fairly simple. This program chooses a random point in the upper left quarter of the screen and plots it. Now, to create the kaleidoscope effect, the point is mirrored onto the other three quarters of the screen. Mirroring graphics is the key to producing kaleidoscope images.

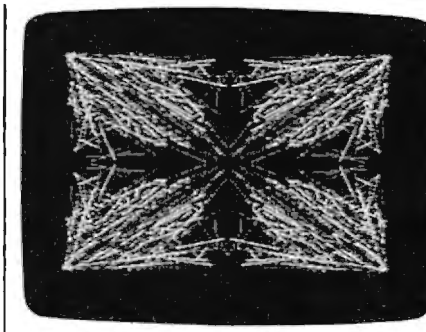
```
10 REM PROGRAM 1:KALEIDOSCOPE W
   ITH DOTS IN 4 DIVISIONS
20 HR = 279:VR = 191: HGR2
30 HCOLOR= RND (1) * 8
40 X = RND (1) * HR / 2:Y = RND
    (1) * VR / 2
60 HPLOT X,Y: HPLOT HR - X,VR -
   Y
70 HPLOT HR - X,Y: HPLOT X,VR -
   Y
100 GOTO 30
```

Note lines 60 and 70. These two lines do the actual plotting. See how the variables HR and VR are used as offsets for plotting mirrored points. The variables HR and VR contain the maximum horizontal and vertical coordinates available on the Apple's hi-res screen. By using these two values for offsetting point coordinates, the program generates symmetrical displays.

The second example offers a slight variation on the first: Instead of plotting random points, this program draws random lines. Lines are specified by their beginning and end points. So, instead of picking just one random point, this program picks two points and draws a line between them.

```
10 REM PROGRAM 2:KALEIDOSCOPE W
   ITH LINES IN 4 DIVISIONS
20 HR = 279:VR = 191: HGR2
30 HCOLOR= RND (1) * 8
40 X1 = RND (1) * HR / 2:Y1 = R
   ND (1) * VR / 2
50 X2 = RND (1) * HR / 2:Y2 = R
   ND (1) * VR / 2
60 HPLOT X1,Y1 TO X2,Y2: HPLOT
   HR - X1,VR - Y1 TO HR - X2,V
   R - Y2
70 HPLOT HR - X1,Y1 TO HR - X2,
   Y2: HPLOT X1,VR - Y1 TO X2,V
   R - Y2
100 GOTO 30
```

To draw the actual lines, this program uses Apple's TO option.



Four-way symmetry creates beautiful, colorful patterns in "Apple Kaleidoscope."

When used in conjunction with HPLOT, the TO statement informs the computer to draw a line from one point *to* another. See lines 60 and 70 for an example.

Eight Images

If you think four-image patterns were impressive, try eight-image designs. By diagonally splicing each rectangular section of the four-image display, we create eight separate triangles. This doubles the number of quadrants for a spectacular display.

Add the following lines to the first example for an eight-image kaleidoscope program with dots:

```
10 REM PROGRAM 3:KALEIDOSCOPE W
   ITH DOTS IN 8 DIVISIONS
25 XY = VR / HR:YX = HR / VR
40 Y = RND (1) * VR / 2:X = RND
    (1) * Y * YX
80 HPLOT Y * YX,X * XY: HPLOT H
   R - Y * YX,VR - X * XY
90 HPLOT HR - Y * YX,X * XY: HP
   LOT Y * YX,VR - X * XY
```

As with the first program, points are mirrored to the original four quadrants. Next, lines 80 and 90 mirror points to the remaining four triangles by switching the horizontal and vertical coodinates and then scaling them.

The same mirroring of points can be applied to the line-drawing example. For an eight-quadrant line kaleidoscope, add the following lines to the second example, replacing the original program lines where necessary:

```
10 REM PROGRAM 4:KALEIDOSCOPE W
   ITH LINES IN 8 DIVISIONS
25 XY = VR / HR:YX = HR / VR
40 Y1 = RND (1) * VR / 2:X1 = R
   ND (1) * Y1 * YX
50 Y2 = RND (1) * VR / 2:X2 = R
   ND (1) * Y2 * YX
80 HPLOT Y1 * YX,X1 * XY TO Y2
   * YX,X2 * XY
85 HPLOT HR - Y1 * YX,VR - X1 *
    XY TO HR - Y2 * YX,VR - X2
   * XY
90 HPLOT HR - Y1 * YX,X1 * XY T
   O HR - Y2 * YX,X2 * XY
95 HPLOT Y1 * YX,VR - X1 * XY T
   O Y2 * YX,VR - X2 * XY
```

The best way to learn how each of these kaleidoscope algorithms work is to experiment with them. There's no telling what you may come up with. For example, try merging the first and fourth examples above, or the second and third.

Use On Other Computers

The programs listed in this article can be easily converted to work on other computers with hi-res point-plotting and line-drawing commands.

To begin translation, change line 20 to set the variables HR and VR equal to your computer's maximum horizontal and vertical resolution, respectively. Also, alter line 20 to enter hi-res mode and set up any color palettes necessary.

Line 30 randomly selects the current drawing color. If your computer specifies its colors from within the line or point commands, set a variable equal to the random-color number and use this variable in the plotting statements.

Lines 60–95 contain either point or line commands. Change these lines to match the syntax required by your computer. All other statements in the kaleidoscope programs are fairly generic and should run fine without modification. ©

News & Products

Stocking Stuffers From Thunder Mountain

Mindscape has announced a special Holiday Stocking Software Classics promotion for its Thunder Mountain line. The promotion consists of five different packages of software, each containing three separate programs. There are three packages for the Commodore 64, and two for IBM PC and compatibles.

The first Commodore 64 package contains *Pac-Man, Rambo,* and *Scott Adams' Adventureland S.A.G.A. I;* the second package holds *Pole Position, Dig Dug,* and *Maxi Golf;* third in the Commodore 64 series is a package consisting of *Top Gun, Ms. Pac-Man,* and *Cyrus Chess.*

For IBM and compatibles owners, the first holiday package holds *Top Gun, Ms. Pac-Man,* and *Mind Dance, Volume I;* the second IBM package contains *Pac Man, Dig Dug,* and *Mind Dance, Volume 2.*

Suggested retail for the packages is $24.95.

Mindscape, 3444 Dundee Rd., Northbrook, IL 60062

Circle Reader Service Number 201.

Atari ST And Apple II Conquered By PBI

PBI Software has released an Atari ST and Apple II version of *Strategic Conquest,* a war strategy game. The game was previously available only on the Macintosh.

As Commander in Chief of an army, navy, and air force, players must explore and conquer an unknown world. The computer is the opponent and has the same objective. Each player begins with just one city in an unexplored world and must capture and take over a range of cities and continents, aided by an arsenal including armies, bombers, submarines, aircraft carriers, and battleships. Producing and commanding these pieces efficiently insures survival and expansion of the player's domain.

Playing time can vary from half an hour to over ten hours, depending on the players' skill and organization, and on the computer's level of aggressiveness, which the players can determine. There are over two billion possible world scenarios available. Both versions utilize the Macintosh interface complete with mouse support, windows, and pull-down menus.

The program for the Atari ST has a suggested retail price of $39.95 and requires 512K of memory. The Apple II version retails for $49.95 and runs on the Apple IIe with 128k, IIc, or IIGS.

PBI Software, 1163 Triton Dr., Foster City, CA 94404

Circle Reader Service Number 202.

The City, Updated For Atari ST

DataSoft's IntelliCreations has announced the availability of Version 3.0 of *Alternate Reality—The City* for the Atari ST. The update features graphics that were recently developed for other 16-bit computers. The interior scenes were designed on the EGA IBM and the three-dimensional exterior effects were first used on the Macintosh.

Game play is the same on Version 3.0, and characters created on Version 2.0 can be used in Version 3.0.

Owners of Version 2.0 for the Atari ST can obtain 3.0 upgrades by sending their 2.0 disks and a check or money order for $10 to Intellicreations.

IntelliCreations, 19808 Nordhoff Pl., Chatsworth, CA 91311

Circle Reader Service Number 203.

Educational Organizer

MindPlay has announced the release of an educational computer program designed as a planning tool for teachers and students. With *Pacesetter,* users can break assignments into individual steps, create a personal schedule, and then track their progress. The program, recommended for students grade 3 and up, includes 13 templates for homework and reports; ten types of progress reports, including bar graphs; monthly and annual calendar printouts; and a Certificate of Completion for printing. *Pacesetter* also includes "Challenge Upgrade" options for customizing the program.

Also available for use with the program is *Projects I,* which contains 14 ready-to-use assignments for practice with planning.

Pacesetter is available for the Apple II Series, including the IIGS, and retails for $69.99. A backup disk is included and lab packs are available. Suggested retail for *Projects I* is $24.99.

MindPlay, 82 Montvale Ave., Stoneham, MA 02180

Circle Reader Service Number 204.

Scientic Puzzles

M-ss-ng L-nks: Science Disk is the latest in the series of language games released by Sunburst Communications. Designed for students from grades 5–9, the program teaches science through word puzzles. Scientific passages are presented with letters or words missing. The students are challenged to reconstruct the passages by filling in the blanks.

There are 63 passages covering nine scientific topics and their properties. The passages may be called up by topic or property. The program also features a change option that allows teachers to create their own formats.

M-ss-ng L-nks: Science Disk comes with a program disk, a backup, and a teacher's guide. The program is available for the Apple II family of computers and retails for $65.

Sunburst Communications has also released updates for the Apple versions of three other *M-ss-ing L-nks* programs. Printer options, editor features, and two new puzzle formats have been added to *Classics Old and New, MicroEncyclopedia,* and *Young People's Literature.* Teachers can now enter their own formats to focus on particular areas of language. Free updates are available to customers through Sunburst.

Sunburst Communications, 39 Washington Ave., Pleasantville, NY 10570

Circle Reader Service Number 205.

Four New Programs From PAR Software

PAR Software has announced the release of *Express Paint* for the Amiga. The program combines the features of desktop publishing and paint programs into one package. Users can create newsletters, images, posters, and business reports.

The program requires 512K and retails for $79.95.

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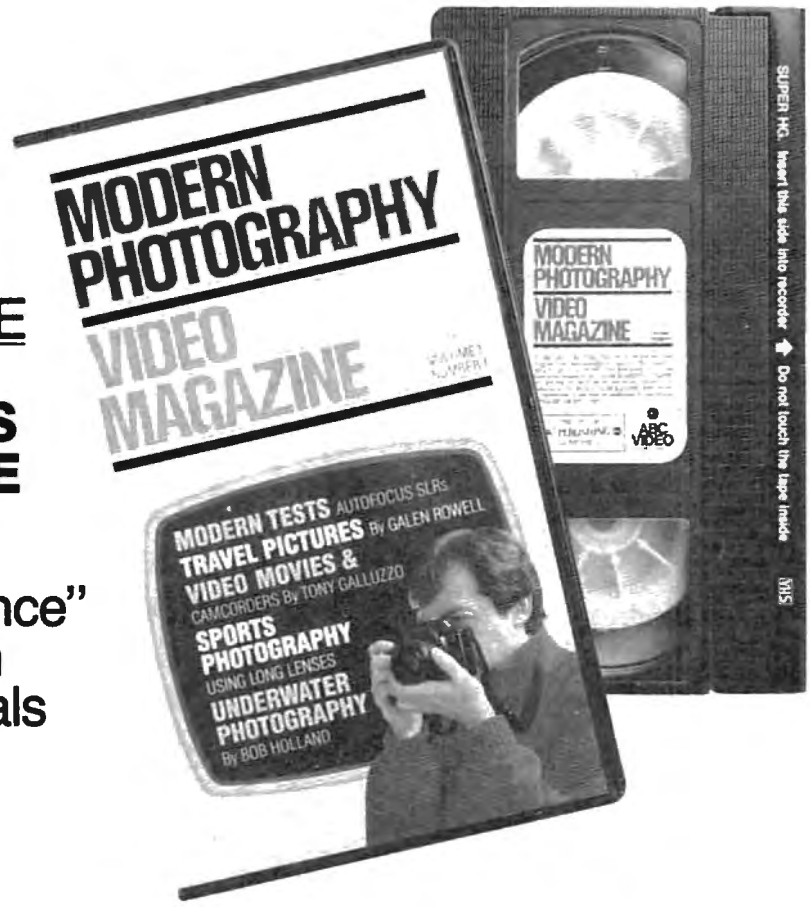

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Ea$y Loan$ has also been released for the Amiga from PAR Software. By using the interface capabilities of the Amiga, the program can aid users in loan and credit management for both private individuals and businesses. Features include customization of amortization schedules, view and print summary schedules, and a detailed printout of complete loan tables.

The program requires 256K and retails for $39.95.

For PC compatibles, PAR Software has released *InQuest!*, which is an organizational database for managing information such as sales prospects, business contacts, employees, clients, customers, suppliers, and appointments. In addition to managing people-oriented information, the program can be used for other data management purposes as well.

The program is compatible with the IBM XT, AT, PC compatibles, WANG, NEC, DG portables and most other portable computers with at least 256K RAM and a hard disk, or two 1.2-meg floppy disks. Suggested retail is $99.95.

PAR's first release for the Macintosh is *Ea$y Check$*, a desk accessory program that automates the process of checkbook management. Features include a built-in tracking program that automatically tracks tax-sensitive transactions. The user can also define and customize up to 30 different check formats for printing checks.

The program requires a minimum of 126K and retails for $39.95.

PAR Software, P.O. Box 1089, Vancouver, WA 98666

Circle Reader Service Number 206.

Basic Math Blasts Off

Davidson & Associates has added *Math Blaster Plus* to its line of educational software. The program is designed for students in grades 1–6, and teaches basic math skills in addition, subtraction, multiplication, division, fractions, decimals, and percentages, through five learning activities. Over 750 basic math facts can be learned through both creative drill and practice, and problem-solving activities.

The program features Davidson's new student desktop interface with pull-down menus, double high-resolution graphics, and mouse or keyboard access. Features also include a test maker which allows users to choose and sort random problems from all the files on the disk to make up a review-type test. A record-keeping option that monitors students' progress and awards outstanding scores is also included.

The program is available for the Apple IIGS, IIc, and IIe with extended 80-column card, and IBM PC with a minimum of 256K. Suggested retail price is $49.95.

Davidson & Associates, 3135 Kashiwa St., Torrance, CA 90505

Circle Reader Service Number 207.

Tailless Mouse

Torrington has released the *Manager Mouse Cordless*, which operates up to 10 hours on a single charge. The infrared mouse works within four feet of its receiver, which mounts on any IBM PC or compatible.

Features include a two-wheel tracking design and Torrington's patented suspension system.

Suggested retail price is $229.

The Torrington Company, 59 Field St., Torrington, CT 06790

Circle Reader Service Number 208.

Home Project Tool

Britannica Software has announced the release of *W.O.R.K. At Home*, which stands for write, organize, report, and "kalculate." This program is the first software package released in the new Britannica DesignWare Plus product line, which is designed to provide users with tools for simplifying everyday home projects, such as preparing school reports, keeping track of expenses, maintaining an address book, and so on.

The *W.O.R.K. At Home* package includes a tutorial disk which takes users step by step through commands and keystrokes needed to use these integrated programs. Also included are two user booklets, a user's guide, and the *W.O.R.K. Book*, with illustrations and many application examples. The program contains help screens, pull-down menus, and prompt lines.

The program is available for Apple, MS/DOS formats, and the Commodore 64. Suggested retail price is $59.95.

Britannica Software, 185 Berry St., San Francisco, CA 94107

Circle Reader Service Number 209.

Hi Tech Now Publishes Sesame Street

Hi Tech Expressions has acquired the publishing rights for a line of Sesame Street software developed by Children's Television Workshop. The first six preschool titles are now available, and each package includes a free Sesame Street poster.

The programs are designed to allow children to experiment, solve problems, and practice skills while having fun.

Astro-Grover is a numbers game using counting, adding, and subtracting skills. The game is available for the Commodore 64, Atari XL/XE, Apple II, and IBM and compatibles. *Ernie's Magic Shapes*, a shape and color matching game, and *Big Bird's Special Delivery*, a matching game using object recognition, are both available for the Commodore 64, Atari XL/XE, and IBM and compatibles.

Three animated programs—*Pals Around Town*, a get-to-know the neighborhood activity; *Ernie's Big Splash*, a maze builder using planning, predicting, and problem-solving skills; and *Grover's Animal Adventures*, a visit to different animal environments—are all available for the Commodore 64, and IBM and compatibles.

All six programs carry a suggested retail price of $9.95 each.

Hi Tech Expressions, 1700 N.W. 65th Ave., Suite 9, Plantation, FL 33313

Circle Reader Service Number 210.

Star Soft's New Programs

Star Soft International is introducing new computer software games created by Red Rat, Martec-Software, and Cascade Games, all of England; Andromeda of both the United States and Hungary; and Starsoft Development Laboratories of the U.S. These games are compatible with Atari, Atari ST, Commodore 64, and IBM, and have never been released in the United States or Canada.

Suggested retail prices of triple packs start at $6.99.

Star Soft is also introducing *The Pirates Of The Barbary Coast*, which will be available in four languages on the international market. The game is available for the Commodore 64, Atari, and Atari ST, and will soon be available for IBM.

Suggested retail price is $17.99.

Star Soft International, 50 Charles Lindbergh Blvd., Suite 400, Uniondale, NY 11553

Circle Reader Service Number 211.

Three New Math Programs

True BASIC has released three new programs in the Kemeny/Kurtz Math Series: *Arithmetic, Algebra I*, and *MacFuntion*. The three programs are designed for use either as course supplements or for self-study and review of mathematical concepts. Each offers online help and a menu-driven interface which allows users to experiment with their own examples.

MacFunction allows students to examine graphs of three-dimensional functions, and lets them adjust eye lev-

el, show or remove hidden surfaces, plot partial derivatives, and show two-dimensional contour plots. The program requires a 512K Macintosh.

A general purpose calculator for evaluating numeric expressions, and routines for calculating distances on a number line are included with *Arithmetic*. The program includes routines for computations with fractions, percentages, and square roots. Users can also learn how to convert to and from scientific notation and the metric system.

Algebra I includes topics in beginning and intermediate algebra, and basic arithmetic concepts. Students can evaluate, plot, and simplify algebraic expressions; work with fractions, numeric expressions, radicals, and geometric measurement; and learn systems of quadratic and nonquadratic equations. The program also includes an illustration of finding roots.

Algebra I and *Arithmetic* are available for an IBM PC or compatible, Macintosh, Amiga, or Atari ST. Each of the three programs retails for $49.95.

True BASIC, 39 S. Main St., Hanover, NH 03755

Circle Reader Service Number 212.

New Amiga Programs From Oxxi

Oxxi has developed a new *Modula-2* software construction set called *Benchmark* for Amiga Computers. The program integrates the editor, compiler, and linker.

The editor is based on an EMACS editor developed at the MIT Artificial Intelligence Laboratory and contains over 125 commands for dealing with multiple files, windows, and buffers. The compiler implements the entire Modula-2 language and can be activated by pressing a key while in the editor. Compilation of densely packed programs takes place at an average speed of 10,000 lines per minute with speeds of up to 30,000 lines per minute possible. The editor automatically positions itself at the sight of any errors and displays an error message. Once the program has been completed, the linker is activated by pressing a single key while in the editor. The program is linked into a stand-alone executable file.

Suggested retail price is $199.

The following add-on products are available for *Benchmark Modula 2* at a suggested retail price of $99 each. *C Language Standard Library* implements many of the functions available in the C language standard library. *Simplified Amiga Libraries* is designed to help beginners access the complicated Amiga Libraries, and help more advanced programmers work more efficiently. *IFF Libraries, Graphic Resource Management* is a set of libraries dealing with Interchange File Format files and the full documentation of the IFF format. It allows bitmapped images to be integrated into Modula-2 programs as a resource.

Nimbus from Oxxi is a cash management accounting system for small businesses. The program allows access to the general ledger, accounts payable, and accounts receivable. When data is entered into either accounts payable or accounts receivable, the program automatically updates the general ledger. Customers and vendors are tracked by name rather than a number.

The program is written in C and allows over 450K of company data to be entered onto a single disk.

Suggested retail price is $149.

Oxxi has also released two new versions of *MaxiPlan* for the new generation of Amiga computers. *MaxiPlan 500* is optimized for a 512K environment, while version 1.8 of *MaxiPlan Plus* includes new macros, faster recalculation speed, and a print spooler. Both versions offer X-Y (scatter), 3-D pie, 3-D bar, exploding pie, step, and hi-low chart styles. *MaxiPlan Plus* includes all the features of *MaxiPlan 500* along with a macro language facility similar to Microsoft *Excel*.

MaxiPlan 500 retails for $149, while *MaxiPlan Plus* sells for $199.

Oxxi, 1835-A Dawns Way, Fullerton, CA 92631

Circle Reader Service Number 213.

Two New Titles From Brøderbund

VideoWorks II is now available from Brøderbund Software. The program, published by a Brøderbund affiliate label, MacroMind, allows users to create slide shows and animated presentations for business, education, science, art, or entertainment, on either a Macintosh II, 512, Plus, or SE. One improvement over the original *Video Works* is a new overview window which helps users assemble shows with up to 24 images on the screen at once. Both art and animation can be moved with familiar Macintosh commands such as cut, copy, and paste.

The program comes with its own library of precreated movies and clip animation. Users can also take images from PICT, MacPaint, GLUE, or other sources and animate anything from a business presentation to a music video. Shows can include animation, wipes, fades, dissolves, timing options, sound effects, and music.

The program consists of three 3½-inch disks that include the program and tutorials, clip art, artwork and movies, and a training disk. The suggested retail price is $195.

Another MacroMind title, *MazeWars+*, is also available from Brøderbund, and is the first realtime, multiplayer game for the AppleTalk network. Up to 30 people can play at once on a network, or 2 over a modem. The game can also be played against the computer. Suggested retail price is $49.95.

Brøderbund Software, 17 Paul Dr., San Rafael, CA 94903-2101

Circle Reader Service Number 214.

Medieval Adventure For Eight-Bit Ataris

Artworx Software has released *Cycleknight* for the Atari line of eight-bit computers. The object of the program is to direct the armed Cycleknight to a medieval castle in search of the kidnapped Queen and her villagers. The player will meet up with the Blacknight and must barter with strange creatures by using the language simulator. One to four people can play the game, which features over 2000 castle chambers and five skill levels. Players can also construct their own castles.

Suggested retail price is $19.95.

Artworx Software, 1844 Penfield Rd., Penfield, NY 14526

Circle Reader Service Number 215.

Four New Programs For Atari Eight-Bit

Clearstar Softechnologies has released four new titles for Atari eight-bit computers. An arcade game, *Time Bomb*, requires players to make their way to the top of a building where a time bomb is ticking away. On the way, players will encounter booby traps that will have to be overcome in order to reach the bomb in time. *Classy Chassy* is a pinball game that features the ability to add "English" to the ball. Each game retails for $9.95.

The *Elite Personal Accountant* is a home accounting package. Eight menus guide the user through the program from setting up, to entering records, to producing the reports. All reports can be printed to the screen or to any printer. Suggested retail price is $39.95.

Lightspeed C is a C compiler for the Atari that supports most standard C definition. It is designed to compile and link programs rapidly, diminishing the time needed to debug a program. The program requires a minimum of 48K and one disk drive. Suggested retail is $39.95.

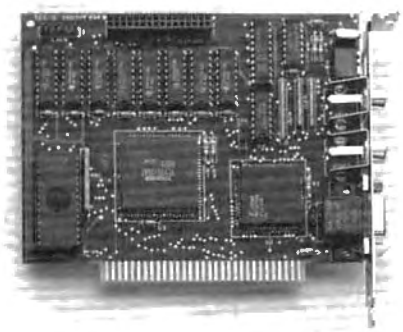
Clearstar Softechnologies, 1501 Wood Ave., #36, Sumner, WA 98390

Circle Reader Service Number 216.

Enhanced Graphics Adapter

BOCA Research has introduced the *EGA by BOCA*, a board that provides total emulation of the IBM Enhanced Graphics Adapter, Color Graphics Adapter, Monochrome Display Adapter, and Hercules Graphics Card. The board provides full compatibility with standard video modes, no matter which monitor is chosen.

EGA by BOCA displays 16 colors from a palette of 64 and features 640 x 350 resolution (EGA). With monochrome display, the resolution is 720 x 348 (HGC). The loadable character generator has capabilities of holding up to 512 displayable character codes.



The EGA by BOCA video board for the PC is compatible with the CGA, EGA, monochrome, and Hercules video boards.

The board operates with any current software packages that support the above-mentioned adapters. An IBM compatible feature adapter and two RCA external video jacks are provided for future expansion. The board also provides software that enables the selection of video output modes without opening the PC box. Diagnostics software and a light pen port are also included.

EGA by BOCA provides 256K of standard video memory and can be used for the IBM PC, XT, AT, and compatibles. Suggested retail price is $199.

BOCA Research, 6401 Congress Ave., Boca Raton, FL 33487

Circle Reader Service Number 217.

Income Tax Help

HowardSoft's *Tax Preparer* software package has tax laws built in for incorporating more than the current year. The program includes revisions to the tax code that resulted from recent reforms. For 1988, the program automatically does calculations in accordance with the new tax laws. By typing in 1987 as the tax year, the program automatically adjusts the numbers to correspond to the 1987 tax laws. This forecasting ability applies not only to 1987, but for several years thereafter as defined by the Tax Reform Act. The package can be used by individuals as well as professional tax preparers.

The program features onscreen guidance through the preparation process, unlimited record keeping to support any entry, automatic IRS-accepted printouts of more than 20 IRS forms and schedules, phone support, and a manual.

Available for the IBM and IBM compatibles, the program retails for $295. The program is also available for the Apple II series for $250.

HowardSoft, 1224 Prospect St., Suite 150, La Jolla, CA 92037

Circle Reader Service Number 218.

Quick File Reference

From Group L Corporation comes *Memory Lane*, which automatically tracks and indexes files whether created by *WordPerfect*, *dBase*, *1-2-3*, or any other program. To locate information, the user presses a "hot key" and types in the words or numbers to be located. The program then locates the information, and the user can cut and paste any part of the reference back into the active document or program.

The program requires 85K RAM and supports all versions of MS-DOS. For a limited time, the introductory price is $99.

Group L Corporation, 481 Carlisle Dr., Herndon, VA 22070

Circle Reader Service Number 219.

IBM Compatibility For The Atari Eight-Bit

Happy Computers has released the *IBMXFR* program, which makes it possible for Atari eight-bit personal computer users to share files on floppy disk with an IBM PC or compatible. The program is included with version 7.10 *Warp Speed Software*.

Text files, data bases, and higher-level language programs may be shared, and the diskette file converter operates in both directions. IBM files may be converted to Atari format, and Atari files may be converted to IBM format. A built-in text conversion feature allows automatic bidirectional translation between ASCII used on the IBM, and ATASCII used on the Atari, allowing access to the same text files using a word processor on either computer.

The program operates with Atari 1050 disk drives that are equipped with Happy Computers' *1050 Enhancement*. The drive equipped with the enhancement is automatically reprogrammed to handle the different sector sizes and file structures. Both directions of the conversion process are performed using the Atari. The IBM PC is not required to be present.

Atari owners that already have the enhancement hardware may obtain the newer version as an upgrade. Others will need the entire hardware/software package, which retails for a limited time at $99.95.

Happy Computers, P.O. Box 1268, Morgan Hill, CA 95037

Circle Reader Service Number 220.

Romance On The High Seas

Users can determine their own fate in Infocom's interactive romance, *Plundered Hearts*. As the heroine, the user will find adventure aboard a ship sailing the Caribbean, in search of her ailing father. Author Amy Briggs created the characters and the setting, but the user must make the decisions that will control the main character's fate as she encounters pirates, crocodiles, and rough seas.

The package includes a letter from the heroine and a 50-guinea note from the Bank of St. Sinistra. Each package also includes a coupon for a discount on Infocom's *Cutthroats*, a deep sea adventure.

Plundered Hearts is available for the Atari XL/XE and Commodore 64/128 for a suggested retail price of $34.95. The IBM PC series and MS-DOS compatibles, Apple II series, Macintosh, Atari ST, and Amiga versions are available for $39.95.

Infocom, 125 CambridgePark Dr., Cambridge, MA 02140

Circle Reader Service Number 221.

New Pascal Development System For ST

Metacomco has released a new *Pascal 2* compiler and development system for the Atari ST, replacing the *MCC Pascal version 1.35*. The system was improved to provide an ISO standard compiler core, but with a range of extensions for programmers wishing to access all the features of the Atari ST's Motorola 68000 processor and GEM environment.

Features include new libraries, a new linking loader, a resource editor, a new screen editor, and a new make utility. The *Pascal 2* manual has also been rewritten to include full documentation examples and tutorial sections.

The system requires a minimum of a 520 ST with single disk drive. Suggested list price is $99.95. Registered users may upgrade to the new version for $62.

Metacomco, 26 Portland Square, Bristol BS2 8RZ, UK

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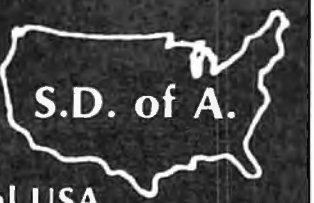

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COMPUTE!'s Guide To Typing In Programs

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 set of programs to check your typing—"The Automatic Proofreader."

Programs for the IBM and those in ST BASIC for 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 characters in curly braces; *do not type the braces.* For example, {CLEAR} or {CLR} instructs you to type the character 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 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.

For Commodore computers, 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, repeat the character the indicated number of times. For example, {5 RIGHT}, {6 S}, and [<8 Q>], mean, respectively, that you should enter five cursor rights, six shifted S's, and eight Commodore-Q's. On the Atari, inverse characters (white on black) should be entered with the inverse vid-

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	
←	←	

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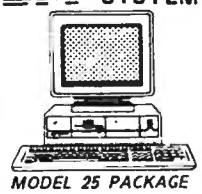

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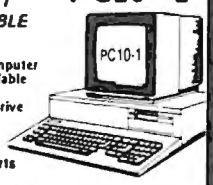

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eo key (Atari logo key on 400/800 models).

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 and Atari ST program listings in GFA BASIC 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 to enter that line into memory. (For the Amiga, you can also enter the line simply by moving the cursor off the line.) 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.

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.

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.

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:RE
    AD A:POKE I,A:CK=CK+A
    :NEXT I
120 IF CK<>19072 THEN ? "
    Error in DATA Stateme
    nts.  Check Typing.":
    END
130 A=USR(1536)
140 ? :? "Automatic Proof
    reader Now Activated.
    "
150 END
160 DATA 104,160,0,185,26
    ,3,201,69,240,7
170 DATA 200,200,192,34,2
    08,243,96,200,169,74
180 DATA 153,26,3,200,169
    ,6,153,26,3,162
190 DATA 0,189,0,228,157,
    74,6,232,224,16
200 DATA 208,245,169,93,1
    41,78,6,169,6,141
210 DATA 79,6,24,173,4,22
    8,105,1,141,95
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,
    124,241,76,205,238
250 DATA 0,0,0,0,0,32,62,
    246,8,201
260 DATA 155,240,13,201,3
    2,240,7,72,24,101
270 DATA 203,133,203,104,
    40,96,72,152,72,138
280 DATA 72,160,0,169,128
    ,145,88,200,192,40
290 DATA 208,249,165,203,
    74,74,74,74,24,105
300 DATA 161,160,3,145,88
    ,165,203,41,15,24
310 DATA 105,161,200,145,
    88,169,0,133,203,104
320 DATA 170,104,168,104,
    40,96
```

Program 2: Commodore Proofreader

By Philip Nelson

```
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
```

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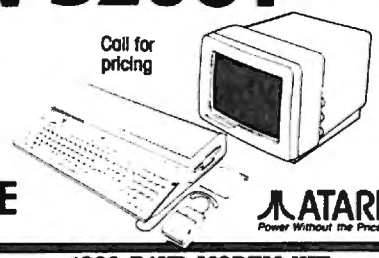

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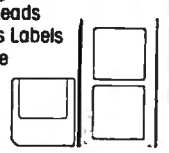

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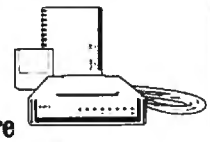

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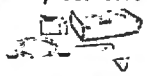

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Not responsible for typographical errors.

```
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 3: IBM Proofreader

By Charles Brannon

```
10 'Automatic Proofreader Ver
   sion 3.0 (Lines 205,206 ad
   ded/190 deleted/470,490 ch
   anged from V2.0)
100 DIM L$(500),LNUM(500):COL
    OR 0,7,7:KEY OFF:CLS:MAX=
    0:LNUM(0)=65536!
110 ON ERROR GOTO 120:KEY 15,
    CHR$(4)+CHR$(70):ON KEY(1
    5) GOSUB 640:KEY (15) ON:
    GOTO 130
120 RESUME 130
130 DEF SEG=&H40:W=PEEK(&H4A)
140 ON ERROR GOTO 650:PRINT:P
    RINT"Proofreader Ready."
150 LINE INPUT L$:Y=CSRLIN-IN
    T(LEN(L$)/W)-1:LOCATE Y,1
160 DEF SEG=0:POKE 1050,30:PO
    KE 1052,34:POKE 1054,0:PO
    KE 1055,79:POKE 1056,13:P
    OKE 1057,28:LINE INPUT L$
    :DEF SEG:IF L$="" THEN 15
    0
170 IF LEFT$(L$,1)=" " THEN L
    $=MID$(L$,2):GOTO 170
180 IF VAL(LEFT$(L$,2))=0 AND
     MID$(L$,3,1)=" " THEN L$
    =MID$(L$,4)
200 IF ASC(L$)>57 THEN 260 'n
    o line number, therefore
    command
205 BL=INSTR(L$," "):IF BL=0
    THEN BL$=L$:GOTO 206 ELSE
     BL$=LEFT$(L$,BL-1)
206 LNUM=VAL(BL$):TEXT$=MID$(
    L$,LEN(STR$(LNUM))+1)
210 IF TEXT$="" THEN GOSUB 54
    0:IF LNUM=LNUM(P) THEN GO
    SUB 560:GOTO 150 ELSE 150
220 CKSUM=0:FOR I=1 TO LEN(L$
    ):CKSUM=(CKSUM+ASC(MID$(L
    $,I))*I) AND 255:NEXT:LOC
    ATE Y,1:PRINT CHR$(65+CKS
    UM/16)+CHR$(65+(CKSUM AND
     15))+" "+L$
230 GOSUB 540:IF LNUM(P)=LNUM
    THEN L$(P)=TEXT$:GOTO 15
    0 'replace line
240 GOSUB 580:GOTO 150 'inser
    t the line
260 TEXT$="":FOR I=1 TO LEN(L
    $):A=ABC(MID$(L$,I)):TEXT
    $=TEXT$+CHR$(A+32*(A>96 A
    ND A<123)):NEXT
270 DELIMITER=INSTR(TEXT$," "
    ):COMMAND$=TEXT$:ARG$="":
    IF DELIMITER THEN COMMAND
    $=LEFT$(TEXT$,DELIMITER-1
    ):ARG$=MID$(TEXT$,DELIMIT
    ER+1) ELSE DELIMITER=INST
    R(TEXT$,CHR$(34)):IF DELI
    MITER THEN COMMAND$=LEFT$
    (TEXT$,DELIMITER-1):ARG$=
    MID$(TEXT$,DELIMITER)
280 IF COMMAND$<>"LIST" THEN
    410
290 OPEN "scrn:" FOR OUTPUT A
    S #1
300 IF ARG$="" THEN FIRST=0:P
    =MAX-1:GOTO 340
310 DELIMITER=INSTR(ARG$,"-")
    :IF DELIMITER=0 THEN LNUM
    =VAL(ARG$):GOSUB 540:FIRS
    T=P:GOTO 340
320 FIRST=VAL(LEFT$(ARG$,DELI
    MITER)):LAST=VAL(MID$(ARG
    $,DELIMITER+1))
330 LNUM=FIRST:GOSUB 540:FIRS
    T=P:LNUM=LAST:GOSUB 540:I
    F P=0 THEN P=MAX-1
340 FOR X=FIRST TO P:N$=MID$(
    STR$(LNUM(X)),2)+" "
350 IF CKFLAG=0 THEN A$="":GO
    TO 370
360 CKSUM=0:A$=N$+L$(X):FOR I
    =1 TO LEN(A$):CKSUM=(CKSU
    M+ASC(MID$(A$,I))*I) AND
    255:NEXT:A$=CHR$(65+CKSUM
    /16)+CHR$(65+(CKSUM AND 1
    5))+" "
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$="LLIST" THEN
    OPEN "lpt1:" FOR OUTPUT A
    S #1:GOTO 300
420 IF COMMAND$="CHECK" THEN
    CKFLAG=1:GOTO 290
430 IF COMMAND$<>"SAVE" THEN
    450
440 GOSUB 600:OPEN ARG$ FOR O
    UTPUT AS #1:ARG$="":GOTO
    300
450 IF COMMAND$<>"LOAD" THEN
    490
460 GOSUB 600:OPEN ARG$ FOR I
    NPUT AS #1:MAX=0:P=0
470 WHILE NOT EOF(1):LINE INP
    UT #1,L$:BL=INSTR(L$," ")
    :BL$=LEFT$(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$="NEW" THEN IN
    PUT "Erase program - Are
    you sure";L$:IF LEFT$(L$,
    1)="y" OR LEFT$(L$,1)="Y"
     THEN MAX=0:LNUM(0)=65536
    !:GOTO 130:ELSE 130
500 IF COMMAND$="BASIC" THEN
    COLOR 7,0,0:ON ERROR GOTO
     0:CLS:END
510 IF COMMAND$<>"FILES" THEN
    520
515 IF ARG$="" THEN ARG$="A:"
    ELSE SEL=1:GOSUB 600
517 FILES ARG$:GOTO 130
520 PRINT"Syntax error":GOTO
    130
540 P=0:WHILE LNUM>LNUM(P) AN
    D P<MAX:P=P+1:WEND:RETURN
560 MAX=MAX-1:FOR X=P TO MAX:
    LNUM(X)=LNUM(X+1):L$(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$:LNUM(P)=LNUM:RET
    URN
600 IF LEFT$(ARG$,1)<>CHR$(34
    ) THEN 520 ELSE ARG$=MID$
    (ARG$,2)
610 IF RIGHT$(ARG$,1)=CHR$(34
    ) THEN ARG$=LEFT$(ARG$,LE
    N(ARG$)-1)
620 IF SEL=0 AND INSTR(ARG$,"
    .")=0 THEN ARG$=ARG$+".BA
    S"
630 SEL=0:RETURN
640 CLOSE #1:CKFLAG=0:PRINT"S
    topped.":RETURN 150
650 PRINT "Error #";ERR:RESUM
    E 150
```

Program 4: Apple Proofreader

By Tim Victor, Editorial Programmer

```
10 C = 0: FOR I = 768 TO 768
   + 68: READ A:C = C + A: PO
   KE I,A: NEXT
20 IF C < > 7258 THEN PRINT "
   ERROR IN PROOFREADER DATA
   STATEMENTS": END
30 IF PEEK (190 * 256) < > 76
    THEN POKE 56,0: POKE 57,3
   : CALL 1002: GOTO 50
40 PRINT CHR$ (4);"IN#A$300"
50 POKE 34,0: HOME : POKE 34,
   1: VTAB 2: PRINT "PROOFREA
   DER INSTALLED"
60 NEW
100 DATA 216,32,27,253,201,14
    1
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 And 128

Ottis Cowper, Technical Editor

"MLX" is a labor-saving utility that allows almost fail-safe entry of machine language programs. Included are versions for the Commodore 64 and 128.

Type in and save some copies of whichever version of MLX is appropriate for your computer (you'll want to use it to enter future ML programs from COMPUTE!). Program 1 is for the Commodore 64, and Program 2 is for the 128 (128 MLX can also be used to enter Commodore 64 ML programs for use in 64 mode). 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. (Commodore 128 users *can* enter the data from an MLX listing using the built-in monitor if the rightmost column of data is omitted, but we recommend against it. It's much easier to let MLX do the proofreading and error checking for you.)

Figure 1: 64 MLX Keypad

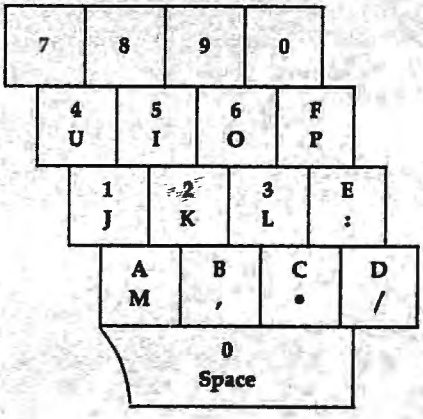
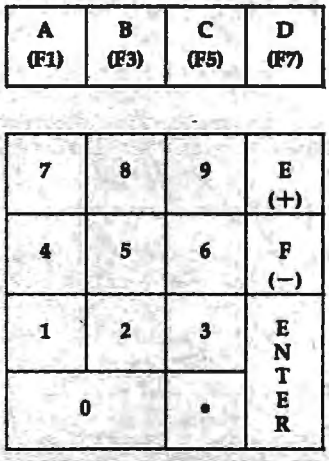


Figure 2: 128 MLX Keypad



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, 128 MLX redefines the function keys and + and − keys on the numeric keypad so that you can enter data one-handed. In either case, the keypad is active only while entering data. Addresses must be entered with the normal letter and number keys. The figures below show the keypad configurations for each version.

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 (save only for the 128 version). 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 (128 MLX makes use of BLOAD). Disk users should also note that the drive prefix 0: is automatically added to the filename (line 750 in 64 MLX), 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. The 128 version makes up for this by giving you the option of scratching the existing file if you want to reuse a filename.

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 128 version also has a CATALOG DISK option so you can view the contents of the disk directory before saving or loading.

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 (DLOAD *"filename"* on the 128) or LOAD *"filename"* for tape, and then RUN. Such programs will usually have a starting address of 0801 for the 64 or 1C01 for the 128. Other programs must be reloaded to specific addresses with a command such as LOAD *"filename"*,8,1 for disk (BLOAD *"filename"* on the 128) or LOAD *"filename"*,1,1 for tape, then started with a SYS to a particular memory address. On the Commodore 64, the most common starting address for such programs is 49152, which corresponds to MLX address C000. In either case, you should always refer to the article which accompanies the ML listing for information on loading and running the program.

An Ounce Of Prevention

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

Program 1: MLX For Commodore 64

```
SS 10 REM VERSION 1.1: LINES 8
      30,950 MODIFIED, LINES 4
      85-487 ADDED
EK 100 POKE 56,50:CLR:DIM IN$,
      I,J,A,B,A$,B$,A(7),N$
DM 110 C4=48:C6=16:C7=7:Z2=2:Z
      4=254:Z5=255:Z6=256:Z7=
      127
CJ 120 FA=PEEK(45)+Z6*PEEK(46)
      :BS=PEEK(55)+Z6*PEEK(56
      ):H$="0123456789ABCDEF"
SB 130 R$=CHR$(13):L$="{LEFT}"
      :S$=" ":D$=CHR$(20):Z$=
      CHR$(0):T$="{13 RIGHT}"
CQ 140 SD=54272:FOR I=SD TO SD
      +23:POKE I,0:NEXT:POKE
      {SPACE}SD+24,15:POKE 78
      8,52
FC 150 PRINT"{CLR}"CHR$(142)CH
      R$(8):POKE 53280,15:POK
      E 53281,15
EJ 160 PRINT T$" {RED}{RVS}
      {2 SPACES}{8 @}
      {2 SPACES}"SPC(28)"
      {2 SPACES}{OFF}{BLU} ML
      X II {RED}{RVS}
      {2 SPACES}"SPC(28)"
      {12 SPACES}{BLU}"
FR 170 PRINT"{3 DOWN}
      {3 SPACES}COMPUTE!'S MA
```

```
      CHINE LANGUAGE EDITOR
      {3 DOWN}"
JB 180 PRINT"{BLK}STARTING ADD
      RESS[4]";:GOSUB300:SA=A
      D:GOSUB1040:IF F THEN18
      0
GF 190 PRINT"{BLK}{2 SPACES}EN
      DING ADDRESS[4]";:GOSUB
      300:EA=AD:GOSUB1030:IF
      {SPACE}F THEN190
KR 200 INPUT"{3 DOWN}{BLK}CLEA
      R WORKSPACE [Y/N][4]";A
      $:IF LEFT$(A$,1)<>"Y"TH
      EN220
PG 210 PRINT"{2 DOWN}{BLU}WORK
      ING...";:FORI=BS TO BS+
      EA-SA+7:POKE I,0:NEXT:P
      RINT"DONE"
DR 220 PRINTTAB(10)"{2 DOWN}
      {BLK}{RVS} MLX COMMAND
      {SPACE}MENU {DOWN}[4]":
      PRINT T$"{RVS}E{OFF}NTE
      R DATA"
BD 230 PRINT T$"{RVS}D{OFF}ISP
      LAY DATA":PRINT T$"
      {RVS}L{OFF}OAD FILE"
JS 240 PRINT T$"{RVS}S{OFF}AVE
       FILE":PRINT T$"{RVS}Q
      {OFF}UIT{2 DOWN}{BLK}"
JH 250 GET A$:IF A$=N$ THEN250
HK 260 A=0:FOR I=1 TO 5:IF A$=
      MID$("EDLSQ",I,1)THEN A
      =I:I=5
FD 270 NEXT:ON A GOTO420,610,6
      90,700,280:GOSUB1060:GO
      TO250
EJ 280 PRINT"{RVS} QUIT ":INPU
      T"{DOWN}[4]ARE YOU SURE
       [Y/N]";A$:IF LEFT$(A$,
      1)<>"Y"THEN220
EM 290 POKE SD+24,0:END
JX 300 IN$=N$:AD=0:INPUTIN$:IF
      LEN(IN$)<>4THENRETURN
KF 310 B$=IN$:GOSUB320:AD=A:B$
      =MID$(IN$,3):GOSUB320:A
      D=AD*256+A:RETURN
PP 320 A=0:FOR J=1 TO 2:A$=MID
      $(B$,J,1):B=ASC(A$)-C4+
      (A$>"@")*C7:A=A*C6+B
JA 330 IF B<0 OR B>15 THEN AD=
      0:A=-1:J=2
GX 340 NEXT:RETURN
CH 350 B=INT(A/C6):PRINT MID$(
      H$,B+1,1);:B=A-B*C6:PRI
      NT MID$(H$,B+1,1);:RETU
      RN
RR 360 A=INT(AD/Z6):GOSUB350:A
      =AD-A*Z6:GOSUB350:PRINT
      ":";
BE 370 CK=INT(AD/Z6):CK=AD-Z4*
      CK+Z5*(CK>Z7):GOTO390
PX 380 CK=CK*Z2+Z5*(CK>Z7)+A
JC 390 CK=CK+Z5*(CK>Z5):RETURN
QS 400 PRINT"{DOWN}STARTING AT
      [4]";: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$,I):GOSUB320:IF
       I<25 THEN GOSUB380:A(I
      /3)=A
PK 570 NEXT:IF A<>CK THEN GOSU
      B1060:PRINT"{BLK}{RVS}
      {SPACE}ERROR: REENTER L
      INE [4]":F=1:GOTO440
HJ 580 GOSUB1080:B=BS+AD-SA:FO
      R I=0 TO 7:POKE B+I,A(I
      ):NEXT
QQ 590 AD=AD+8:IF AD>EA THEN C
      LOSE3:PRINT"{DOWN}{BLU}
      ** END OF ENTRY **{BLK}
      {2 DOWN}":GOTO700
GQ 600 F=0:GOTO440
QA 610 PRINT"{CLR}{DOWN}{RVS}
      {SPACE}DISPLAY DATA ":G
      OSUB400:IF IN$=N$ THEN2
      20
RJ 620 PRINT"{DOWN}{BLU}PRESS:
       {RVS}SPACE{OFF} TO PAU
      SE, {RVS}RETURN{OFF} TO
       BREAK[4]{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[4]";IN$:IF IN$=N$
      {SPACE}THEN220
PR 720 F=0:PRINT"{DOWN}{BLK}
      {RVS}T{OFF}APE OR {RVS}
      D{OFF}ISK: [4]";
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$(PEEK(BS+I));:IF ST T
      HEN800
FC 790 NEXT:CLOSE1:CLOSE15:GOT
      O940
GS 800 GOSUB1060:PRINT"{DOWN}
      {BLK}ERROR DURING SAVE:
      [4]":GOSUB860:GOTO220
MA 810 OPEN 1,8,8,IN$+",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}[4]":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
```

Program 2: MLX For Commodore 128

```
AE 100 TRAP 960:POKE 4627,128:
       DIM NL$,A(7)
XP 110 Z2=2:Z4=254:Z5=255:Z6=2
       56:Z7=127:BS=256*PEEK(4
       627):EA=65280
FB 120 BE$=CHR$(7):RT$=CHR$(13
       ):DL$=CHR$(20):SP$=CHR$
       (32):LF$=CHR$(157)
KE 130 DEF FNHB(A)=INT(A/256):
       DEF FNLB(A)=A-FNHB(A)*2
       56:DEF FNAD(A)=PEEK(A)+
       256*PEEK(A+1)
JB 140 KEY 1,"A":KEY 3,"B":KEY
        5,"C":KEY 7,"D":VOL 15
       :IF RGR(0)=5 THEN FAST
FJ 150 PRINT"{CLR}"CHR$(142);C
       HR$(8):COLOR 0,15:COLOR
        4,15:COLOR 6,15
GQ 160 PRINT TAB(12)"{RED}
       {RVS}{2 SPACES}[9 @]
       {2 SPACES}"RT$;TAB(12)"
       {RVS}{2 SPACES}{OFF}
       {BLU} 128 MLX {RED}
       {RVS}{2 SPACES}"RT$;TAB
       (12)"{RVS}{13 SPACES}
       {BLU}"
FE 170 PRINT"{2 DOWN}
       {3 SPACES}COMPUTE!'S MA
       CHINE LANGUAGE EDITOR
       {2 DOWN}"
DK 180 PRINT"{BLK}STARTING ADD
       RESS[4]";:GOSUB 260:IF
       {SPACE}AD THEN SA=AD:EL
       SE 180
FH 190 PRINT"{BLK}{2 SPACES}EN
       DING ADDRESS[4]";:GOSUB
        260:IF AD THEN EA=AD:E
       LSE 190
MF 200 PRINT"{DOWN}{BLK}CLEAR
       {SPACE}WORKSPACE [Y/N]?
       [4]":GETKEY A$:IF A$<>"
       Y" THEN 220
QH 210 PRINT"{DOWN}{BLU}WORKIN
       G...";:BANK 0:FOR A=BS
       {SPACE}TO BS+(EA-SA)+7:
       POKE A,0:NEXT A:PRINT"D
       ONE"
DC 220 PRINT TAB(10)"{DOWN}
       {BLK}{RVS} MLX COMMAND
       {SPACE}MENU [4]{DOWN}":
       PRINT TAB(13)"{RVS}E
       {OFF}NTER DATA"RT$;TAB(
       13)"{RVS}D{OFF}ISPLAY D
       ATA"RT$;TAB(13)"{RVS}L
       {OFF}OAD FILE"
HB 230 PRINT TAB(13)"{RVS}S
       {OFF}AVE FILE"RT$;TAB(1
       3)"{RVS}C{OFF}ATALOG DI
       SK"RT$;TAB(13)"{RVS}Q
       {OFF}UIT{DOWN}{BLK}"
AP 240 GETKEY A$:A=INSTR("EDLS
       CQ",A$):ON A GOTO 340,5
       50,640,650,930,940:GOSU
       B 950:GOTO 240
SX 250 PRINT"STARTING AT";:GOS
       UB 260:IF(AD<>0)OR(A$=N
       L$)THEN RETURN:ELSE 250
BG 260 A$=NL$:INPUT A$:IF LEN(
       A$)=4 THEN AD=DEC(A$)
PP 270 IF AD=0 THEN BEGIN:IF A
       $<>NL$ THEN 300:ELSE RE
       TURN:BEND
MA 280 IF AD<SA OR AD>EA THEN
       {SPACE}300
PM 290 IF AD>511 AND AD<65280
       {SPACE}THEN PRINT BE$;:
       RETURN
SQ 300 GOSUB 950:PRINT"{RVS} I
       NVALID ADDRESS {DOWN}
       {BLK}":AD=0:RETURN
RD 310 CK=FNHB(AD):CK=AD-Z4*CK
       +Z5*(CK>Z7):GOTO 330
DD 320 CK=CK*Z2+Z5*(CK>Z7)+A
AH 330 CK=CK+Z5*(CK>Z5):RETURN
QD 340 PRINT BE$;"{RVS} ENTER
       {SPACE}DATA ":GOSUB 250
       :IF A$=NL$ THEN 220
JA 350 BANK 0:PRINT:F=0:OPEN 3
       ,3
BR 360 GOSUB 310:PRINT HEX$(AD
       )+":";:IF F THEN PRINT
       {SPACE}L$:PRINT"{UP}
       {5 RIGHT}";
QA 370 FOR I=0 TO 24 STEP 3:B$
       =SP$:FOR J=1 TO 2:IF F
       {SPACE}THEN B$=MID$(L$,
       I+J,1)
PS 380 PRINT"{RVS}"B$+LF$;:IF
       {SPACE}I<24 THEN PRINT"
       {OFF}";
RC 390 GETKEY A$:IF (A$>"/" AN
       D A$<":") OR(A$>"@" AND
        A$<"G") THEN 470
AC 400 IF A$="+" THEN A$="E":G
       OTO 470
QB 410 IF A$="-" THEN A$="F":G
       OTO 470
FB 420 IF A$=RT$ AND ((I=0) AN
       D (J=1) OR F) THEN PRIN
       T B$;:J=2:NEXT:I=24:GOT
       O 480
RD 430 IF A$="{HOME}" THEN PRI
       NT B$:J=2:NEXT:I=24:NEX
       T:F=0:GOTO 360
XB 440 IF (A$="{RIGHT}") AND F
        THEN PRINT B$+LF$;:GOT
       O 470
JP 450 IF A$<>LF$ AND A$<>DL$
       {SPACE}OR ((I=0) AND (J
       =1)) THEN GOSUB 950:GOT
       O 390
PS 460 A$=LF$+SP$+LF$:PRINT B$
       +LF$;:J=2-J:IF J THEN P
       RINT LF$;:I=I-3
GB 470 PRINT A$;:NEXT J:PRINT
       {SPACE}SP$;
HA 480 NEXT I:PRINT:PRINT"{UP}
       {5 RIGHT}";:L$="
       {27 SPACES}"
DP 490 FOR I=1 TO 25 STEP 3:GE
       T#3,A$,B$:IF A$=SP$ THE
       N I=25:NEXT:CLOSE 3:GOT
       O 220
BA 500 A$=A$+B$:A=DEC(A$):MID$
       (L$,I,2)=A$:IF I<25 THE
       N GOSUB 320:A(I/3)=A:GE
       T#3,A$
AR 510 NEXT I:IF A<>CK THEN GO
       SUB 950:PRINT:PRINT"
       {RVS} ERROR: REENTER LI
       NE ":F=1:GOTO 360
DX 520 PRINT BE$:B=BS+AD-SA:FO
       R I=0 TO 7:POKE B+I,A(I
       ):NEXT I
XB 530 F=0:AD=AD+8:IF AD<=EA T
       HEN 360
CA 540 CLOSE 3:PRINT"{DOWN}
       {BLU}** END OF ENTRY **
       {BLK}{2 DOWN}":GOTO 650
MC 550 PRINT BE$;"{CLR}{DOWN}
       {RVS} DISPLAY DATA ":GO
       SUB 250:IF A$=NL$ THEN
       {SPACE}220
JF 560 BANK 0:PRINT"{DOWN}
       {BLU}PRESS: {RVS}SPACE
       {OFF} TO PAUSE, {RVS}RE
       TURN{OFF} TO BREAK[4]
       {DOWN}"
XA 570 PRINT HEX$(AD)+":";:GOS
       UB 310:B=BS+AD-SA
DJ 580 FOR I=B TO B+7:A=PEEK(I
       ):PRINT RIGHT$(HEX$(A),
       2);SP$;:GOSUB 320:NEXT
       {SPACE}I
XB 590 PRINT"{RVS}";RIGHT$(HEX
       $(CK),2)
GR 600 F=1:AD=AD+8:IF AD>EA TH
       EN PRINT"{BLU}** END OF
        DATA **":GOTO 220
EB 610 GET A$:IF A$=RT$ THEN P
       RINT BE$:GOTO 220
QK 620 IF A$=SP$ THEN F=F+1:PR
       INT BE$;
XS 630 ON F GOTO 570,610,570
RF 640 PRINT BE$"{DOWN}{RVS} L
       OAD DATA ":OP=1:GOTO 66
       0
BP 650 PRINT BE$"{DOWN}{RVS} S
       AVE FILE ":OP=0
DM 660 F=0:F$=NL$:INPUT"FILENA
       ME[4]";F$:IF F$=NL$ THE
       N 220
RP 670 PRINT"{DOWN}{BLK}{RVS}T
       {OFF}APE OR {RVS}D{OFF}
       ISK: [4]";
SQ 680 GETKEY A$:IF A$="T" THE
       N 850:ELSE IF A$<>"D" T
       HEN 680
SP 690 PRINT"DISK{DOWN}":IF OP
        THEN 760
EH 700 DOPEN#1,(F$+",P"),W:IF
       {SPACE}DS THEN A$=D$:GO
       TO 740
JH 710 BANK 0:POKE BS-2,FNLB(S
       A):POKE BS-1,FNHB(SA):P
       RINT"SAVING ";F$:PRINT
MC 720 FOR A=BS-2 TO BS+EA-SA:
       PRINT#1,CHR$(PEEK(A));:
       IF ST THEN A$="DISK WRI
       TE ERROR":GOTO 750
GC 730 NEXT A:CLOSE 1:PRINT"
       {BLU}** SAVE COMPLETED
       {SPACE}WITHOUT ERRORS *
       *":GOTO 220
RA 740 IF DS=63 THEN BEGIN:CLO
       SE 1:INPUT"{BLK}REPLACE
        EXISTING FILE [Y/N][4]
       ";A$:IF A$="Y" THEN SCR
       ATCH(F$):PRINT:GOTO 700
       :ELSE PRINT"{BLK}":GOTO
        660:BEND
GA 750 CLOSE 1:GOSUB 950:PRINT
       "{BLK}{RVS} ERROR DURIN
       G SAVE: [4]":PRINT A$:G
       OTO 220
FD 760 DOPEN#1,(F$+",P"):IF DS
        THEN A$=DS$:F=4:CLOSE
       {SPACE}1:GOTO 790
```

```
PX 770 GET#1,A$,B$:CLOSE 1:AD=
       ASC(A$)+256*ASC(B$):IF
       {SPACE}AD<>SA THEN F=1:
       GOTO 790
KB 780 PRINT"LOADING ";F$:PRIN
       T:BLOAD(F$),B0,P(BS):AD
       =SA+FNAD(174)-BS-1:F=-2
       *(AD<EA)-3*(AD>EA)
RQ 790 IF F THEN 800:ELSE PRIN
       T"{BLU}** LOAD COMPLETE
       D WITHOUT ERRORS **":GO
       TO 220
ER 800 GOSUB 950:PRINT"{BLK}
       {RVS} ERROR DURING LOAD
       : {4}":ON F GOSUB 810,8
       20,830,840:GOTO220
QJ 810 PRINT"INCORRECT STARTIN
       G ADDRESS (";HEX$(AD);"
       )":RETURN
DP 820 PRINT"LOAD ENDED AT ";H
       EX$(AD):RETURN
EB 830 PRINT"TRUNCATED AT ENDI
       NG ADDRESS ("HEX$(EA)")
       ":RETURN
FP 840 PRINT"DISK ERROR ";A$:R
       ETURN
KS 850 PRINT"TAPE":AD=POINTER(
       F$):BANK 1:A=PEEK(AD):A
       L=PEEK(AD+1):AH=PEEK(AD
       +2)
XX 860 BANK 15:SYS DEC("FF68")
       ,0,1:SYS DEC("FFBA"),1,
       1,0:SYS DEC("FFBD"),A,A
       L,AH:SYS DEC("FF90"),12
       8:IF OP THEN 890
FG 870 PRINT:A=SA:B=EA+1:GOSUB
        920:SYS DEC("E919"),3:
       PRINT"SAVING ";F$
AB 880 A=BS:B=BS+(EA-SA)+1:GOS
       UB 920:SYS DEC("EA18"):
       PRINT"{DOWN}{BLU}** TAP
       E SAVE COMPLETED **":GO
       TO 220
CP 890 SYS DEC("E99A"):PRINT:I
       F PEEK(2816)=5 THEN GOS
       UB 950:PRINT"{DOWN}
       {BLK}{RVS} FILE NOT FOU
       ND ":GOTO 220
GQ 900 PRINT"LOADING ...{DOWN}
       ":AD=FNAD(2817):IF AD<>
       SA THEN F=1:GOTO 800:EL
       SE AD=FNAD(2819)-1:F=-2
       *(AD<EA)-3*(AD>EA)
JD 910 A=BS:B=BS+(EA-SA)+1:GOS
       UB 920:SYS DEC("E9FB"):
       IF ST>0 THEN 800:ELSE 7
       90
XB 920 POKE193,FNLB(A):POKE194
       ,FNHB(A):POKE 174,FNLB(
       B):POKE 175,FNHB(B):RET
       URN
CP 930 CATALOG:PRINT"{DOWN}
       {BLU}** PRESS ANY KEY F
       OR MENU **":GETKEY A$:G
       OTO 220
MM 940 PRINT BE$"{RVS} QUIT
       {4}";RT$;"ARE YOU SURE
       {SPACE}[Y/N]?":GETKEY A
       $:IF A$<>"Y" THEN 220:E
       LSE PRINT"{CLR}":BANK 1
       5:END
JE 950 SOUND 1,500,10:RETURN
AF 960 IF ER=14 AND EL=260 THE
       N RESUME 300
MK 970 IF ER=14 AND EL=500 THE
       N RESUME NEXT
KJ 980 IF ER=4 AND EL=780 THEN
        F=4:A$=DS$:RESUME 800
DQ 990 IF ER=30 THEN RESUME:EL
       SE PRINT ERR$(ER);" ERR
       OR IN LINE";EL
```

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.

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.

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.

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.

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.

```
BF 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
BC 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
0E 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$,P)
E6 350 R$ = "": 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
B8 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)
2D 570 FOR F = 1 TO 8:C = C * 2
       - 255 * (C > 127) + V(F):
       C = C - 255 * (C > 255):
       NEXT : RETURN
0A 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
B4 610 PRINT "DISK ERROR": GOTO
       150
```

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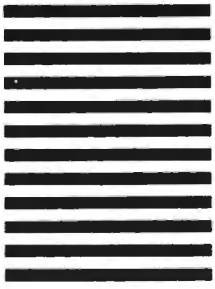

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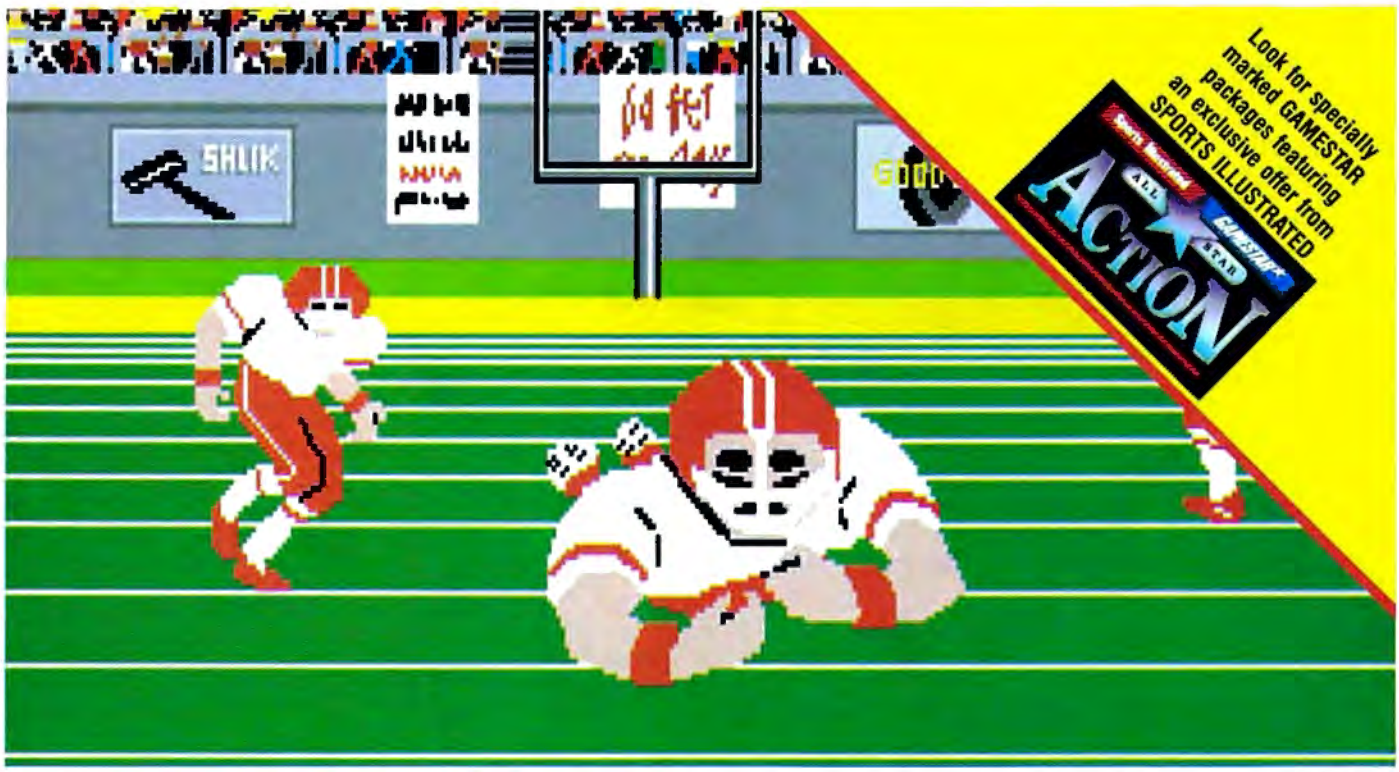

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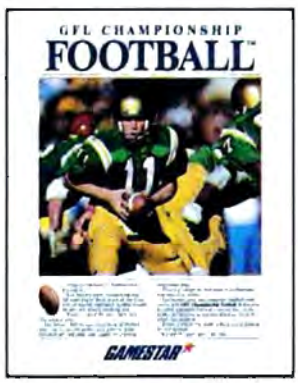

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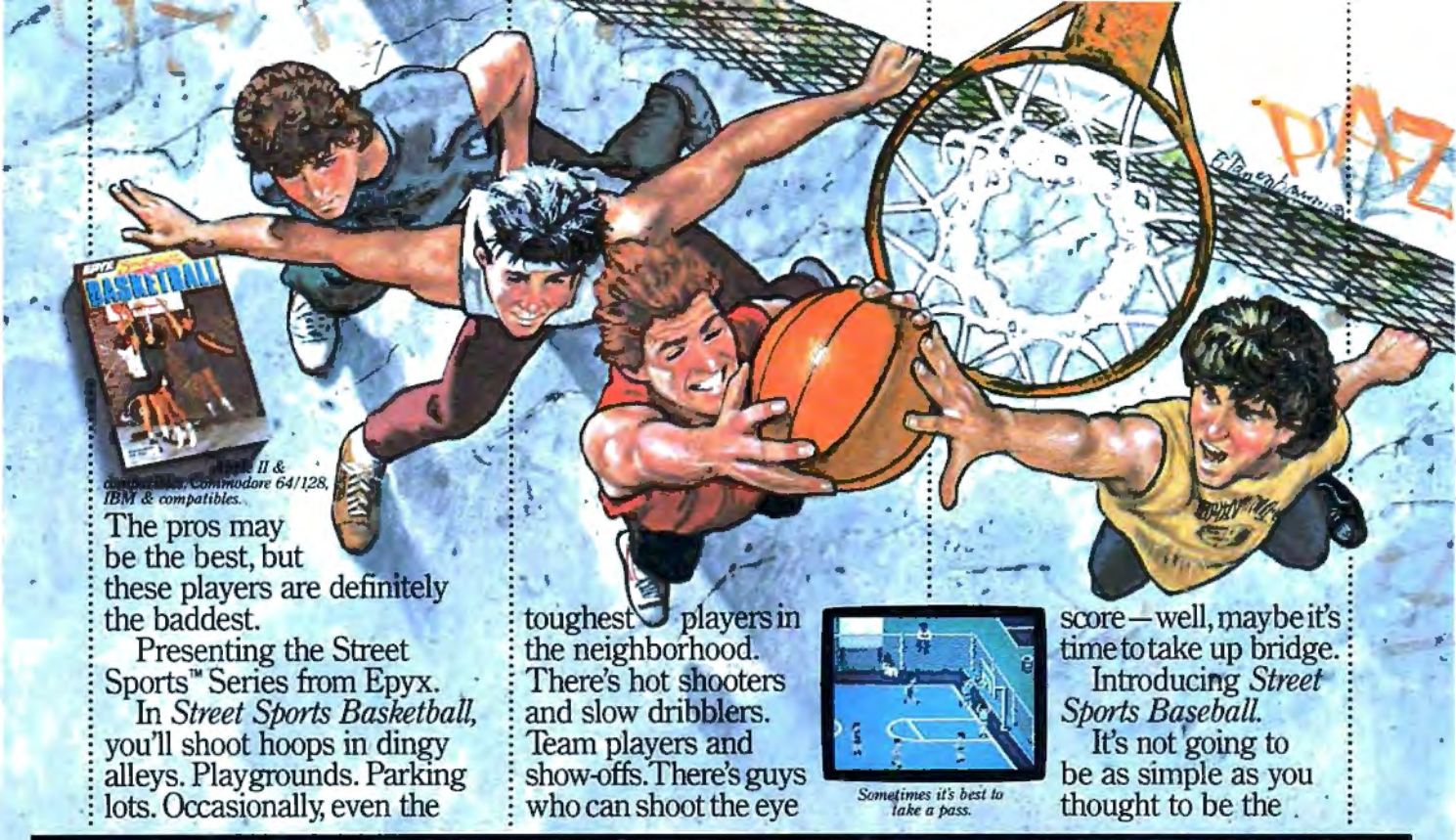

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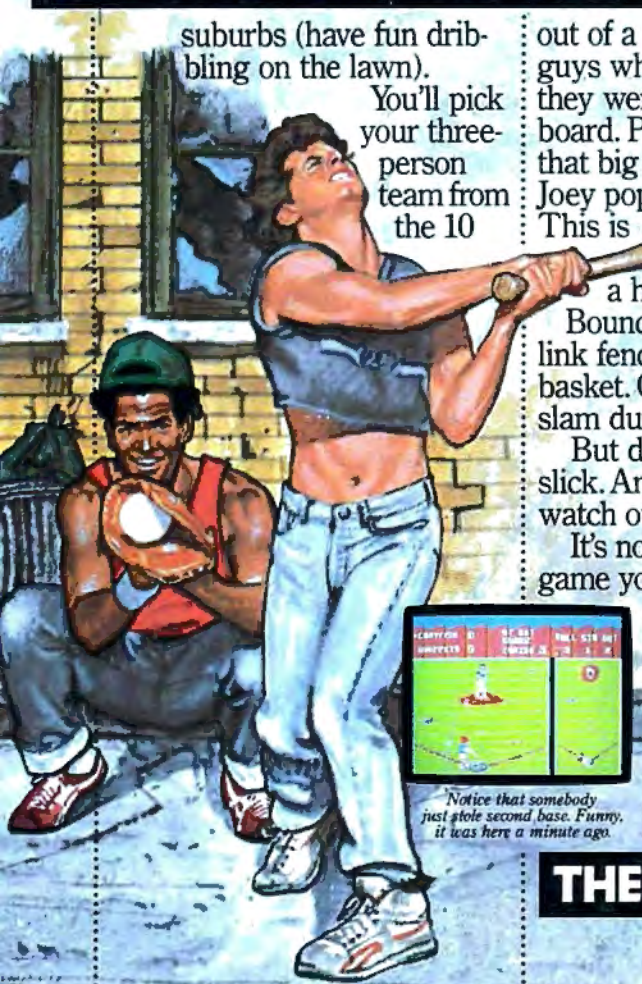

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