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How to Access a BBS

To access a BBS, you must have a modem (MOdulator-DEModulator). This is a piece of hardware that enables your computer to communicate with another via telephone lines. A good modem to purchase is one that will operate at a high speed or baud rate. *Bits per second (BPS)* is a more accurate term.

You'll also need terminal software to let your computer communicate with your modem. Rather than going into specifics of how to use a terminal, I strongly suggest that you read the program's manual or documentation. It's vital that you understand how and why a terminal works before you go online. If you simply don't understand what it's all about, contact someone in your local user group for help.

Accessing a local BBS is relatively simple, and it doesn't have to be a Commodore BBS. You can access one running on an IBM, Atari, or any other computer.

Load your terminal software and configure it to 8-bit ASCII mode, no parity, and one stop bit. There's usually a menu option that lets you set these parameters. Most BBS's operate on this standard, and you should have no trouble connecting. It's unusual to find one operating at 7-bit, even parity, and two stop bits, but they exist. Make sure that you are set for the correct baud rate (BPS) for the board you're calling. Most boards can handle speeds between 300 and 2400 baud.

If you don't know of any BBS's in your area, contact your user group or local computer dealer. If you can get just one number, you're on your way to finding others. Most BBS's have a good list of local, state, national, and sometimes international BBS's.

Once you've made your connection, you may have to hit Return or Enter a few times to "wake up" the BBS. Once you're in, you'll probably see a message welcoming you to the board. At that point, it may ask for your name and password or for you to type *New* if you're a new caller. From there, follow the instructions.

Once you've gained access to a new BBS, read what appears on your screen. Most BBS's offer clear instructions for what to do next, but new users often are intimidated and fail to comprehend what they're reading. Take a deep breath, read, and try to comprehend before you panic.

You'll probably have limited or no access on your first call, and you may have to register. This involves filling out some sort of online registration form. Occasionally, you may get instant access to the BBS and its numerous features, but this is the exception rather than the rule. You'll more than likely have to wait a day or two and call back after the sysop processes your application.

Some systems require a fee to access. I often find that a BBS that requires a fee is not worth the money. BBS's really worth calling are the ones that are free and for which fees are voluntary.

Once you have access, go to and read the help files; otherwise, you'll be lost. Try to capture them in your terminal software's buffer to print out and read later. This is your map to the BBS and will facilitate your moving around the system. Not only will help files save you time and make it easier for you to find your way through a strange BBS, but these files also usually explain many of the board's special features that can make your visit more fun.

Try reading and leaving messages. Peruse the available files and download (receive) an interesting program or file. If you need help, try paging the sysop. If available, he or she may come online with you in chat mode.

The rest is really just exploring the system and getting to know it. Some may offer online games for one or more callers. Other boards have multiple telephone lines that allow several callers to chat live with each other. Each one is different. Check out the menus to see what's offered and don't forget to read the help files.

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tion, and the possible combinations of message bases and transfer sections you intend to have. This is a great timesaver and will save you headaches down the road when you want to reconfigure your setup. Design your menus carefully, if your bulletin board software has that capability.

Know the Password

Before you start your BBS, you should decide whether to make the system open to all callers or require that callers be verified and use a password for access. As a sysop, I want to know who's calling my BBS, even if I let people use fictitious names or handles online. I also strongly suggest using passwords. They'll cut down on the number of hackers trying to crash your board and ensure the privacy of your users' messages and electronic mail.

If you're fussy, you can verify all potential users by making them supply their correct names and addresses by mail. Some sysops ask for a photocopy of a driver's license as proof of a caller's identification. On the other hand, you can simply screen applications for suspicious names and addresses, such as John Doe or 12345 USA Street. I don't usually permit callers full access to my board unless the information they supply is complete and accurate.

If I happen to be at my computer when someone new calls my BBS and registers online, I often get on my voice phone and call the number listed on the application while the caller is still connected. That number should be busy when I call. If it's not, I get suspicious and investigate further.

No Hogs, Please

I suggest you limit your callers to 45 minutes per call and two or three calls per day. If you give everyone unlimited time, you'll find some users abuse the privilege and hog the line so others cannot use the BBS. The same holds true for downloading privileges. Don't give too much, or it will discourage other callers who constantly get a busy signal because someone is downloading program after program.

This includes you. If you hog the system by playing games, people trying to connect will get frustrated. If you want to use your computer for personal use, do so only during slow periods or, in the case of a part-time BBS, during the board's off hours; or buy another computer.

Callers can get discouraged with a BBS if it's difficult to connect, and sysops can get discouraged if people don't call. Don't expect your BBS to overflow with callers the minute you put it online. If you decide to go public, advertise your board's number on other BBSs; make leaflets with *The PrintShop, PrintMaster,* or a similar package; and distribute copies to bookstores, computer stores, schools, and libraries. During summer months especially, expect a slowdown in logons. Not too many people sit at home calling a BBS on a bright summer day; don't let it discourage you.

Other things can get on your nerves as a sysop. These include users' not obeying rules you've established and asking you questions that are plainly explained on the board. Those who simply disconnect instead of properly logging off and who complain because your system doesn't meet their expectations are other examples of callers a sysop can do without.

If you're willing to put up with these relatively minor aggravations, you may be sysop material, especially when you begin to reap the fruits of running a BBS. You'll learn more about computers, have PD and shareware software uploaded to you, communicate with people from all over. Best of all, you don't have to call out; people call you. In closing, the best rewards for me in running a BBS since 1984 are all the appreciative users I've met. They've become more than callers; they've become good friends. ⊡

Rick Lembrée is the CEO of Harbour Lights Communications, a desktop publishing firm; chief sysop of Harbour Lights BBS, the oldest continuously operating BBS in Maine; chairman of Southern Maine Commodore User Group; and editor of its newsletter, *C-Link*.

BBS Software

To set up your own electronic bulletin board system, you'll need the proper software, whether it's commercial or public domain. Public domain software and shareware are available through your user group or can be downloaded from many bulletin boards, including my BBS, Harbour Lights, at (207) 967-3719. If you use shareware, please send in your registration fee to the author. Here are a few available titles: *EBBS 64, EBBS 128, RIBIT BBS, All American BBS, 64 Messenger BBS, Star BBS.*

Here's a sample of some of the commercial BBS programs available for the 64 or 128. *ARB BBS* gets my vote as being one of the better bulletin board programs available. It supports multiple message bases, X-Modem and Punter protocols, story boards, multiple levels, online games, E-Mail, and more. Its manufacturer, L & S Computers, also offers good support. But all those listed here are sure to get you off on the right foot.

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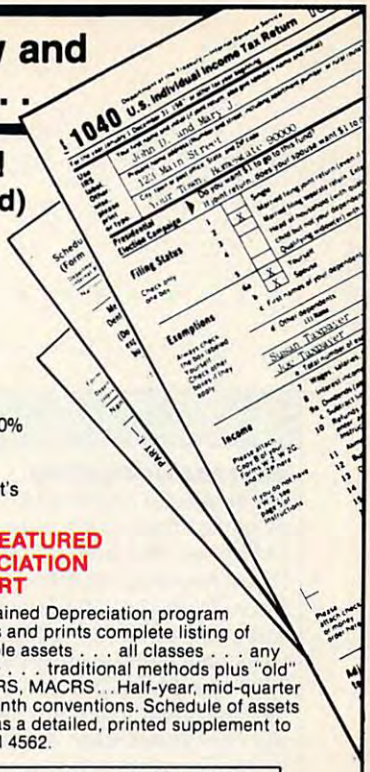

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FEEDBACK

EDITORS AND READERS

Address Correction

Thank you for referring to our company in the "Feedback" column of the December 1990 issue of *COMPUTE*. Our correct address, however, is Jason-Ranheim, 3105 Gayle Lane, Auburn, California 95603; and our telephone numbers are (800) 421-7731 and (916) 878-0785. We fear that the letters sent to the San Jose address will be returned since we moved from that address some years ago.

JUDITH HANSON
MARKETING DEPT.
JASON-RANHEIM
AUBURN, CA

Our apologies to Jason-Ranheim and any readers who may have written for EPROM information to the old address we mistakenly provided.

Keep It Clean

I followed the instructions for cleaning my keyboard as you suggested in "Feedback" (November 1989), but now I'm having problems with it again. Some keys require excessive pressure to work, while others print double characters at the slightest touch. According to a discussion on our local bulletin board, cleaning may not solve the problem. Some people say a little piece of rubber that bridges the switch gap between the key and metal contacts on a printed circuit board may be wearing out. I would appreciate your comments.

JOSEPH J. KNUEVEN
WYOMING, OH

The "Feedback" you referred to essentially recommends the use of compressed air, a pencil eraser, and rubbing alcohol. Alcohol is a great cleaner providing it's ethyl alcohol. A Commodore repair person we contacted, who has corrected this particular problem many times, says dirty contacts are usually the culprit for the majority of keyboard ailments and that a cleaning is called for. Using alcohol isn't always necessary, however. Instead, use a pencil eraser to clean the metal contacts; then score the connector, which is plastic rather than rubber, with a small wire brush.

Back to the Board

I was very pleased with the *Electronic Billboard* program (June 1990), but I have one problem. My word processor won't save files in the proper Commodore ASCII format for the program to read from disk. I decided to modify the program to write to disk the 99 lines the user can enter directly from option 2 on the *Billboard* menu. The program can then load the text into memory with the load routine from option 1.

First, load Billboard.Bas and type in the lines listed below. Remember to save the program when you've finished. To use this routine from the main menu, select option 2 from the main menu and enter the lines of your message in the usual way. When you've finished, type an asterisk (*) on the last line as you normally would. Then press S at the prompt, and the message will be saved to disk automatically as "BILLBOARD.DATA." Later, when you want to load this file from disk, select option 1 from the main menu. Lines 1100 and 1110 are simply disk error-checking routine from the 1541's user manual.

MIKE TENNANT
WASHINGTON, PA

```
CH 130  DIMS1$(MX),S2$(MX),L$(9
        9):R1$="{RVS}":R2$="
        {OFF}":S1%=SP*3:S2%=SP*
        5-5
RX 200  PRINT"{DOWN} PRESS RETU
        RN TO START MESSAGE SCR
        OLL"
HR 205  PRINT"{SHIFT-SPACE}ENTE
        R S TO SAVE MESSAGE":PR
        INT" PRESS Q TO QUIT";
PF 210  CH$="":INPUTCH$:IFCH$="
        Q" OR CH$="Q" THEN SYS2
        048:END
XF 215  IFCH$="S"ORCH$="S"THEN
        {SPACE}GOSUB1000:GOTO20
        0
RG 300  POKE214,23:PRINT:PRINTS
        P$;:POKE214,23:PRINT:PR
        INTB$;:SYS828
XE 570  S1$(N)=C$:L$(N)=C$:
        {6 SPACES}IFS1$(N)="-"T
        HENGOTO440
PJ 1000 OPEN15,8,15:GOSUB1100
AH 1010 OPEN2,8,2,"0:BILLBOARD
        .DATA,S,W":GOSUB1100
XC 1020 FORZ=1TON-1:PRINT#2,L$
        (Z):NEXT:GOSUB1100
GG 1030 CLOSE2:GOSUB1100:CLOSE
        15:PRINT"SAVED.":RETUR
        N
QH 1100 INPUT#15,EN,EM$,ET,ES:
        IFEN>1THENPRINTEN,EM$,
        ET,ES:STOP
CE 1110 RETURN
```

A Charitable Offer

As a former treasurer of the church I attend, I have developed Commodore 64 programs to manage the finances of the church and make periodic reports to the governing body and congregation. I converted some of these programs for use on a PC owned by the church, and they are still in use. I would be happy to share either the 64 or the PC version of these programs with any church or other charitable organization that would care to contact me.

WALTER L. JOHNSON
515 SE NOLAN ST.
DEKALB, TX 75559

My Own BBS?

Last year you ran an article that talked about people running their own BBSs (Bulletin Board Systems). That sounded interesting, but I have a lot of questions to ask. How could I run my own BBS? Does it cost a fortune? Does it tie up the phone lines?

If I couldn't run my own, could you tell me how to become a member of someone else's BBS? I heard you need certain things such as a BBS program. Could you tell me how to get one?

TIM HEALY
RAYMOND, NH

You picked a good time to write, Tim. In this issue, Rick Lembrée, who's been operating his BBS in Maine since 1984, shares his expertise with our readers. If you already have a 64 and a modem, you have all the hardware you need for a small system. You will need a BBS

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program, but check the article for further information about this interesting computer activity.

A Reader Helps

A couple of letters in the January 1991 "Feedback" are worth mentioning. John Potter asked about disabling the programmed function keys on his 128. Here's an easy way. Poke 828, 183 to get the 64 values; then poke 828, 173 to reenable the 128 definitions.

Walter Stegemiller asked about delays in programs that use extensive arrays. Creating simple variables, such as A or B$, after the arrays are DIMensioned is the usual cause for one-time delays. Each new variable causes a delay.

To avoid this, preassign all simple variables using a DIM statement, such as DIM A, B$, X, Y, Z, before creating the array. Also, the notorious *garbage collection* delay occurs only when using strings. This might help Walter isolate the cause of the delays in his programs.

BOB RENAUD
WASHINGTON, MA

Thanks for the tips, Bob.

Stars for Sale

I am 72 years old with vision only in one eye, so I like ready-to-run programs on disk. You have one in the June 1990 *Gazette* called *Starburst Graphics* that I would like to use for camcorder graphics. Is there any chance you will have this on sale soon?

RICH MAUNEY
MT. HOLLY, NC

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FEEDBACK continued from G-17

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PET Vets

Your magazine is informative when it comes to the 64, but once in a while it would be fun and interesting to read an article about the old datasette, 1520 plotter, and my old Commodore 16 computer. I am sure there is more than a minority of dedicated Commodore owners who would enjoy taking this old hardware down from the attic, dusting it off, and exploring its capabilities again. Where else can we get information on this old hardware? They haven't written a book on antique computers yet, but maybe there's someone with ideas on how to expand their use despite the newer PCs.

DENNIS KOZIK
WEST ISLIP, NY

Perhaps you and other Commodore veterans might want to contact the writer of this next letter. You might also try your local user's group.

If anyone out there is a fellow Commodore collector or user of older Commodores (PET, VIC-20, Plus/4, C16, or B128), write me. Let's share information on software, hardware, and other resources before they become nonexistent.

LARRY ANDERSON
547 LEWIS ST. #14
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Who's Got the Ribbon?

I was reading your "Feedback" column in December, and I was able to help out someone with the Tech Sketch light pen. Now I hope someone can help me find a ribbon for my Okimate 10 printer. I sent an order to the Okidata supply address, and the postal service returned my letter, stating that Okidata was no longer there. Should I have to discard my printer because I can't find ribbons?

DOROTHY REYES
HOLLIS, NY

We don't know what address you used to order your ribbon, but when we contacted Okidata, a spokesperson said the company is still very much in business and offered the following advice. Contact Okidata and someone will either direct you to a dealer near you who stocks the ribbons or else arrange to have one sent to you by mail. Write to Okidata, Customer Service, 532 Fellowship Road, Mount Laurel, New Jersey 08054. Okidata ribbons are also available through Ramco Computer Supplies, P.O. Box 475, Manteno, Illinois 60950;, (800) 522-6922. A black ribbon from Ramco sells for $5.25, a color one for $5.75. You might also try contacting a local computer store.

If you have a question, comment, or problem, we want to hear from you. Send your letters to Gazette Feedback, COMPUTE Publications, 324 West Wendover Avenue, Suite 200, Greensboro, North Carolina 27408. ⊡

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D'IVERSIONS

FRED D'IGNAZIO

Recently I attended the Consumer Electronics Show in Chicago, previewing new computers. I passed by the Sharp Electronics booth and was struck by its line of pastel-colored products. There were juicy peach TVs, baby blue calculators, lime green radios, and shocking pink boom boxes. I also noticed that the products' cases didn't have sharp right angles with well-defined corners. Instead the cases were contoured, their corners rounded, smooth, and soft-looking. The products looked less like an engineer's chassis but more like something organic and alive. It was all high-tech designer chic—something with a decidedly human look and feel.

The "in" look now in southern California is clothes that haven't seen the inside of a washer or the underbelly of an iron. Beards, legs, and underarms that haven't been shaved and unwashed hair that has a stiff, greasy, "sexy" look are also fashionable.

Rumpled is in. People are rumpled. Clothing is rumpled. Technology with a rumpled look is next.

Rampant miniaturization and "digital fusion" will help rumple technology and give it a much more human look and feel. Appliances will fuse: cameras, VCRs, and TVs; telephones, fax machines, laser copiers, and answering machines; computers, radios, TVs, CD players, CD-ROMs, and laser discs.

If technology continues to shrink and converge, then it will become possible for appliance and clothes designers to work closely together to design intelligent clothing in which the appliances are housed. If high-tech becomes microminiaturized, just think of all the computing power you will be able to fit inside a woman's shoulder pads, a Texan's cowboy hat, or a teenager's pump tennis shoes.

Whole entertainment centers will travel with us. We'll wear them as microspeaker earrings, laser disc neckties, and CD-ROM belts. We'll carry entire libraries as encyclopedia suspenders, fax machine necklaces, and data-dump jumpsuits.

It won't stop there. In the future when high-tech is built into our clothes, even our underwear will be intelligent. Undershirts will have body sensors and release deodorant as needed. Undergarments will have environmental-control panels that will keep us toasty warm on cold days and frosty cool during the dog days of summer. Our underwear will be multitasking. While it keeps us from being socially suspicious, it may also be working on a tough engineering problem, sorting out a personalized newspaper, calculating our taxes, or designing a challenging videogame for us to play when we get home at night.

NEXT CENTURY'S HOT ITEM: HIGH TECH TO GO

At the end of the 1990s, we'll look back at our desktop computers, and marvel. "How could a computer be so big?" we'll say, shaking our heads. "And look at it. It just sits there, all blocky, square, and squat."

The term *desktop computing* will become a quaint term that carries the same nostalgia as hula hoops, tail fins, Howdy Doody, or Bing Crosby.

Nobody will be doing desktop computing because the desktop computer will have disappeared. In rare cases where a megamainframe is required, the computer will have disappeared into the desk. In all other cases, we'll wear all the computing power we need in our different outfits.

Getting dressed in the morning will be a hard thing to do—especially when we are naked and don't have any onboard computing power. "Do I want to feel really intelligent today and wear my 20-gigabyte sport coat, or do I feel lowbrow enough to get by with my old 100-meg T-shirt?"

In the future, everyone will wear glasses. The glasses will "correct" our vision from real-world reality to a virtual reality that has a computer-display screen overlaid on top.

When we need to access information at school, at work, or in a meeting, we'll reach into our pockets and pull on pairs of sunglasses. In most cases we'll see facts, figures, pictures, simulations, and so on; but we might secretly be looking at digital movies, controlling a CD player embedded in our earrings, or playing videogames using our eye movements to control optical joysticks.

Technology clothing can be pretty flashy, but it's only a waystation to the real high-tech look of the next century. By the year 2001, many trendsetters will have abandoned clunky high-tech clothing for the new look: technology embedded in your body. After all, what are people to do on the beach in skimpy bathing suits? Or in the shower, or in bed?

We can take our technology with us, but it'll soon be a bother to wear all-terrain technology "wetsuits" that can go anywhere. Instead, people in the know will be carrying all their appliances as *dermal implants* inside their bodies. And it will be a gas! Imagine pressing your belly button to call your mom, who is vacationing in some renovated gulag, or closing your eyes and watching the new Rocky movie *(Rocky XXV)*.

Technology in the near future will be everywhere, but it will also be invisible. It may be under your clothing, inside a tooth filling, or on the tip of your tongue. For heavy-duty computing, though, you can mount a mainframe unit as a collar around the neck of your favorite pet. And if you're smart, you'll get a really intelligent collar that will also kill fleas. ⊡

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BEGINNER BASIC

LARRY COTTON

WHERE TO FROM HERE?

SOME BASIC RAMBLINGS

For many computer users, the first time they encounter BASIC is when they turn on their machines. On the 64 or 128, the first screen you see is a BASIC screen. The computer attempts to interpret anything typed on the keyboard as a BASIC command.

If you type your name and press Return, the computer will look it up in its internal BASIC dictionary. And unless your name happens to be LIST or another BASIC keyword, the computer will announce that you've entered a syntax error; your name wasn't in its BASIC interpreter.

The 64's version of BASIC is similar to the original BASIC invented at Dartmouth College almost 30 years ago. The 128's version contains all of the 64's commands and adds many of its own, such as RDOT and SPRDEF. Since these commands are unique to the 128, we won't spend much time on them in this column; I have to cover what's common to both computers.

There's been a lot of press—mostly bad—about BASIC's speed. There's no doubt about it; BASIC is slow. Every instruction the computer sees in a program must be translated just as if it had never seen it before. If you say PRINT X+Y, the computer must first look up PRINT to see if it's a valid BASIC statement, then look up the value of X, and then check to see if the + sign really means anything. It then looks up the value of Y, does the addition, and prints the result on the screen.

If you say PRINT A−B, the computer doesn't remember that PRINT has passed the validity test, so it looks it up again, then goes through essentially the same procedure as PRINT X+Y, except with a different mathematical operation and different variables.

Even at this snail's pace (electronically speaking), the answer's usually on the screen by the time you've lifted your finger from the Return key. In other words, BASIC is quite fast enough for some programs.

It's not fast enough, however, for high-resolution graphics or arcade-style games. That's because moving several objects simultaneously in a blast-the-aliens-as-fast-as-you-can game or updating flight-simulator scenery calls for rapid math calculations. The program must also react quickly to joystick movements and print recognizable pictures onscreen.

If you're into programming games, don't depend on BASIC to be able to handle the speed. Such programs virtually grind to a halt if they're written in BASIC, so programmers must resort to another language or else program in the language the computer understands—machine language. (But that's a topic Jim Butterfield covers in his column.)

Another bad reputation BASIC has garnered over the years is that it's unstructured and encourages sloppy programming. In other words, since there are so many ways to accomplish a given task, each programmer can approach a program in an individualistic and often hodgepodge way.

Quite a few columns back, Todd Heimarck and I debated the relative merits of structured and unstructured programming. You can program either way in BASIC; other languages require more structure. I argued that structuring restricts creativity, elegance, and flexibility.

I tend to write programs top-down, starting at the top and working down until the program's finished. BASIC's perfect for this. You simply tinker, test, and tweak until the program works. But does it really work under every conceivable condition?

A better way is to think of the structure before you ever begin. What are the main things you want to accomplish? Can tasks be broken into manageable modules of code? Can you use meaningful variable names? Can you help explain the code with remarks? Can you keep lines short?

So what is BASIC good for? In its ability to manipulate large amounts of data, in doing complex math problems, in the programming of simple music and sound effects, in giving tests, or in collecting data, BASIC shines.

For instance, if you want to write a program that creates and maintains a list, BASIC is the ideal programming language. First, it collects data using the INPUT and/or GET statements. It remembers data in the form of text (strings) or numeric variables. It can save your list to a disk and load it back into the computer. BASIC also works well sending data from the computer to a printer.

Two of the most popular programs I've written to illustrate various BASIC programming techniques are a quiz that teaches state capitals and a list-making program. Both are easily written in BASIC and work well. The user never realizes that the programs are not extremely fast.

All these ramblings are leading to a plea for your input to help me write this column. BASIC is a wonderful language, but what would you like to do with it? Would you like to gather data? Control appliances? Play music? Learn to type? Time reactions? Dial a phone?

I'd also like to know how long you, the reader and BASIC programmer, have been with me. Are you a programming veteran or a novice?

I'd really like to know what you would like to learn about, and do with, BASIC. I can be reached in care of COMPUTE, 324 West Wendover Avenue, Suite 200, Greensboro, North Carolina 27408. ⊡

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MACHINE LANGUAGE

JIM BUTTERFIELD

It seems pointless to have code that adds 0 to a number, or for that matter subtracts 0. After all, anything plus 0 gives an unchanged value, right?

In the case of a carry, adding/subtracting 0 can make good sense. For example, suppose you have the address of a variable stored in $FD/FE and you want to move to the next variable, seven bytes away. After an intial CLC to clear the carry, you would add to the low part of the address with LDA $FD, ADC #$07, STA $FD. How about the high part of the address? One way to do the job is to let the carry add in "naturally" with LDA $FE, ADC #$00, STA $FE. The 0 might be viewed as the high-order part of the value 7.

There are several such tricks that involve adding 0; usually the carry flag plays a role. This time, I'd like to concentrate on a special trick: adding or subtracting 256 to a byte, in steps, causing its value to roll around to the original number.

All bytes must contain values in the range of 0 to 255, or $00 to $FF in hex. If I should add, say, 128 (hex 80) to any value and then do it again, the number will return to its original value. What's the point?

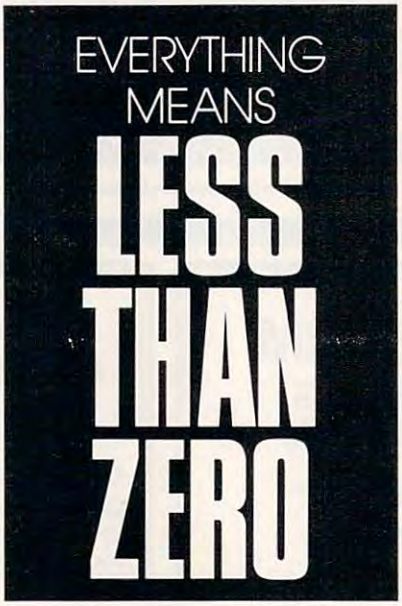
One example of adding 0 can be found in every Commodore 8-bit computer. It's part of a routine called CHRGET. On the 64, you'll see this code at addresses $84–$89. It looks like this:

```
0084  SEC
0085  SBC  #$30
0087  SEC
0088  SBC  #$D0
```

Successively subtracting hex 30 and D0 (decimal 48 and 208) walks the value in the A register completely around, leaving it where it started. What's the point?

As it turns out, this clever piece of code adjusts the carry according to the value in the A register. If the value is below hex 30, the carry will be set; if it's above, the carry will be clear. The flag will be used by the program that called this subroutine.

Another clever and interesting piece of code that has been showing up lately is used in converting a value to hexadecimal ASCII prior to printing it. The number is split into two four-bit groups, each of which will be translated to a printable character in the hexadecimal range 0–9 or A–F.



Once you've isolated the four-bit nybble with a value ranging from 0 to 15, the usual method is to test to see if it's less than 10. If so, add hex #30 to create a character from 0 to 9; otherwise, add hex #$37 to produce A to F. There are many variations of this basic method, but they all involve two additions and a test.

The clever method rolls the number completely around, and then some! If you do this in decimal mode, the number will end up at the right place with no tests needed. And this method deliberately puts the carry flag to use to get the numbers exactly where they're wanted.

Here's the method. First, the program sets decimal mode. We'll discuss the effects of this in a moment. The carry flag is cleared, and we add 90 decimal. The code so far reads as follows:

```
SED
CLC
ADC #$90
```

Let's see what happens so far. If the original value was in the range 0–9, adding hex 90 in decimal mode will yield $90–$99, and the carry flag will be clear. If the number was in the range 10–15 (hex A–F), adding will produce 100–105, or more accurately, 00–05 hex with the carry flag set. Note that decimal mode has been used with numbers that aren't in true decimal format; in principle, values such as A or F would not be legal BCD. No matter—the computer will adjust the value correctly.

The rest of the calculation is straightforward. Remaining in decimal mode and leaving the carry flag as is, we add 40. The code is a simple ADC #$40, followed by clearing decimal mode with CLD.

If the original value was in the range 0–9, its modified value of 90–99 will be added to 40 (decimal mode, of course), producing the correct result of $30–$39. There will be a resulting carry, but that doesn't matter.

On the other hand, if the original value was 10–15 (hex A–F), the modified value of 00–05 will be added to 40, plus a carry! This will yield a result of 41–46, the correct ASCII values for letters A–F.

Numeric or ASCII, the number is ready to print. And there were no comparison tests.

The little program that follows simply displays its first 12 bytes in hexadecimal. It gives you an easy way of checking the above method and seeing the usual way of separating a byte into its two nybbles.

The program runs on virtually all 8-bit Commodore computers. One caution should be observed: If an interrupt occurs while the computer is in decimal mode, the interrupt program will run in decimal mode. That's

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not serious for normal interrupt routines, but there's an anomaly with Commodore computers prior to the VIC-20. On such computers (PET, CBM), the keyboard-reading routine uses the ADC instruction; as a result, false keyboard values are seen if a decimal-mode interrupt takes place. You may eliminate this effect by locking out the IRQ during the time you're in decimal mode; issue the command SEI just before SED and the command CLI right after CLD. Even with a newer machine, I recommend that you try your hand at adding this coding. It's good practice.

```
2000  LDX #$00
```

The loop that counts the 12 bytes will be controlled from the X register. The program will be at hex 2000, so that's where we will read the bytes from.

```
2002  LDA $2000,X
```

The value to be printed in now is in the A register. To split it into two parts, we'll save (push) it on the stack and then extract the first nybble.

```
2005  PHA
```

Get the high nybble by shifting the contents of A to the right four times. Zero bits slide into the right side, and the high bits move to the low end of the byte. The low bits are lost. We'll bring them back when we pop the stack.

Your assembler might prefer that you type LSR A rather than the LSR shown. Give it whatever it wants.

```
2006  LSR
2007  LSR
2008  LSR
2009  LSR
```

The high nybble is converted to a binary value from 0 to 15. We're ready to do the conversion. The following code could be made into a subroutine, since we'll use it again for the low nybble.

```
200A  SED
200B  CLC
200C  ADC #$90
200E  ADC #$40
2010  CLD
```

Conversion complete. Let's print the character we've created.

```
2011  JSR $FFD2
```

Pull the original value from the stack with PLA and use AND to isolate the low nybble. Convert to ASCII and print.

```
2014  PLA
2015  AND #$0F
2017  SED
2018  CLC
2019  ADC #$90
201B  ADC #$40
201D  CLD
201E  JSR $FFD2
```

For neatness, print a space so that the next byte will be separated from this one.

```
2021  LDA #$20
2023  JSR $FFD2
```

On to the next byte, unless we have done 12 (hex 0C), in which case we quit.

```
2026  INX
2027  CPX #$0C
2029  BNE $2002
202B  RTS
```

It's a neat method, and it illustrates how a little thought can produce elegant number handling. And it's not too clever—the code is sound.

Rolling a number around by adding or subtracting 0? It can be quite handy.

```
100 DATA 162,0,189,0,32
110 DATA 72,74,74,74,74
120 DATA 248,24,105,144
130 DATA 105,64,216,32
140 DATA 210,255,104,41
150 DATA 15,248,24,105,144
160 DATA 105,64,216,32
170 DATA 210,255,169,32
180 DATA 32,210,255,232
190 DATA 224,12,208,215,96
200 FOR J=8192 TO 8235
210 READ X
220 T=T+X
230 POKE J,X
240 NEXT J
250 IF T<>5402 THEN STOP
300 PRINT "HEX CONVERSION"
310 PRINT "DEMO"
320 SYS 8192
```

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PROGRAMMER'S PAGE

RANDY THOMPSON

You stare at it all the time. BASIC's PRINT statement depends on it. All of your software would be useless without it. I am, of course, talking about your computer screen.

This month I've selected a couple of tips designed to manipulate your computer's most visual component. Both were sent in by readers, as was a correction to November's column.

Cursor Control

This short 64 program gives BASIC programmers a cursor-locate command and a box-clear command.

```
KH 10 FOR I=679TO748:READ D:PO
      KE I,D:NEXT
CK 20 DATA 32,182,2,134,176,32
      ,182,2
PS 30 DATA 164,176,24,32,240,2
      55,96,32
XC 40 DATA 253,174,32,158,183,
      96,32,167
GE 50 DATA 2,134,177,32,182,2,
      232,134
DF 60 DATA 178,32,182,2,134,17
      9,169,32
JB 70 DATA 166,176,164,177,32,
      210,255,232
AB 80 DATA 228,178,208,248,196
      ,179,208,1
HB 90 DATA 96,230,177,166,177,
      164,176,24
SD 100 DATA 32,240,255,24,144,
       224
```

This program stores two machine language routines in memory starting at location 679.

To position the cursor on the screen after running the program above, all you have to do is enter SYS 679, *X, Y* where *X* is the desired horizontal position (0–39) and *Y* is the desired vertical position (0–24).

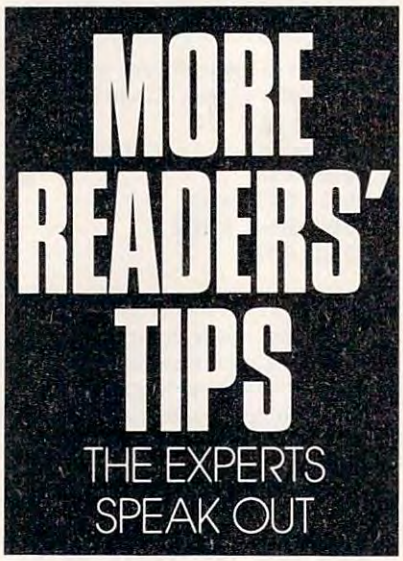
The syntax for the second routine, which clears any rectangular area on the computer screen, is SYS 701, *X1, Y1, X2, Y2*. Coordinates *X1, Y1* and *X2, Y2* specify the upper-left and lower-right corners of the area to clear, respectively. So to clear a 10 × 10 character area in the middle of the screen, you'd use the command SYS 701, 14, 7, 23, 16.

ERIK MARTIN
DENTON, TX

Scrolling Down

Scrolling your computer's text screen up a line is easy: Simply move the cursor to the bottom of the screen and execute a PRINT statement.

Scrolling the screen down is not as simple. The November 1989 "Programmer's Page" shows you how you can use a PRINT instruction to make the 64's screen scroll down, but there's another way to accomplish this feat. Move the cursor to any spot on the screen and execute the command SYS 59749. Anything below the cursor will scroll downward. Lines located above the cursor remain in place.



Calling this ROM routine repeatedly can cause a strange side effect, however. For example, clear your 64's screen by pressing SHIFT–CLR/HOME, type SYS 59749, and press Return. Now, cursor up until your cursor is back on top of the SYS command and press Return again. Repeat this last step four more times. On the fourth try, your cursor takes a strange detour before reaching the top of the screen.

The cause of this misdirection has to do with how the 64 manages its screen. Using a screen line link table, found at locations 217–242, your computer keeps track of lines that have a logical length of 40 or more characters (BASIC program lines that take up two screen lines, for example). The ROM routine located at 59749 moves lines down by adding 40 spaces to the beginning of the current line. This creates a line with a logical length of 80 characters, or two screen lines. Repeated calls to 59749 can wreak havoc on the screen line link table, however. With direct calls to this ROM routine, it's possible to create logical lines that are longer than the system is prepared to handle. With a little preparation you can keep this table in check and keep your scroll-down routine from confusing your cursor.

To safely scroll the screen down, position the cursor on the desired line and then type in and execute the following instructions:

```
L=PEEK(214)+218:POKE
  L,PEEK(L) OR 128:SYS 59749
```

The POKE command updates the screen line link table before SYS 59479 takes effect. This ensures that no logical lines exceed the size of two screen lines, and scrolling down works as expected.

ADAM D. KROPELIN
JEFFERSONVILLE, VT

Oops

In your November column, there's an error in the program that copies BASIC and Kernal ROM. In line 20 the first value in the FOR–NEXT loop should be 57344, not 7344. It doesn't change anything, but it does take an unnecessarily long time to run. Also, the location for the INPUT prompt character is 43846, not 53846.

HUBERT CHAN
ST. ALBERT, AB, CANADA

We're interested in seeing your best programming tips and tricks. Send your submissions to Programmer's Page, COMPUTE's Gazette, 324 West Wendover Avenue, Suite 200, Greensboro, North Carolina 27408. We'll pay $25–$50 for each tip that we publish. ⊡

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LYSLE E. SHIELDS III

CROSS AID

USE THIS HANDY DATABASE FOR THE 64 TO HELP SOLVE CROSSWORD PUZZLES

How many times have you been stuck in a crossword puzzle, trying to find a three-letter word that ends in *u* for a large, flightless bird? Many people enjoy spending time solving as well as making crossword puzzles, but finding the appropriate word is not always easy. A computer with a program such as *Cross Aid* can help.

Cross Aid searches a database by length of word and the known letters in that word. It also lets crossword fans edit and compile their own crossword databases. In the above case, it would search for all three-letter words that end in *u*. If the word has been entered in the database, any crossword puzzle fan would expect the program to find the word *emu*.

Entering the Program

Cross Aid is written entirely in machine language. To enter this program, you'll need *MLX*, our machine language entry program (see "Typing Aids" elsewhere in this section). When *MLX* prompts you, respond with the values given below.

Starting address: 0801
Ending address: 1168

When you've finished typing, be sure to save a copy of the program before exiting *MLX*.

Although *Cross Aid* is written in machine language, it loads and runs like a BASIC program. Upon entering the program, you'll see the title and a word-entry box. At this point you may type in a word to search for or add a word to the database. Other operations include correcting or deleting words already in the database.

To add a word and to search for a word are almost the same operation. Type in the word to add or search for and press Return. If the word is already in the database, then it will be shown, and the bottom line will report that one word has been found. However, if the word is not found, the program will ask if you wish to add the word to the database. Answer yes by pressing Y or no by pressing N.

In addition to searching for whole words, you can search for words with missing letters. This is where the program comes in handy in helping you solve crossword puzzles. When you enter a period, number, or any character other than a letter in the unknown character positions, the computer will turn these illegal characters into question marks. You'll then be asked if you accept the word.

The computer will then search for all the words in the database that match this combination. They will be reported and totaled at the bottom of the screen. If more words are found than the screen can hold, you will be prompted with a question either to stop or to continue. Press S to end the listing or any other key to continue.

If It Quacks

For example, suppose you need a four-letter word for *water fowl* that starts with the letters *du*. Simply type in the first two letters and then two periods for the missing letters. Depending on what words are in your database, you may get *duck, dude, duel,* and *duke*. If you knew only that the word ended in *k*, you could type three periods and the final letter. All four-letter words ending in *k* in your database would then appear.

In addition to creating the database, you may at times need to perform maintenance on it. *Cross Aid* gives you two ways to edit: correct a word or delete one. To enter maintenance mode, type in a word that will bring up the misspelled word and then press Shift-Return. As with normal searches, a list will appear that matches the word pattern. A cursor will appear in the list. Move the cursor over the mistake and retype the letters to correct the spelling error or errors. Be careful not to edit a word into one that already exists or a duplicate will result in the database.

To delete a word, move the cursor over a word and press Shift-D. The word will disappear. When you've finished making changes to the database, press Return.

It's very important to end the program correctly. Otherwise, you may find that many of the words you thought you entered will be missing from the database. To end, simultaneously press the Commodore key and the S key. This will cause the computer to save vital information needed for the database.

Create a Directory

The first time you run the program, it will search for the directory of words in your database. Since you haven't created one yet, the light on your disk drive will flash. You may ignore it and continue the program. As soon as you've entered some words, the program will save them automatically in a file called CROSS.DIR when you end the program.

It will take a little effort for you to build up a useful database, but it won't be long before you have a good selection of words commonly found in crossword puzzles. Use the program a few times, and its value should soon become apparent. As an additional piece of advice, using a fast loader will help the speed of the program.

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PROGRAMS

CROSS AID

```
0801:0D 08 0A 00 9E 28 32 30 05
0809:38 30 29 00 00 00 00 7A E0
0811:28 A9 80 20 90 FF 4C 90 5F
0819:09 AA AA AA AA AA AA 4C F9
0821:38 08 4C 68 10 4C DE 0F DD
0829:4C FE 10 4C 8E 10 4C 9D D0
0831:10 4C B6 10 60 EA EA A9 62
0839:00 20 90 FF 20 68 10 20 46
0841:EE 0A 20 4E 0B B0 3B 38 FD
0849:20 3A 0A C9 00 F0 1C C9 9B
0851:01 D0 09 20 E8 0A C9 00 3C
0859:F0 11 D0 F3 A9 01 20 85 96
0861:0C C9 53 F0 06 20 BA 0C 95
0869:18 90 DD A5 6B D0 08 20 8E
0871:4C 0C B0 03 4C 02 0C 20 93
0879:5B 0C A9 00 20 85 0C 4C EA
0881:40 08 20 BA 0C 38 20 3A 1F
0889:0A 48 18 90 08 20 BA 0C FE
0891:18 20 3A 0A 48 20 C0 08 E9
0899:68 C9 00 F0 17 C9 01 D0 12
08A1:EC 20 B2 09 20 A8 10 20 FA
08A9:49 0A C9 00 F0 06 48 D0 1B
08B1:E4 18 90 D9 20 5B 0C A9 1A
08B9:00 20 85 0C 4C 40 08 A9 60
08C1:07 85 6A A9 00 85 69 A9 31
08C9:F0 85 65 A9 04 85 66 A4 A2
08D1:69 B1 65 09 80 91 65 20 75
08D9:E4 FF F0 FB 48 A4 69 B1 93
08E1:65 29 7F 91 65 68 C9 0D 65
08E9:D0 03 4C 68 09 C9 04 D0 7B
08F1:03 4C 5F 09 A2 03 DD 26 16
08F9:0E F0 05 CA 10 F8 30 31 90
0901:18 BD 2A 0E 65 69 C9 FF 19
0909:F0 C5 C9 28 F0 C1 85 69 C3
0911:18 BD 2E 0E 65 6A C9 18 C5
0919:F0 B5 C9 06 F0 B1 85 6A 6E
0921:18 BD 32 0E 65 65 85 65 07
0929:BD 36 0E 65 66 85 66 D0 A6
0931:9E 29 3F F0 9A C9 1B 10 16
0939:96 85 50 A4 69 20 13 0A 48
0941:A5 61 F0 8B A5 62 F0 87 75
0949:A9 07 20 E0 09 A5 50 A4 28
0951:69 91 65 C8 C0 28 F0 02 40
0959:84 69 18 4C D0 08 A9 0B D4
0961:20 E0 09 18 4C D0 08 A9 BD
0969:F0 85 FB A9 D8 85 FC A0 E6
0971:00 B1 FB 29 0F C9 07 F0 A0
0979:14 C9 0B D0 1C 20 06 0A ED
0981:A9 FF A0 00 91 61 A9 00 E1
0989:8D 0D 00 F0 0C 20 06 0A AB
0991:A0 00 B1 65 91 61 8C 0D B8
0999:00 E6 FB D0 02 E6 FC A5 3D
09A1:FC C9 DB D0 CC A5 FB C9 EB
09A9:C0 D0 C6 20 15 0D 4C BA 5B
09B1:0C 20 5A 10 A9 00 85 FB 72
09B9:85 FD A9 A0 85 FC 85 FE 77
09C1:A0 00 B1 FD C9 FF F0 08 72
09C9:91 FB E6 FB D0 02 E6 FC 99
09D1:E6 FD D0 02 E6 FE B1 FD A5
09D9:D0 E8 91 FB 4C 63 10 85 16
09E1:51 20 13 0A A4 69 C0 00 F3
09E9:F0 0B B1 65 88 F0 06 C9 A1
09F1:20 D0 F7 C8 C8 A5 51 91 E4
09F9:FB C8 B1 65 C0 28 F0 04 55
0A01:C9 20 D0 F1 60 A5 FB 85 52
0A09:65 A5 FC 29 03 18 69 04 BA
0A11:85 66 A5 66 29 03 AA 18 5F
0A19:69 D8 85 FC 8A 18 69 80 A0
0A21:85 64 8A 18 69 84 85 62 AE
0A29:A5 65 85 FB 85 61 85 63 F9
0A31:B1 61 85 61 B1 63 85 62 C5
0A39:60 90 0A 20 8E 10 20 23 FC
0A41:0C AA 18 90 03 20 9D 10 F5
0A49:A9 06 85 66 A9 EF 85 6D 50
0A51:A9 04 85 6E A9 00 85 67 92
0A59:AD 64 0E C9 FF F0 07 C9 57
0A61:00 D0 06 A9 00 60 A9 01 DA
0A69:60 20 2D 0C AD 11 00 85 53
0A71:FD AD 12 00 85 FE A5 6D 13
0A79:85 FB A5 6E 85 FC 18 A5 E0
0A81:67 65 FB 85 FB 85 61 85 B8
0A89:63 90 02 E6 FC A5 FC 29 C3
0A91:03 48 18 69 80 85 62 68 1A
0A99:18 69 84 85 64 A0 00 B9 5C
0AA1:64 0E C8 91 FB A5 FD 91 A1
0AA9:63 A5 FE 91 61 E6 FD D0 45
0AB1:02 E6 FE C4 68 D0 E8 38 3D
0AB9:A5 67 65 68 85 67 38 A9 91
0AC1:27 E5 68 C5 67 10 11 A9 93
0AC9:00 85 67 E6 66 18 A9 28 A9
0AD1:65 6D 85 6D 90 02 E6 6E 44
0AD9:A5 66 C9 17 D0 03 A9 02 EC
0AE1:60 20 9D 10 4C 59 0A 20 DE
0AE9:A8 10 4C 59 0A A9 93 20 B3
0AF1:D2 FF A9 0E 20 D2 FF A9 7B
0AF9:08 20 D2 FF A9 00 8D 20 FC
0B01:D0 8D 21 D0 A2 00 BD 5E 03
0B09:0D 9D 00 04 E8 E0 1C D0 21
0B11:F5 A9 28 85 FB A9 04 85 FD
0B19:FC A9 1D 85 FD A9 0E 85 4C
0B21:FE 20 F8 0C A9 50 85 FB 34
0B29:A9 04 85 FC A9 20 85 FD 6C
0B31:A9 0E 85 FE 20 F8 0C A9 E6
0B39:78 85 FB A9 04 85 FC A9 E0
0B41:23 85 FD A9 0E 85 FE 20 49
0B49:F8 0C 4C 15 0D 20 38 0D 20
0B51:A9 01 85 68 A9 00 85 6B 77
0B59:A6 68 A9 A0 9D 50 04 20 72
0B61:E4 FF AA A5 91 C9 7F D0 1D
0B69:03 4C 11 0C E0 00 F0 EF CF
0B71:E0 5F D0 03 20 35 08 E0 E0
0B79:AE D0 03 4C 11 0C E0 0D C7
0B81:D0 04 18 4C BB 0B E0 8D 22
0B89:D0 04 38 4C BB 0B E0 14 B4
0B91:D0 11 A6 68 A9 20 9D 50 09
0B99:04 E0 01 F0 01 CA 86 68 C1
0BA1:4C 59 0B 8A A6 68 E0 26 FC
0BA9:D0 03 4C 60 0B 29 3F A6 9A
0BB1:68 9D 50 04 E8 86 68 4C 2C
0BB9:59 0B 08 A9 00 85 6C A6 70
0BC1:68 A9 20 9D 50 04 CA D0 4D
0BC9:04 28 4C 4E 0B 8E 3B 0E 71
0BD1:86 68 BD 50 04 C9 00 F0 3A
0BD9:04 C9 1B 30 09 A9 3F 9D D5
0BE1:50 04 A0 01 84 6B 9D 3B 8D
0BE9:0E CA D0 E6 A5 6B D0 02 C0
0BF1:28 60 A9 02 20 85 0C C9 82
0BF9:4E D0 04 28 4C 4E 0B 28 48
0C01:60 A9 03 20 85 0C C9 59 5F
0C09:D0 03 20 B6 10 4C 40 08 F3
0C11:A9 00 8D 3B 0E 20 8E 10 81
0C19:20 FE 10 68 68 A9 04 4C C7
0C21:85 0C A9 30 A2 05 95 57 E2
0C29:CA 10 FB 60 A2 05 B5 57 1C
0C31:A8 C8 C0 3A D0 04 CA 10 C7
0C39:F5 E8 98 95 57 A0 30 E8 79
0C41:E0 06 F0 06 98 95 57 18 AB
0C49:90 F5 60 A2 05 B5 57 C9 D4
0C51:30 D0 05 CA 10 F7 18 60 F3
0C59:38 60 A2 00 B5 57 C9 30 C8
0C61:D0 05 E8 E0 05 D0 F5 A0 46
0C69:01 B5 57 99 C0 07 C8 E8 90
0C71:E0 06 D0 F5 C8 A2 00 BD 83
0C79:50 0D 99 C0 07 C8 E8 E0 4A
0C81:0E D0 F4 60 0A AA BD 7A 6A
0C89:0D 85 FB BD 7B 0D 85 FC FC
0C91:A0 00 A2 00 B1 FB D0 01 6E
0C99:E8 E0 00 F0 02 A9 20 09 6D
0CA1:80 99 A0 04 C8 C0 28 D0 1F
0CA9:EB 20 43 0D 48 A9 20 A0 C2
0CB1:27 99 A0 04 88 10 FA 68 FA
0CB9:60 A9 A0 85 FB A9 04 85 EC
0CC1:FC A2 14 A5 FB 85 61 85 1C
0CC9:63 A5 FC 29 03 48 18 69 02
0CD1:80 85 62 68 18 69 84 85 53
0CD9:64 A0 27 A9 20 91 FB A9 B4
0CE1:00 91 61 91 63 88 10 F3 F4
0CE9:18 A9 28 65 FB 85 FB 90 52
0CF1:02 E6 FC CA 10 CD 60 A0 2A
0CF9:00 B1 FD 48 A0 02 B1 FD 31
0D01:48 88 B1 FD 91 FB C8 C0 46
0D09:27 D0 F9 68 91 FB A0 00 6E
0D11:68 91 FB 60 A9 00 85 FB 9D
0D19:A9 D8 85 FC A2 18 BD 04 B3
0D21:0E A0 27 91 FB 88 10 FB 86
0D29:18 A9 28 65 FB 85 FB 90 93
0D31:02 E6 FC CA 10 E8 60 A9 E0
0D39:20 A2 26 9D 50 04 CA D0 A3
0D41:FA 60 20 E4 FF F0 FB 48 47
0D49:20 E4 FF D0 FB 68 60 17 13
0D51:0F 12 04 28 13 29 20 06 FD
0D59:0F 15 0E 04 2E 20 20 20 94
0D61:20 20 20 20 20 20 20 20 7B
0D69:20 43 12 0F 13 13 20 41 FD
0D71:09 04 20 16 31 2E 30 20 39
0D79:20 84 0D A3 0D B6 0D CA C8
0D81:0D E7 0D 20 50 12 05 13 A7
0D89:13 20 01 0E 19 20 0B 05 9A
0D91:19 20 14 0F 20 03 0F 0E EC
0D99:14 09 0E 15 05 20 2E 2E 46
0DA1:2E 00 20 4D 0F 12 05 20 96
0DA9:2E 2E 2E 20 28 13 3D 53 89
0DB1:14 0F 10 29 00 20 41 03 34
0DB9:03 05 10 14 20 57 0F 12 68
0DC1:04 3F 20 28 59 2F 4E 29 81
0DC9:00 20 4E 0F 14 20 46 0F 63
0DD1:15 0E 04 2E 20 20 41 04 65
0DD9:04 20 57 0F 12 04 3F 20 19
0DE1:28 59 2F 4E 29 00 20 45 FF
0DE9:0E 04 20 0F 06 20 50 12 64
0DF1:0F 07 01 08 0D 2E 20 20 77
0DF9:54 08 01 0E 0B 20 19 0F 5B
0E01:15 2E 00 02 06 06 06 06 AD
0E09:06 06 06 06 06 06 06 06 25
0E11:06 06 06 06 06 06 06 02 29
0E19:05 05 05 07 70 40 6E 5D C8
0E21:20 5D 6D 40 7D 1D 9D 11 03
0E29:91 01 FF 00 00 00 00 01 4F
0E31:FF 00 00 28 D8 00 00 00 96
0E39:FF 08 00 00 00 00 00 00 57
0E41:00 00 00 00 00 00 00 00 5D
0E49:00 00 00 00 00 00 00 00 65
0E51:00 00 00 00 00 00 00 00 6D
0E59:00 00 00 00 00 00 00 00 75
0E61:00 00 00 00 00 00 00 00 7D
0E69:00 00 00 00 00 00 00 00 85
0E71:00 00 00 00 00 00 00 00 8D
0E79:00 00 00 00 00 00 00 00 95
0E81:00 00 00 00 00 00 00 00 9D
0E89:00 00 00 40 30 3A 43 52 EC
0E91:4F 53 53 2E 44 49 52 80 E3
0E99:40 20 10 08 04 02 01 40 CA
0EA1:30 3A 43 52 4F 53 53 2E 8E
0EA9:23 23 00 00 A9 00 85 FB 74
0EB1:A9 A0 85 FC A9 00 A8 91 7B
0EB9:FB C8 D0 FB E6 FC A5 FC 53
0EC1:C9 BF D0 F0 60 A9 00 AA 30
0EC9:9D 00 C8 E8 D0 FA 60 A5 35
0ED1:0C C5 0B D0 07 AD 3B 0E 47
0ED9:C5 09 F0 2F 20 10 0F A9 35
0EE1:00 85 07 A9 A0 85 08 A9 AF
0EE9:FF 85 0D A5 0C 85 0B AD 9D
0EF1:3B 0E 85 09 20 04 11 90 34
0EF9:13 20 40 11 A9 20 AE 3A 26
0F01:0E A0 FF 20 BA FF A9 00 79
0F09:20 D5 FF 60 4C AD 0E A5 8D
0F11:09 D0 01 60 A5 0D C9 00 03
```


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```
0F19:D0 34 20 5A 10 20 8B 0F 7D
0F21:E6 FB D0 02 E6 FC 20 40 97
0F29:11 A9 20 AE 3A 0E A0 FF 74
0F31:20 BA FF A9 00 85 FD A9 64
0F39:A0 85 FE A9 FD A6 FB A4 AA
0F41:FC 20 D8 FF A9 FF 85 0D 66
0F49:20 63 10 20 35 11 60 20 23
0F51:5A 10 A5 07 85 FB A5 08 35
0F59:85 FC A0 00 B1 FB F0 25 12
0F61:B9 3C 0E C9 3F F0 04 D1 61
0F69:FB D0 0B C8 CC 3B 0E D0 E7
0F71:EB 20 63 10 18 60 18 AD 1B
0F79:3B 0E 65 07 85 07 90 02 41
0F81:E6 08 18 90 CD 20 63 10 E6
0F89:38 60 A9 00 85 FB A9 A0 21
0F91:85 FC A0 00 B1 FB F0 07 2C
0F99:C8 D0 F9 E6 FC D0 F5 84 99
0FA1:FB 60 20 5A 10 20 8B 0F A6
0FA9:A6 FC 18 A5 FB 6D 3B 0E D1
0FB1:90 01 E8 E0 BF F0 21 A0 28
0FB9:00 B9 3C 0E 91 FB C8 C4 81
0FC1:09 D0 F6 A9 00 91 FB A9 F9
0FC9:00 85 0D A9 00 85 07 A9 53
0FD1:A0 85 08 20 63 10 18 60 90
0FD9:20 63 10 38 60 A9 0C A2 CA
```

```
0FE1:8C A0 0E 20 BD FF A9 20 93
0FE9:AE 3A 0E A0 FF 20 BA FF AF
0FF1:A9 00 4C D5 FF A9 0C A2 2D
0FF9:8C A0 0E 20 BD FF A9 20 AB
1001:AE 3A 0E A0 FF 20 BA FF C8
1009:A9 00 85 FD A9 C8 85 FE 09
1011:A9 FD A2 C0 A0 C8 4C D8 7F
1019:FF E6 0C 20 04 11 90 05 01
1021:20 D0 0E 18 60 38 60 20 8D
1029:5A 10 A0 00 A5 07 85 FB DE
1031:A5 08 85 FC B1 FB 99 64 BB
1039:0E C8 CC 3B 0E D0 F5 20 9F
1041:63 10 18 AD 3B 0E 65 07 D8
1049:85 07 90 02 E6 08 A5 FB BE
1051:85 11 A5 FC 85 12 A9 00 C4
1059:60 A5 01 85 0E 29 FE 85 24
1061:01 60 A5 0E 85 01 60 20 C0
1069:AD 0E 20 C6 0E A9 00 85 F0
1071:07 A9 A0 85 08 A9 00 8D 60
1079:3B 0E 85 09 8D 3C 0E 8D 03
1081:64 0E 85 0B 85 0C A9 FF 68
1089:85 0D 4C DE 0F A9 00 85 CB
1091:07 A9 A0 85 08 A9 00 85 78
1099:0C 20 D0 0E 20 50 0F 90 B3
10A1:11 A9 FF 8D 64 0E 60 20 C9
```

```
10A9:1A 10 90 F0 A9 00 8D 64 C8
10B1:0E 60 4C 28 10 A9 00 85 A9
10B9:0C 20 04 11 90 04 E6 0C E7
10C1:D0 F7 A6 0C E0 00 F0 01 C7
10C9:CA 86 0C 20 D0 0E 20 5A CD
10D1:10 20 8B 0F 20 63 10 A5 B8
10D9:FB 18 6D 3B 0E 85 FB 90 6E
10E1:02 E6 FC A5 FC C9 BF D0 16
10E9:0D 20 10 0F E6 0C E6 0B CB
10F1:20 AD 0E 20 35 11 A9 00 92
10F9:85 0D 4C A3 0F 20 10 0F 0C
1101:4C F6 0F A9 00 85 FC A5 39
1109:09 0A 26 FC 0A 26 FC 85 2F
1111:FB 18 A9 00 65 FB 85 FB 8E
1119:A9 C8 65 FC 85 FC A5 0C 36
1121:48 4A 4A 4A A8 68 29 07 28
1129:AA B1 FB 3D 98 0E D0 02 01
1131:18 60 38 60 20 04 11 B1 69
1139:FB 1D 98 0E 91 FB 60 A5 77
1141:09 A2 30 A8 38 E9 0A 90 2F
1149:03 E8 D0 F7 98 09 30 8D 97
1151:AA 0E 8E A9 0E A5 0B 18 ED
1159:69 41 8D AB 0E A9 0C A2 BE
1161:A0 A0 0E 4C BD FF 00 00 70
```

VICTOR BARBEE

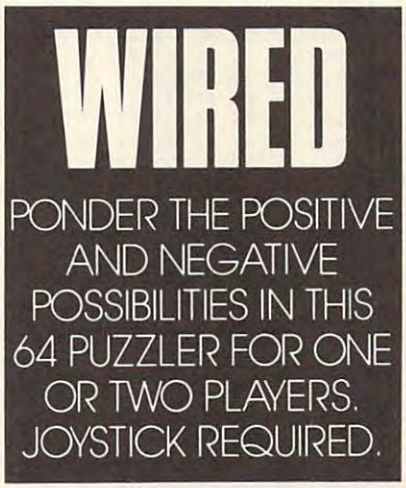
On reconnaissance to a bleak and hazardous planet, you fall prey to the vile and loathsome Toiloots. You attempt to flee in your hovercraft, hoping to make a timely escape. You discover to your horror, however, that the fiends have sabotaged your ship's wiring. The positive and negative terminals on all the circuits are clearly marked, but the connecting cables now resemble an upturned pot of spaghetti.

You've managed to drive them off, but you can expect another attack at any time. Keep cool. You must use cunning and logic to reassemble the tangled array of cables, repair the damage, and blast off to safety. You'll also have to hurry before the cretins break through your hatch and grill you for lunch.

Wired is a puzzle that offers many variations and options. You must assemble a jigsaw-type picture using the joystick and onscreen pointer. A series of circuit lines comprise the picture, which looks like an electrical schematic diagram. The design is randomly created, so you never play the same game twice. Four sizes are available, and clues are provided to make the larger puzzles easier if you get in over your head. There's also a two-player option in which players race to solve identical puzzles.

Wired is written entirely in machine language. To enter the program, you'll need to use *MLX*, our machine language entry program (see "Typing Aids" elsewhere in this section). When *MLX* prompts you, respond with the values given below.

Starting address: 0801
Ending address: 1BB8



Be sure to save a copy of the program before you exit *MLX*.

Plug in and Turn On

When you run the program, a menu will appear at the bottom of the screen. Plug a joystick into port 1 and press the fire button to begin. Use the joystick to highlight right or left to select the desired item. Use the Game option to choose the puzzle size. There are four sizes for the one-player option and two sizes for two players. Select the smallest size for a demonstration.

Highlight Make and press the fire button. A nine-square puzzle will appear. Click on Play, and the menu will disappear. You can now maneuver the white cursor arrow with the joystick. To exchange two pieces, click on one and then on the other. To rotate a piece to the right, click on a piece and then click again. You may continue to click and rotate until you've achieved the desired orientation.

The object of the game is to complete the circuits, joining wires to connect the positive and negative nodes. To see a completed picture, move the arrow to the bottom of the screen. The menu will reappear. Highlight Show at the far right of the menu and click the fire button. The puzzle will solve itself.

Each circuit forms a continuous line from one side of the board to another. Notice that each wire begins with a positive (+) node and ends with a negative (−) one. Knowing this is the key to solving the puzzles. Click on Make again to create another puzzle. The designs are created in a random fashion, so if one seems too difficult, just make another.

You may need some help with the larger grids. There are three hints to make the game easier and more colorful. After you've made a puzzle, click on Tint. Half the circuit wires and their appropriate nodes turn red. This added color will make the puzzle

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easier to solve. Try clicking on Chex. The background for half the squares will change from dark to light blue. Click on Show to see the finished product. Notice that the dark and light squares alternate to form a checkerboard pattern. Chex and Tint can be used together or alternately.

Clicking on Test at any time will turn all the correctly placed pieces purple. Resuming Play will change them back. When a puzzle is correctly assembled, the circuit lines will flash, announcing a victory. The Win detector may not always report a solved puzzle due to the possibility of duplicate or symmetrical pieces. If a puzzle looks right to you, use the Test function to locate the offending pieces. If any of the hints are used during a game, the menu turns blue to keep you honest. After you've won, hit the fire button for the menu.

Double Your Fun

When you're ready to challenge a friend, click on Game to select the two-player option. Click on Make, and two puzzles will appear. They're identical, but one is flipped upside down. Click on Play. Now the orange arrow can be controlled by a joystick in port 2.

The rules for a two-player game are the same. Players can decide whether to allow hints or not. The circuit lines flash for the first completed puzzle. Either player can call up the menu, but the white arrow must be used to make selections.

The difficulty level ranges from fairly easy to almost impossible. A large puzzle played without hints can take hours to solve. On the other hand, a nine-square puzzle can be won in less than a minute.

WIRED

```
0801:0B 08 70 17 9E 32 34 30 6E
0809:37 00 00 00 20 20 20 20 96
0811:20 20 20 20 20 A0 C4 B9 06
0819:3C 08 99 F8 00 B9 FD 08 F6
0821:99 33 03 88 D0 F1 A0 09 4C
0829:B9 0C 08 99 FF 03 88 D0 A1
0831:F7 A9 86 85 2D A9 28 85 B6
0839:2E 4C 00 01 14 F0 04 86 76
0841:28 2F 1A B9 6E 09 99 E8 C3
0849:07 C8 D0 F7 EE 02 01 EE 19
0851:05 01 C6 F9 D0 ED A2 03 23
0859:20 34 03 F0 33 C9 07 D0 95
0861:16 A2 01 20 34 03 D0 0A A0
0869:A2 04 20 34 03 18 69 07 65
0871:10 05 A2 0A 20 34 03 85 1D
0879:A8 A5 A7 85 A9 A5 FE 85 FB
0881:F7 A5 FF 85 F8 20 6C 03 73
0889:A5 F8 85 FF A5 F7 85 FE 72
0891:E8 20 34 03 D0 1E A2 08 21
0899:20 34 03 A0 02 84 A8 85 2A
08A1:A6 18 A5 FC 65 A6 85 F7 58
08A9:A5 FD 65 A7 85 F8 20 6C EF
08B1:03 4C 13 01 E8 20 34 03 FB
08B9:D0 1C A0 03 84 A8 E8 20 36
08C1:34 03 F0 08 A2 08 20 34 F4
08C9:03 4C 5C 01 A2 0C 20 34 C3
08D1:03 E6 A7 4C 5C 01 E8 20 AF
08D9:34 03 D0 0A E8 20 34 03 B2
08E1:18 69 04 A8 D0 D6 E8 20 37
08E9:34 03 D0 0A A2 02 20 34 21
08F1:03 18 69 06 D0 ED A2 08 A2
08F9:20 34 03 D0 E6 A9 00 85 F7
0901:A7 A4 FB F0 0C 06 FA 2A 37
0909:26 A7 C6 FB CA D0 F2 A8 D8
0911:60 48 B1 FE 85 FA A9 08 FE
0919:85 FB 68 A4 FE D0 02 C6 4A
0921:FF C6 FE C0 E7 D0 DE A4 B5
0929:FF C0 07 D0 D8 A9 37 85 BA
0931:01 58 4C 0D 08 A4 A8 F0 49
0939:22 A5 F7 38 E5 A8 B0 03 7E
0941:C6 F8 38 85 F7 A5 FC E5 8A
0949:A8 B0 02 C6 FD 85 FC B1 3A
0951:F7 88 91 FC 98 D0 F8 C4 42
0959:A9 F0 0A B1 F7 C6 FD C6 76
0961:F8 C6 A9 10 EC 60 78 E6 98
0969:01 4C 16 08 60 00 0B 08 73
0971:0A 00 9E 32 30 36 31 E3 20
0979:80 8D 54 85 FB A9 08 1B C3
0981:A4 FD A9 78 85 FE A2 28 B7
0989:A0 86 20 29 08 4C 00 80 16
0991:00 00 8E 7A BD 8C 41 22 E1
0999:A0 56 91 FD A5 FC CD 28 88
09A1:B1 0D 08 A5 FB CD 27 08 98
09A9:D0 01 60 E6 FB D0 94 8B B6
09B1:27 E6 FD D0 E3 E6 FE A9 40
09B9:00 F0 DD 00 FF 90 CD FF A1
09C1:41 E3 64 E3 3D 65 A6 55 5A
09C9:EF FD 8E 97 8D 8B 3A 4E FB
09D1:E6 38 E6 E6 E6 B6 93 22 0C
09D9:A1 F8 8A 23 1B 0E 36 04 FF
09E1:5A E4 76 56 6A EB 04 8E 28
09E9:8B A7 0A 8F 07 20 80 83 23
09F1:02 A9 38 DA 48 59 92 97 88
09F9:8C A7 A2 AE 78 CA F0 38 84
0A01:2B 9E 36 8E 8A 8F 0C 40 EC
0A09:96 E1 83 8B 56 26 00 4E A3
0A11:E2 08 E9 90 11 78 C8 A9 84
0A19:79 D8 10 59 99 99 B0 8F DB
0A21:6A A9 AD 8F 0C 01 6A 9A 57
0A29:9A 3B E9 69 02 EA EA E8 A7
0A31:A4 59 09 69 90 02 38 A9 4C
0A39:69 A8 06 8A 03 59 29 9A FF
0A41:5A A0 8B 5A 26 6A 6A 80 F1
0A49:1E 60 E6 40 02 E5 EA E8 CB
0A51:A1 A6 29 28 0E 65 9A 83 46
0A59:39 02 E0 65 40 0E AA A6 33
0A61:A6 66 66 56 AA 80 CB 2D B0
0A69:71 B6 C0 C0 03 7A 98 55 90
0A71:F0 BF FA F3 9F E1 00 F3 05
0A79:5F E4 7A 72 75 50 04 08 E9
0A81:C8 7F 8B 32 08 D7 7F 9F AC
0A89:EE CF 7F 9C 2B 0F 20 2B C3
0A91:E0 2B 09 5E B9 34 07 19 AD
0A99:29 71 8C F9 C8 51 1D 03 98
0AA1:F9 F2 20 7B 7B 5B FB D1 3E
0AA9:FE 03 7B 6E C5 C4 10 FB B1
0AB1:D5 B0 7F 33 00 05 20 FF 54
0AB9:80 71 F8 70 E1 31 90 71 F6
0AC1:50 C7 5B 85 7B 73 D7 41 4E
0AC9:48 13 00 7D 21 1E 63 B3 9A
0AD1:F1 0C 10 C8 44 1C 03 50 59
0AD9:FD 02 FD 60 17 19 02 3E 92
0AE1:0B 58 3B 05 19 17 75 64 BD
0AE9:D4 11 FE 01 40 05 01 EF A4
0AF1:D5 C1 BF 3C 1F 1F 1E 11 DF
0AF9:17 40 3E 05 F7 39 07 73 E7
0B01:0C 64 04 40 76 23 A0 F3 30
0B09:20 23 E0 A3 FF 02 71 96 CF
0B11:2D 0F 96 16 0F CD 94 F2 81
0B19:60 D9 C8 DF C8 AA F5 60 2A
0B21:D9 F2 00 47 23 0F 98 8C 68
0B29:81 8C 42 C1 F0 88 13 3A 91
0B31:D6 4E 3C A6 E2 20 AF 83 B2
0B39:E5 C2 43 A0 08 06 06 20 E9
0B41:96 0A 8F 8A B0 E3 68 0E B3
0B49:96 12 8F 88 0A 8F 60 80 79
0B51:83 E5 8E 83 39 58 4E 3C B0
0B59:22 03 72 CA E6 60 89 A3 AB
0B61:B2 08 1E 96 21 8F 51 10 F9
0B69:F1 B0 19 F1 60 A9 F0 08 7A
0B71:8A 83 65 0E F3 38 CA 00 51
0B79:C4 03 67 0B EC 78 02 0A A7
0B81:0F 87 38 64 32 04 01 01 F2
0B89:2A 96 39 8A E7 38 BD F0 B6
0B91:98 8C 09 27 6B C4 A3 AD 0E
0B99:C2 63 21 C3 83 65 C3 A3 27
0BA1:37 01 9E 00 03 61 D9 F0 A9
0BA9:10 07 90 B0 38 38 EA C8 E7
0BB1:DA F0 58 C8 98 A8 83 65 DC
0BB9:8E AC 8D 81 0C 96 3B 0E 4B
0BC1:36 30 A0 20 8E 85 05 78 22
0BC9:02 A0 01 44 A0 60 01 27 1D
0BD1:02 02 02 C0 B2 4A 3C 0A F6
0BD9:32 12 80 65 C4 03 26 C3 36
0BE1:43 A0 50 2B 58 32 8A 45 64
0BE9:03 03 8B E5 C3 E3 A9 30 43
0BF1:0C 4F 3C D4 56 63 77 C3 A9
0BF9:63 B5 8E AC 3B 04 04 04 C1
0C01:04 3A 96 8D 8E 3B 0E 32 05
0C09:26 07 07 B2 58 EA 68 AA EB
0C11:F0 60 69 F1 78 BA F0 68 FE
0C19:E9 F0 60 39 F1 C8 56 0D 6E
0C21:6A C5 20 09 09 A8 58 3E 4E
0C29:3C BE 8A 84 0A 8F 85 3B 7D
0C31:2C 80 03 58 66 3C 12 95 43
0C39:00 19 C8 08 08 08 08 00 A1
0C41:06 50 97 62 F1 01 00 07 24
0C49:1B 28 60 1B 05 72 AF 01 09
0C51:9C 77 27 AB 22 6B 67 A0 63
0C59:20 59 83 CE B4 7B A7 79 91
0C61:30 92 40 21 80 E1 01 C9 A7
0C69:29 49 D0 C1 2D 70 A1 41 4E
0C71:FF A3 31 A1 F1 3B 4C 0C D3
0C79:91 20 08 8C A1 C1 1B 10 86
0C81:F0 72 E4 75 64 58 17 49 9E
0C89:47 F0 EA 85 10 CE CF C7 5A
0C91:85 AD 01 DC 29 08 D0 D1 A2
0C99:07 97 2A EA 8F CA 41 88 C1
0CA1:EE F1 0B 92 80 20 5D 80 F7
0CA9:C9 A5 AE 26 07 06 21 37 12
0CB1:07 98 AD CA 4C 50 80 A8 23
0CB9:60 B9 27 78 04 90 18 2A 99
0CC1:69 00 61 19 1C F7 C9 53 F3
0CC9:99 C2 96 C3 80 08 C4 88 A4
0CD1:C5 5F 99 C6 5F 60 00 FF C0
0CD9:2F B9 80 AD F1 8B AE 46 44
0CE1:BA 97 C5 13 44 FA 8C 02 50
0CE9:25 06 E4 E4 2D 94 8D 95 6D
0CF1:8C 84 29 4C 08 92 E2 19 C4
0CF9:32 61 6F 95 C9 04 80 1E 48
0D01:7A 95 4C 80 89 A9 61 42 47
0D09:F0 82 A9 01 20 6F 80 DC 1E
0D11:12 A9 10 9D CC 5F 60 6D 8C
0D19:19 05 0D 08 82 21 D0 2A 87
0D21:2C 20 98 03 20 09 20 8D 8F
0D29:11 C0 03 20 09 10 8D 16 18
0D31:C0 05 40 09 08 29 0F 09 91
0D39:70 8D 18 D0 AD 30 4E 09 D2
0D41:03 8D 02 DD AD C0 06 29 04
0D49:FC 09 02 8D 00 DD C0 A3 D9
0D51:9F DA DB 8D DB 54 35 82 63
0D59:11 09 01 60 11 61 10 01 93
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PROGRAMS

```
0D61:62 11 63 10 01 64 11 65 7F
0D69:10 01 66 11 67 10 01 68 8F
0D71:11 69 10 01 6A 11 6B 10 FE
0D79:01 6C 11 6D 10 01 6E 11 9A
0D81:6F 10 01 70 11 71 10 01 ED
0D89:72 11 73 10 01 74 11 75 02
0D91:10 01 76 11 77 10 01 78 4A
0D99:11 79 10 01 7A E9 7B 11 30
0DA1:31 7B C8 D0 A6 44 67 00 6E
0DA9:B9 08 BC 02 10 7E B9 98 E0
0DB1:C0 4D C9 28 08 D0 0A B5 88
0DB9:D2 FF 99 CF 6E 5F 7D 82 DB
0DC1:84 E0 A9 C0 8D EF 7D EA A9
0DC9:96 C0 78 5A 60 7D 28 7E DB
0DD1:99 A0 7E 02 2F A0 E4 A2 39
0DD9:77 AD B2 81 9C 99 00 20 F4
0DE1:01 FA 5C 99 F4 5D 99 9E 4F
0DE9:5E E1 0F FA D0 EF A6 45 16
0DF1:D0 7C 99 70 7D F0 42 90 92
0DF9:D0 F3 D8 12 04 99 9A DB 4D
0E01:A9 10 99 98 5F C8 C0 4C 9E
0E09:D0 F1 F1 BC 26 00 78 AB E1
0E11:C0 40 0A 79 A4 C1 40 0A 2D
0E19:7A A4 C2 40 0A 7B A4 C3 43
0E21:40 0A 7C A4 C4 40 0A 7D 72
0E29:A4 C5 40 0A 7E A4 C6 BD 83
0E31:00 7F 9D 00 C7 E8 D0 CD 32
0E39:60 00 F9 D7 3B 82 9D A0 02
0E41:7A B2 0B 70 D0 F5 F6 16 12
0E49:07 9D 54 DB E8 E0 0E D0 50
0E51:F8 60 1C 87 D8 F8 C8 08 42
0E59:80 26 60 82 87 CF 79 0E EF
0E61:20 4A C3 74 0E E0 62 CF 68
0E69:1E 81 CC CC CC 0E 14 44 66
0E71:F0 64 43 30 DC 83 A8 0C DC
0E79:0F A0 83 F3 00 B9 04 F3 D7
0E81:33 33 33 00 5A F7 20 1E 7B
0E89:30 00 FF 3A 01 CF C3 C3 F3
0E91:FF 3C A8 00 3F 6B 44 08 0A
0E99:18 21 66 04 0A 9E 1F 84 A4
0EA1:83 10 24 80 26 A3 A4 A0 B9
0EA9:D9 28 29 B8 96 A8 CA F0 4B
0EB1:EE 09 29 D4 8C 60 C9 F0 64
0EB9:EE D1 60 38 A0 0E E9 99 FB
0EC1:29 0E 88 FC CE 0A 01 1A 91
0EC9:00 05 AE 79 9C A0 A2 8E CF
0ED1:79 95 A3 0A 83 AE C2 82 04
0ED9:E0 04 91 09 23 C1 01 31 7D
0EE1:12 CA 4C 20 83 60 78 8F 63
0EE9:98 00 83 FB 82 0D E8 0B A7
0EF1:12 80 AD AF AB 1F 5F 48 C8
0EF9:95 08 5A 84 AD 34 9A 42 2C
0F01:30 0E 8D E2 6F 03 A5 70 DD
0F09:2F 22 0F 18 69 03 32 21 87
0F11:40 AD B3 39 DB F0 07 69 DE
0F19:04 0A 28 67 8D B2 2B A8 6D
0F21:8C D9 E2 6D D4 A7 69 C3 0B
0F29:20 01 F0 20 0F 64 8D 75 52
0F31:0A 4C C3 83 AD D0 C9 02 5E
0F39:90 07 00 05 CE 1A 83 42 D9
0F41:A0 EE AC 82 60 BC A9 F0 63
0F49:E0 CE E0 76 84 A5 7C 22 E4
0F51:62 5A 76 3C 44 4C 31 84 04
0F59:EC 24 0E F1 D4 6F 31 8D 2C
0F61:6A 56 E0 A6 8D 59 81 8A 30
0F69:3A 14 EE 10 20 B6 A0 99 3F
0F71:0C 42 20 AE 83 93 29 A2 74
0F79:8A 9F 0E AD 9F 1C F0 25 D5
0F81:C9 2C F0 21 AD E0 2A F0 F5
0F89:1C C9 20 C8 4D 9C 0C 05 B2
0F91:08 AD 08 C9 09 F0 11 13 FD
0F99:6A C5 81 02 05 EE 4D 14 41
0FA1:50 60 AD B4 75 05 B0 B2 D4
0FA9:B5 20 44 B1 82 20 FF 82 65
0FB1:EE 2C AD 20 3B C9 08 B4 CF
0FB9:45 A3 83 EE 9C AD AD 82 3C
0FC1:C9 0F F0 2E 00 70 C7 00 DA
0FC9:64 18 12 03 CF FB B1 FB 60
0FD1:CD AB 82 D0 04 18 6E 67 E3
0FD9:1A CD F0 E6 FC E8 E0 06 58
0FE1:D0 E9 C4 70 C2 AF 82 8D E9
0FE9:AE 82 4C 47 83 60 B8 D2 DF
0FF1:4C 34 83 A0 78 78 D1 01 08
0FF9:50 F0 50 36 90 66 66 61 36
1001:61 47 41 06 00 53 53 18 38
1009:18 CB DF EA 40 15 6A 02 FF
1011:20 E0 48 28 20 90 30 90 39
1019:76 76 7B 7B 77 76 7C 7B 43
1021:71 6B A6 A0 7D 7D B8 B8 BF
1029:00 FB 47 D0 3D 29 10 80 6D
1031:20 80 67 67 62 62 68 67 B9
1039:63 62 45 3F 4D 46 51 51 B7
1041:5F 5F 80 7D 20 C7 C7 C8 49
1049:C8 73 20 09 09 0F 0F 58 3A
1051:80 80 A8 87 07 A8 08 D0 1B
1059:40 68 68 63 63 87 8D 7F CA
1061:86 93 93 86 6E 2E 1F C8 B7
1069:C4 C4 C3 C3 7C B8 E3 0B 6B
1071:0E 3C 30 F0 AC 0F 40 0E EC
1079:0F E4 05 0A FC 0C 0C FC C8
1081:F0 F0 3F 33 F3 88 1B F3 5D
1089:33 D0 C3 1D 05 FF 62 FF AE
1091:3F 3F 60 05 10 C0 20 3F 80
1099:71 3C CF C8 C3 CF CE 43 46
10A1:1C 09 50 00 01 03 03 03 39
10A9:FF 00 FC FC 10 47 01 3C 15
10B1:3C E4 3C CC 91 00 05 10 24
10B9:30 30 3F F0 0F C0 C0 2D 1F
10C1:5D 1E 94 2A E4 21 AC 1C 6E
10C9:1E 3E 47 1E 7D 1B F0 44 D1
10D1:14 83 CF 1C 8A 73 F8 7C 29
10D9:24 F8 F8 BC 80 F8 68 05 F2
10E1:1C 40 F2 3B 4B 19 F7 B0 91
10E9:B4 51 A9 D3 14 04 06 4C 34
10F1:F1 F0 26 50 05 01 44 C8 8E
10F9:61 BD F2 85 A2 85 0E 21 59
1101:BD 60 85 DF 46 11 FB 91 C8
1109:70 11 C0 10 D0 F0 EE C9 B2
1111:82 01 E0 85 EC F7 F0 0E 60
1119:18 64 AF 10 C4 DC A2 3A 70
1121:86 60 00 AA BC A6 41 34 80
1129:BD 08 F0 0A DE 81 25 02 34
1131:34 09 FE 3B 0D A9 04 18 72
1139:6D 05 87 5C 73 A9 00 99 E5
1141:E6 85 C8 C0 54 D0 F8 1C 51
1149:9F C9 E0 21 80 19 E8 B1 C7
1151:06 B8 8D 99 02 7A 66 2E E4
1159:F2 85 C8 C8 3C 79 2A E6 FE
1161:7C 78 50 72 78 58 72 DA F5
1169:E6 38 9D 63 6D C3 2B 86 4E
1171:18 6F 69 4D D6 8A 0C FE 75
1179:62 34 80 C2 DD 07 26 08 75
1181:07 26 10 07 26 43 AD 80 3D
1189:D9 0A A8 82 B9 F0 07 86 7E
1191:88 88 CC B9 E7 27 27 28 A1
1199:87 FD BD 30 C0 A8 FE A4 05
11A1:2F 43 00 38 A0 00 B1 FD 16
11A9:F0 09 20 06 87 2A 3E 9D E9
11B1:DD 4C 38 A5 FD E9 5A 85 09
11B9:FD B0 02 C6 FE CE 2B 77 B4
11C1:DD 08 4D DE 46 23 D0 47 14
11C9:23 D8 A7 02 34 32 86 E2 23
11D1:E8 D8 30 C9 F8 84 85 FB 22
11D9:BD 00 85 85 FC E2 02 40 9B
11E1:38 01 01 94 15 34 0B 20 79
11E9:3A 86 5D C9 46 06 94 C4 4B
11F1:18 53 B2 20 53 32 07 4A 09
11F9:46 21 A0 A9 04 6C 05 A9 BB
1201:C9 05 A8 C0 6F 40 4E EF 75
1209:81 14 48 08 F0 8B 30 55 E7
1211:18 69 0F 8D 97 2D A9 20 3B
1219:8D 16 20 98 88 4C 1C 89 4E
1221:C6 07 85 02 14 14 07 85 BF
1229:43 31 BE 88 56 89 06 E4 65
1231:88 EE 88 AD 80 40 CD E2 C4
1239:85 D0 DB 60 A9 55 08 DF 68
1241:28 90 AE E0 AA 8A D0 08 AA
1249:18 A5 00 69 08 85 00 60 30
1251:3C 0E 8C 05 A9 AA 8D 64 70
1259:BD 87 04 82 29 04 D0 02 E3
1261:A2 10 16 6B 16 24 8A 18 C2
1269:6D E3 85 9A 25 18 0A A0 D5
1271:08 E8 BD A0 85 2D E1 85 BF
1279:91 F3 F1 2D C1 90 8C C8 A6
1281:3B 03 01 AD E4 85 C9 08 D7
1289:D0 DA 60 E1 C3 0D F1 0C 39
1291:09 37 4F 0A C3 3C 0D 06 C1
1299:63 B7 60 00 58 21 F0 84 17
12A1:59 21 1B 08 10 92 81 99 06
12A9:F2 85 60 21 07 39 21 73 99
12B1:D8 35 BD 38 85 A8 88 A2 4D
12B9:00 B9 C3 11 8D 04 BD 41 0F
12C1:10 99 1C 86 AD 34 89 9D 2F
12C9:2B 86 E8 88 C0 FF D0 E8 5B
12D1:A0 7F 4C 0D 88 77 EC 02 7E
12D9:22 5E C8 95 3E F8 C4 2C A4
12E1:86 5D 87 28 8F 69 61 D7 D0
12E9:E1 16 4C D6 97 96 31 8A 7F
12F1:D6 E0 DD 21 0B 78 73 8C 35
12F9:E0 34 78 AA A2 23 18 63 8A
1301:8A 5E 3A 42 E1 D1 23 24 30
1309:44 3E 0A 4B 23 8F AE D2 5E
1311:1A C3 5B 2A 38 0A 0B 87 CA
1319:44 81 AB 1A 0A F0 18 4C 69
1321:4F 8A 1A 21 18 05 60 28 A4
1329:CD 7F 89 D0 0A 6C 82 10 6B
1331:FD 03 C3 F4 28 86 A4 4F D2
1339:A2 68 F0 91 4C 03 80 F8 6A
1341:DA 64 08 C3 88 C4 80 08 8B
1349:C5 88 C6 80 08 C7 99 00 E7
1351:C8 A0 22 E9 E0 54 00 09 48
1359:80 8D 18 01 12 81 8D 12 F9
1361:D4 A9 FF 8D 0E D4 8D 0F 23
1369:D4 60 30 37 21 22 68 30 1E
1371:2A 42 29 3F BC 96 76 3C BF
1379:32 E6 B8 B9 43 A6 C2 03 62
1381:23 C3 63 E2 0E 8C A9 00 BA
1389:2C 85 3A 0A E8 84 A0 C0 6A
1391:1D 76 8B 99 A7 D0 6D C1 0C
1399:23 D0 80 60 4C DE 08 05 8E
13A1:05 05 B0 00 0A 0A 0A 0F 3D
13A9:0F 0F B0 00 14 14 0A 19 4F
13B1:19 19 B0 00 1E 1E 9A 4A A9
13B9:F5 E0 16 46 0F 67 F1 F0 25
13C1:01 61 16 00 AD F5 8B 38 18
13C9:A9 86 EE 11 28 04 AD F4 F6
13D1:8B CC 43 A2 28 A8 0C C8 48
13D9:C0 22 FB CA A0 1D F6 60 DC
13E1:A2 64 CA D0 FD 25 78 00 4E
13E9:A8 84 6C A8 C0 D3 8C A9 B5
13F1:02 85 1F 09 9C 40 48 A6 0C
13F9:53 25 8B AA A0 00 BD A7 57
1401:8B 20 FC E8 41 4A 87 38 9F
1409:82 92 F1 A6 24 E6 00 AE 2B
1411:4F C2 90 8C 5A 20 D0 D5 37
1419:E9 02 20 12 22 18 98 69 E7
1421:F6 A2 C0 28 D0 F0 B1 FB B1
1429:29 3F 84 AB 0D 91 FB 60 08
1431:77 55 5C C0 4F 85 FC A5 32
1439:00 C9 08 7D 11 08 38 17 DC
1441:21 40 CF 45 D0 9C 8C 18 82
1449:65 FB AB 10 60 A9 90 F0 55
1451:AD A9 62 54 13 C5 68 07 D3
1459:90 11 5E B1 AD E8 10 69 8F
1461:05 8D D8 45 CC 8C D6 3A 5F
1469:14 30 EB AD C0 10 69 28 41
1471:8D EF 8B 90 03 EE F0 8B 18
1479:98 4C E1 8C 60 40 FF 4D 57
```


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PROGRAMS

```
1481:42 6D 77 70 AA 06 0E DA 80
1489:84 C2 8F AD 93 8D D0 06 EB
1491:83 E7 0B 34 83 16 5E 86 D1
1499:33 0F DE 85 20 25 87 9F 97
14A1:5E 89 21 CF 94 C1 11 6D B7
14A9:20 81 3E 74 20 5F 87 DB BA
14B1:C7 3D 74 08 0B 4F CE 07 56
14B9:31 91 03 60 CF 4B 59 36 D9
14C1:8D 00 F8 29 0F 86 ED 8D 5E
14C9:97 30 51 78 08 0A 31 04 4A
14D1:36 49 E2 15 13 75 84 4F DB
14D9:8E 87 34 51 78 44 05 51 F6
14E1:8D 20 36 D0 92 31 0F 15 39
14E9:F6 5C 14 22 41 58 16 11 F1
14F1:73 20 4F 0C D0 99 D3 60 7B
14F9:5D BB 81 E1 CD 4A 8E D0 93
1501:01 A0 F7 60 05 05 44 E4 82
1509:15 4C 3E 8E 77 56 70 88 FF
1511:17 4B 8E 4C 23 8E 00 F6 7A
1519:76 91 60 22 21 20 78 1A A5
1521:1B 1A 19 E4 19 14 13 12 22
1529:E4 19 0D 0C 0B E4 19 06 92
1531:05 64 81 1B 00 B3 00 BD 65
1539:4A 9A C9 03 D0 12 E8 1A 53
1541:F4 D8 30 D4 01 C3 90 AC 54
1549:ED 8B A7 0B A8 A9 00 99 78
1551:CA 8B 60 A9 2E 14 E7 06 02
1559:C3 86 1B BD 8F A8 6E 15 57
1561:60 BA 01 43 01 28 0E 72 F5
1569:28 EA B4 8E 3A F0 11 A8 42
1571:88 42 97 06 1C 63 A0 CD 41
1579:8E 6B 0E 00 B1 FB 38 61 D6
1581:03 4C F7 E2 80 8C E0 06 6B
1589:02 A9 02 9D 72 C8 E8 C0 82
1591:07 D0 E6 84 31 E0 12 2D F6
1599:70 2E 01 E0 1E 0A D5 60 DA
15A1:AD EE 8B 35 2F 0E 06 35 16
15A9:88 89 38 D4 0E C3 01 D0 21
15B1:1B C3 5E BD 72 3C C0 EA F2
15B9:30 5E 42 C9 02 D0 11 3C 2A
15C1:21 30 1A 88 CA 79 6C 8E F7
15C9:F4 60 32 A2 2A B9 45 8B 45
15D1:9D 76 8B C8 8A 33 EE 02 67
15D9:AA B0 F2 18 69 32 AA C9 98
15E1:31 14 AF 04 42 E4 C8 03 1A
15E9:62 C4 03 E1 8E 81 8C 00 88
15F1:EA EA EA FB 07 3A 34 99 8C
15F9:76 8F 98 99 76 C9 23 D0 E1
1601:EF F2 30 80 F8 D8 40 80 1C
1609:8F 39 04 8D C4 05 3E 32 8D
1611:3C 0E 1F 72 16 AD 1B D4 5C
1619:29 03 18 6D 0A 2E 8D 20 B8
1621:17 AA 22 4B 14 E0 3E 0E 2B
1629:85 E0 60 44 C0 42 B1 3B 4E
1631:BC 38 08 AE C1 8F AD BE 1C
1639:B9 2A C0 14 D0 9D AD BB 3A
1641:06 F0 06 C4 5F F0 60 48 81
1649:15 61 78 6C 04 E1 00 9C 72
1651:A0 04 B9 26 9D 20 84 60 3F
1659:EC 29 0D D0 F3 18 8A 28 32
1661:AA 69 04 60 2A AD 42 00 50
1669:6E BF 8F C9 26 D0 DE 41 BE
1671:27 C0 8F 4C D5 8F B5 76 E6
1679:52 C0 58 A9 D8 85 FC AD 29
1681:28 A8 C9 07 90 13 38 E9 C0
1689:07 A8 18 94 71 09 69 A0 D2
1691:9A 88 98 4C 92 AF 00 4B A3
1699:62 88 A5 FB AC 05 85 FB 0E
16A1:90 02 E6 FC 4C A9 90 A9 17
16A9:06 49 79 42 F0 14 5C 63 72
16B1:C5 AD F0 91 C9 02 5A 1C 8A
16B9:48 1B 10 16 4C EE 90 AD 21
16C1:D8 3F 0F AE 94 D8 10 00 1F
16C9:84 F0 05 A9 0E 8D 4B 00 EC
16D1:D3 30 51 38 91 FB C8 18 C7
16D9:21 F8 98 18 69 23 A8 A2 35
16E1:00 AD 85 90 C0 A0 D0 EA 48
16E9:60 20 D2 E0 F5 35 6B 8A 9C
16F1:20 EB 14 00 29 E0 CA 90 9E
16F9:C2 91 AF 72 CA 72 66 87 7D
1701:8A 28 A1 00 02 6A 66 0B 44
1709:43 14 0E FA 1A 90 C1 93 79
1711:59 A8 F0 20 94 8D 53 23 DA
1719:3B 30 86 20 21 82 3E 31 84
1721:82 F9 87 AB A9 FF 8D B8 DB
1729:B4 22 1C 84 A8 04 46 C0 A8
1731:CC 5D 80 4C BA 97 75 C8 D9
1739:10 28 04 FE 44 A0 90 FF AF
1741:10 07 FF 41 CF 10 01 87 95
1749:E0 00 03 C0 00 01 80 E1 3B
1751:48 27 1E 35 1D 1E C1 81 EA
1759:91 99 80 5B C8 C0 80 C4 8B
1761:70 59 A9 6E 8D F8 5F 8D D6
1769:F9 5F E1 72 27 0D 0A 8D DE
1771:28 81 79 C1 46 60 21 0E 63
1779:14 26 C2 1D 04 1B 01 00 F3
1781:00 00 96 3D 74 C4 09 91 B0
1789:56 1C 06 9C 81 96 42 C1 21
1791:20 98 95 A9 21 DB 59 24 92
1799:14 83 E0 50 70 03 41 D1 B7
17A1:0D 1D 4C 1B 10 4A EC C3 20
17A9:5C E0 8D 13 8D 03 17 11 D8
17B1:04 8D 50 A9 64 8D AA D9 72
17B9:C1 43 91 03 25 8A 72 B2 E6
17C1:0F D0 F8 F7 11 84 04 D0 BD
17C9:C7 07 43 5F 78 C1 A9 03 1D
17D1:3D A5 0D F6 8B D6 72 E1 97
17D9:0C D1 F5 F3 04 0D C1 1E 76
17E1:87 0A B0 CF F1 05 EC 71 58
17E9:98 14 EC 19 1F CE 92 12 04
17F1:07 7B 1C 1D C0 0E 04 C0 DE
17F9:5E A4 64 B0 25 AD 53 02 A0
1801:B0 17 29 60 5F DC EE 8A 51
1809:AD 80 20 80 FD E8 3C F6 3F
1811:05 01 D8 17 28 60 9F 29 BB
1819:C3 90 61 9F D1 CE 22 2D B0
1821:1B 0C 03 CE D5 7E B1 12 4D
1829:C7 7E 06 0C EC 17 1C B0 0B
1831:9F 27 C3 50 EC 41 93 EE FA
1839:EF 09 C0 11 EC 03 EE 13 31
1841:00 10 02 AD 82 00 00 20 C4
1849:E9 0F E7 A1 00 80 F3 91 C4
1851:BD 7C FD 9D 72 0F FA EF CE
1859:39 46 01 0A 8F 51 06 20 66
1861:17 8C 90 F6 CE 0D D4 4A 60
1869:0E 54 AD 00 DC A8 39 25 8C
1871:0C 8C 4A 8D 13 20 5C 94 53
1879:6E 69 85 01 D0 22 89 99 B7
1881:50 F0 1B CE 64 7E CE C8 E9
1889:4C 1C 5A 30 1F 23 33 38 59
1891:CD 4C E9 33 13 C7 2F AD EF
1899:0D 4D C9 E6 D0 0D 20 E6 2D
18A1:85 FD CF 03 9E A4 81 AD 76
18A9:80 20 C9 20 D0 0E 60 5A 37
18B1:EB 91 18 AD 49 69 07 8D A5
18B9:60 2D 20 03 C9 2E C2 90 B6
18C1:32 23 B3 CE 23 B3 11 91 D2
18C9:01 29 FD 53 C1 CE 34 30 9B
18D1:FF F1 78 CE 48 A9 27 0D BE
18D9:B5 98 29 08 D0 2C B4 0C 5D
18E1:C9 30 D0 03 4C 42 94 EE D0
18E9:0D 17 AD 02 D0 B0 08 AD 43
18F1:21 09 02 8D 10 D0 EE 60 10
18F9:01 AD 41 C9 28 D0 08 40 AF
1901:A2 EC 86 EA 91 88 F4 80 58
1909:80 9D F8 91 E8 E0 05 D0 C0
1911:F5 11 7E 1A 16 72 92 5E F1
1919:7F 19 5F 40 C7 0E EC 30 C1
1921:1E F0 2D AD 06 01 37 AD 6F
1929:62 D0 59 40 52 05 1D 74 45
1931:17 4D EE B2 00 93 19 48 14
1939:80 CE F0 50 39 6F 40 16 A0
1941:2D 60 72 17 FE 8F 00 48 60
1949:01 04 D0 05 DE 2B 58 15 D0
1951:71 45 59 11 F7 E1 A1 19 6D
1959:07 6B F1 B3 09 65 73 80 A8
1961:14 35 1B 1A 05 42 B1 50 D4
1969:80 64 98 CE 48 1B 74 64 F0
1971:A4 14 11 B0 93 E1 B0 81 2F
1979:90 F1 02 5B 9D 4D AE ED D3
1981:04 99 54 8E F8 24 C1 48 B3
1989:8C AE 4F 0C C0 BD 8F 8E 03
1991:E6 A9 06 31 0B 16 E0 93 7B
1999:20 A9 8E 20 12 8F CD 13 97
19A1:20 8C 69 68 9C EE 34 1C DF
19A9:50 05 B2 8C F2 91 8D EF 4D
19B1:91 60 A9 72 8D 0C F1 2F D0
19B9:B3 81 A0 14 32 C6 40 28 D0
19C1:08 0C 88 03 42 2C 34 E0 48
19C9:82 EE B1 0B F3 60 BA 22 98
19D1:0A E2 05 78 88 01 60 CE C1
19D9:BB 02 20 85 95 4B 02 60 05
19E1:A6 75 06 F0 50 4F 06 08 68
19E9:5F 58 BA F0 36 BD 42 1E 93
19F1:68 9E EA 15 79 CA 23 8A 76
19F9:8A EA F0 13 89 8A 8A 67 6E
1A01:EA 00 9E A9 BA 20 60 F8 29
1A09:A6 A2 00 88 1C 28 3E 7C 3C
1A11:2C 0A 84 20 9D 8A A8 B9 92
1A19:CA 8B D2 AD C1 91 F0 27 28
1A21:47 2F 8A 03 78 C8 48 29 E6
1A29:01 A0 86 F0 15 BD 99 8F 48
1A31:8D BA BD 5E 8E CD B1 95 1D
1A39:D0 0F BD 76 8F C9 02 D0 31
1A41:08 E8 E0 23 C0 3A 20 8F C0
1A49:96 60 04 00 00 3E 70 C4 FF
1A51:05 F0 17 C9 07 F0 13 0C F1
1A59:3E 12 28 0F C4 86 47 05 FA
1A61:40 80 44 86 C7 51 01 A9 F5
1A69:14 8D 62 18 80 50 3C 4C E2
1A71:A2 54 2E CD 39 06 D0 02 34
1A79:A9 44 8D 5D 96 C0 37 E2 24
1A81:F0 28 0A E2 20 99 01 DC ED
1A89:29 10 D0 D7 AE 5F 96 AC BA
1A91:5E 96 AD B2 81 20 04 AB BB
1A99:43 00 15 D0 20 72 81 6E 5B
1AA1:68 68 00 09 20 08 8C AD 9C
1AA9:94 0D C9 04 F0 07 C9 06 22
1AB1:F0 03 C2 19 8A E9 AD 66 C6
1AB9:0A 40 CC 0B 10 99 00 A0 D4
1AC1:10 70 44 98 40 76 28 44 9C
1AC9:50 40 04 78 44 A0 40 04 67
1AD1:C8 44 F0 5C 99 18 00 05 91
1AD9:40 44 68 40 04 90 44 B8 F3
1AE1:40 04 E0 5D 99 08 50 30 E6
1AE9:40 04 A0 99 80 8C 04 A8 D3
1AF1:44 D0 40 04 F8 5E 99 20 59
1AF9:5F 99 48 5F CA C8 8C 37 0D
1B01:D0 B2 60 5A CA 1C 04 1B E7
1B09:0C 71 2C 64 78 2C C4 01 6C
1B11:01 45 B0 01 13 03 03 03 EC
1B19:A0 00 B9 53 97 99 76 8B A7
1B21:C8 C0 31 D0 F5 20 A0 8A 1B
1B29:60 FF 00 E0 7D 63 0E 83 B6
1B31:39 0C E6 58 5E 5F 0F AF A7
1B39:AE A8 48 4C 4C 0C 8C 8C F6
1B41:88 20 C5 80 EA 2A C1 91 99
1B49:20 84 97 20 13 81 EE 15 37
1B51:87 EE 12 01 F8 C9 08 D0 29
1B59:05 A2 00 8E B6 A9 01 E0 E2
1B61:00 F0 05 0A CA 4C DC 97 ED
1B69:8D 51 DE A9 00 8D 60 02 2A
1B71:AE 62 BD 97 97 2D 81 02 3F
1B79:CD 96 97 D0 09 20 86 90 A2
1B81:C2 41 8C 20 1D 8C EE 54 4A
1B89:AD ED 8B C9 23 D0 DF AE EA
1B91:95 97 E0 04 F0 B6 E0 06 FE
1B99:F0 B2 CE F5 8B 20 4B 80 22
1BA1:20 BF 80 4C 03 80 29 DC F5
1BA9:39 5A 39 DE 58 5A 71 58 8F
1BB1:33 50 00 C0 0A 00 00 00 F1
```


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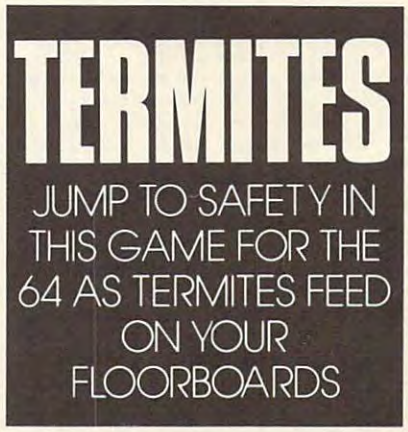
GUS VAKALIS

TERMITES



Termites have infested Kelvin's four-story walkup, and the building is starting to collapse. Kelvin can escape this crushing fate if you help him jump over holes that appear in his path.

Termites is in three parts: a BASIC loader, a machine language sprite file that contains 13 sprite definitions, and the main program, which is written entirely in machine language. To avoid typing mistakes, enter the boot program with *The Automatic Proofreader* (see "Typing Aids" elsewhere in this section). When you've finished typing, save a copy of the program to disk.

To enter the sprite data and the main program, you'll need to use *MLX,* our machine language entry program (see "Typing Aids"). When *MLX* prompts you, respond with the values given below.

Starting address: 3000
Ending address: 3337

Before exiting *MLX,* save a copy of the sprite data with the name T.SPR.

The second machine language program is the main *Termite* program. Again, use *MLX* to type it in. When *MLX* prompts you, respond with the following values.

Starting address: C000
Ending address: CC47

When you've finished typing, be sure to save a copy of the program as T.PRG. Be certain you've saved the two programs with the names T.SPR and T.PRG, as these are the names the boot program looks for when it runs.

Playing the Game

When the game first begins, Kelvin is standing in the doorway of his fourth-floor apartment. Press the space bar to start him on his dash to safety. As he runs along, holes open up before him. To jump the holes, press the space bar. If you jump too soon, he won't clear the hole; wait too long, and it will be too late. Since the space bar controls this game, young children especially should find it easy to play.

The game is divided into four skill levels, with four frames per level. As you progress from frame to frame within each level, you'll find more holes opening, and opening closer together. You'll have to make some quick successive jumps to clear them. As you progress through the four skill levels, you'll find the holes opening up closer to Kelvin's feet. This means you'll have less time to react.

You'll receive 100 points for each hole that you jump, and you'll get bonus points when you successfully complete a frame. The bonus will be equal to the frame number multiplied by the skill level times 100. For example, if you complete frame 1 of level 1, you'll receive 100 bonus points. If you complete frame 4 of level 2, you'll receive an 800-point bonus.

Begin at any skill level; you'll progress automatically as you complete each level. Should Kelvin fall into a hole, the game ends, and the high score and your score will be displayed. You'll also be prompted to play another game or exit to BASIC.

One neat trick: The program monitors the sprite's *x*-position and triggers the sprite-to-background priority register to make Kelvin appear in front of apartment doors but disappear into stairways.

TERMITES

```
SF 10 POKE53280,0:POKE53281,0
MB 20 PRINT"{CLR}{5 DOWN}{YEL}
      "
XJ 30 PRINT"{3 SPACES}UCCCCCCC
      CCCCCCCCCCCCCCCCCCCCCCCC
      CCI"
DQ 40 PRINT"{3 SPACES}{RED}
      {8 SPACES}T E R M I T E
      {SPACE}S !{7 SPACES}
      {YEL} "
BX 50 PRINT"{3 SPACES}
      {33 SPACES}"
EK 60 PRINT"{3 SPACES}{BLU}
      {9 SPACES}COPYRIGHT 1991
      {10 SPACES}{YEL}"
DG 70 PRINT"{3 SPACES}{BLU}
      {2 SPACES}COMPUTE PUBLIC
      ATIONS INTL LTD
      {2 SPACES}{YEL}"
SP 80 PRINT"{3 SPACES}JCCCCCCC
      CCCCCCCCCCCCCCCCCCCCCCCC
      CCK"
FM 90 PRINT"{2 DOWN}{5 RIGHT}
      {RED}({WHT} LOADING GAME
      - PLEASE WAIT{RED} )"
SR 100 IF A=0THENA=1:LOAD"T.PR
      G",8,1
FH 110 IF A=1THENA=2:LOAD"T.SP
      R",8,1
CP 120 SYS49152
```

T.SPR

```
3000:00 00 00 00 14 00 00 5C 5D
3008:30 00 53 00 00 7C 00 00 C4
3010:30 00 00 00 20 00 00 28 00 DA
3018:00 28 00 00 28 00 00 28 EB
3020:00 00 2B 00 00 2C 00 00 96
3028:14 00 00 14 00 00 14 00 FB
3030:00 14 00 00 14 00 00 14 4A
3038:00 00 3F 00 00 30 00 00 41
3040:00 00 00 00 14 00 00 5C 9D
3048:00 00 53 00 00 7C 00 00 05
3050:30 00 00 00 20 00 00 28 00 1B
3058:00 A8 00 00 80 00 00 AB 92
3060:00 00 20 00 00 20 00 00 45
3068:14 00 00 14 00 00 11 00 36
3070:00 11 00 00 51 00 03 41 E6
3078:00 03 03 00 03 03 C0 00 9F
3080:00 14 00 00 5C 00 00 53 1C
3088:00 00 7C 00 00 30 00 00 39
3090:20 00 00 28 00 00 28 00 D3
3098:00 28 00 00 20 00 00 2A 2E
30A0:00 00 2B 00 00 14 00 00 B6
30A8:14 00 00 14 00 00 05 00 5E
30B0:00 01 00 00 35 00 00 34 2F
30B8:00 00 3C 00 00 0F 00 00 DC
30C0:00 00 00 00 14 00 00 5C 1E
30C8:00 00 53 00 00 7C 00 00 85
30D0:30 00 00 20 00 00 28 00 9B
30D8:00 28 00 00 28 00 00 2A AE
30E0:C0 00 3A 00 00 28 00 00 89
30E8:14 00 00 14 00 00 05 00 9E
30F0:00 11 00 00 53 00 00 C3 F3
30F8:00 00 F3 00 00 00 00 00 D7
3100:00 14 00 00 5C 00 00 53 9D
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PROGRAMS

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3108:00 00 7C 00 00 30 00 00 BA
3110:20 00 00 28 00 00 A8 00 56
3118:00 A8 B0 00 8A 80 00 EA FB
3120:00 00 28 00 00 14 00 00 D7
3128:14 00 00 05 00 00 51 40 C7
3130:01 40 40 01 00 40 0D 00 56
3138:C0 0C 00 F0 03 00 00 00 25
3140:00 14 00 00 5C 00 00 53 DD
3148:00 00 7C 00 00 30 00 00 FA
3150:20 00 00 28 B0 00 AA 80 A0
3158:02 AA 00 02 28 00 03 28 F5
3160:00 00 28 00 00 15 00 00 1C
3168:05 40 3D 10 50 0D 50 30 8D
3170:00 00 3C 00 00 00 00 00 5A
3178:00 00 00 00 00 00 00 00 DA
3180:00 00 00 00 14 00 00 35 B8
3188:00 00 C5 00 00 3D 00 00 98
3190:0C 00 00 08 00 00 28 00 C9
3198:00 2A 00 00 02 00 00 EA 80
31A0:00 00 08 00 00 08 00 00 24
31A8:14 00 00 14 00 00 44 00 DE
31B0:00 44 00 00 45 00 00 41 8F
31B8:C0 00 C0 C0 03 C0 C0 00 3C
31C0:00 14 00 00 35 00 00 C5 97
31C8:00 00 3D 00 00 0C 00 00 03
31D0:08 00 00 28 00 00 28 00 0A
31D8:00 28 00 00 08 00 00 A8 2E
31E0:00 00 E8 00 00 14 00 00 B0
31E8:14 00 00 14 00 00 50 00 37
31F0:00 40 00 00 5C 00 00 1C 62
31F8:00 00 3C 00 00 F0 00 00 A6
3200:00 00 00 00 14 00 00 35 3A
3208:00 00 C5 00 00 3D 00 00 1A
3210:0C 00 00 08 00 00 28 00 4B
3218:00 28 00 00 28 00 03 A8 76
3220:00 00 AC 00 00 28 00 00 BA
3228:14 00 00 14 00 00 50 00 78
3230:00 44 00 00 C5 00 00 C3 97
3238:00 00 CF 00 00 00 00 00 96
3240:00 14 00 00 35 00 00 C5 19
3248:00 00 3D 00 00 0C 00 00 84
3250:08 00 00 28 00 00 2A 00 8F
3258:0E 2A 00 02 A2 00 00 AB 2F
3260:00 00 28 00 00 14 00 00 1A
3268:14 00 00 50 00 01 45 00 6A
3270:01 01 40 01 00 40 03 00 B4
3278:70 0F 00 30 00 00 C0 00 5D
3280:00 14 00 00 35 00 00 C5 59
3288:00 00 3D 00 00 0C 00 00 C4
3290:08 00 0E 28 00 02 AA 00 9A
3298:00 AA 80 00 28 80 00 28 23
32A0:C0 00 28 00 00 54 00 01 BC
32A8:50 00 05 04 7C 0C 05 70 A4
32B0:3C 00 00 00 00 00 00 00 33
32B8:00 00 00 00 00 00 00 00 1D
32C0:00 50 00 01 70 00 01 4C 1B
32C8:00 01 F0 00 00 C0 00 00 8E
32D0:80 00 00 A0 00 02 A0 00 C8
32D8:02 21 30 00 E5 70 00 54 D1
32E0:70 00 50 00 00 00 00 00 87
32E8:00 00 00 00 00 00 00 00 4D
32F0:00 00 00 00 00 00 00 00 55
32F8:00 00 00 00 00 00 00 00 5D
3300:00 05 00 00 0D 40 00 31 42
3308:40 00 0F 40 00 03 00 00 80
3310:02 00 00 0A 00 00 0A 80 AC
3318:0C 48 80 0D 5B 00 0D 15 81
3320:00 00 05 00 00 00 00 00 27
3328:00 00 00 00 00 00 00 00 8E
3330:00 00 00 00 00 00 00 00 96
3338:00 00 00 00 00 00 00 00 9E
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T.PRG

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C008:8D 07 CC AD 15 03 8D 08 5E
C010:CC AD 28 03 8D 09 CC AD 70
C018:29 03 8D 0A CC 78 A9 EF CC
C020:8D 14 03 A9 C8 8D 15 03 12
C028:A9 FA 8D 28 03 A9 F6 8D AB
C030:29 03 58 A9 00 8D 2D CC 0A
C038:8D 2C CC 8D 20 D0 8D 21 7E
C040:D0 A9 AB 85 BC A9 D9 85 28
C048:BD A9 05 8D 1A CC A9 06 E9
C050:8D 1B CC A9 31 8D 23 CC 66
C058:A9 93 20 D2 FF A9 30 8D 59
C060:1C CC 8D 1D CC 8D 1E CC 4C
C068:A9 31 8D 22 CC A9 04 8D 81
C070:28 CC A9 50 8D 30 CC A9 E3
C078:FF 8D 0E CC A9 B4 8D 32 59
C080:CC A9 00 8D 0C CC 8D 16 70
C088:CC 8D 15 CC 8D 18 CC 8D 37
C090:0D CC 8D 0F CC 8D 24 CC 20
C098:8D 27 CC 8D 2E CC 8D 2F 0C
C0A0:CC 8D 31 CC 8D 10 D0 8D BA
C0A8:1B D0 A9 50 8D 17 CC 8D 16
C0B0:00 D0 A9 C1 8D 0B CC 8D 77
C0B8:10 CC A9 C6 8D 11 CC A9 0B
C0C0:40 8D 14 CC A9 C0 8D F8 79
C0C8:07 A9 06 8D 27 D0 A9 09 AA
C0D0:8D 25 D0 A9 07 8D 26 D0 A2
C0D8:A9 54 8D 01 D0 A9 01 8D C2
C0E0:12 CC 8D 13 CC 8D 1C D0 27
C0E8:20 E3 C8 A9 50 8D 00 D4 B4
C0F0:A9 21 8D 01 D4 A9 44 8D B4
C0F8:05 D4 A9 20 8D 06 D4 A9 41
C100:68 8D 16 D4 A9 01 8D 17 AE
C108:D4 A9 4A 8D 18 D4 A9 C8 B2
C110:8D 08 D4 A9 FF 8D 0E D4 B8
C118:8D 0F D4 A9 80 8D 12 D4 8E
C120:A2 00 BD 27 C9 9D 02 04 EB
C128:A9 06 9D 02 D8 E8 E0 24 26
C130:D0 F0 AD 1E CC 8D 09 04 A2
C138:AD 1D CC 8D 0A 04 AD 1C 24
C140:CC 8D 0B 04 AD 23 CC 8D 50
C148:19 04 AD 22 CC 8D 25 04 1C
C150:18 A0 00 A2 01 20 F0 FF 9C
C158:A2 00 BD E1 C9 20 D2 FF 77
C160:E8 E0 56 D0 F5 18 A0 00 B9
C168:A2 03 20 F0 FF A2 00 BD 59
C170:37 CA 20 D2 FF E8 E0 DA B3
C178:D0 F5 AD 32 CC 8D D0 04 FC
C180:8D E6 04 18 A0 00 A2 07 D7
C188:20 F0 FF A2 00 BD 37 CA B2
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C198:CE 32 CC AD 32 CC 8D 70 D4
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C1B0:CA 20 D2 FF E8 E0 DA D0 4D
C1B8:F5 CE 32 CC AD 32 CC 8D 5B
C1C0:10 06 8D 26 06 18 A0 00 B3
C1C8:A2 0F 20 F0 FF A2 00 BD BC
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C1E8:00 A2 13 20 F0 FF A2 00 46
C1F0:BD 11 CB 20 D2 FF E8 E0 5C
C1F8:F6 D0 F5 A9 EF 8D BF 07 C1
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C208:D0 03 4C E8 C6 A9 01 8D 3B
C210:15 D0 A5 C5 C9 3C D0 FA 41
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C220:AD 29 CC F0 06 CE 29 CC F9
C228:4C 30 C2 A9 80 8D 04 D4 E9
C230:AD 10 D0 29 01 F0 0F AD D4
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C240:8D 19 CC 4C 68 C2 AD 12 EC
C248:CC C9 FF D0 0F 38 AD 00 68
C250:D0 E9 0C 4A 4A 4A 8D 19 8E
C258:CC 4C 68 C2 38 AD 00 D0 D9
C260:E9 10 4A 4A 4A 8D 19 CC 54
C268:AE 13 CC 18 AD 17 CC 69 F1
C270:A0 8D 17 CC AD 18 CC 69 2A
C278:00 8D 18 CC CA D0 EC 18 BC
C280:AD 17 CC 6D 19 CC 8D 17 41
C288:CC AD 18 CC 69 00 8D 18 2E
C290:CC 18 A9 04 6D 18 CC 8D EA
C298:18 CC AD 17 CC 85 B8 AD 20
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C2A8:CC A9 00 8D 18 CC A0 28 35
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C2C8:F0 0A AD 16 CC C9 04 D0 C6
C2D0:15 4C 4F C5 AD 16 CC C9 63
C2D8:08 D0 0B 4C 4F C5 AD 0F B8
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C2E8:AD 1B D4 D9 33 CC F0 09 FB
C2F0:C8 CC 28 CC D0 F2 4C 7F 4A
C2F8:C3 AD 2F CC CD 30 CC 10 57
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C308:FF F0 11 18 A5 B8 6D 1A 74
C310:CC 85 BA A5 B9 69 00 85 0A
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C320:1B CC 85 BA A5 B9 E9 00 AC
C328:85 BB A0 28 B1 BA C9 66 6A
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C338:46 AD 12 CC C9 FF F0 08 95
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C350:A0 28 A9 20 91 BA C8 91 04
C358:BA A0 00 B1 BA C9 64 D0 17
C360:04 A9 20 91 BA C8 B1 BA 88
C368:C9 64 D0 04 A9 20 91 BA F3
C370:A9 81 8D 04 D4 A9 00 8D F9
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C380:12 CC C9 FF F0 2A AD 10 19
C388:D0 F0 0B AD 00 D0 C9 2D F4
C390:F0 16 C9 3D F0 3C AD 00 F6
C398:D0 C9 2A F0 03 4C 08 C4 6D
C3A0:A9 00 8D 1B D0 4C 08 C4 EC
C3A8:A9 01 8D 1B D0 4C 08 C4 35
C3B0:AD 10 D0 D0 0B AD 00 D0 1A
C3B8:C9 2A F0 EC C9 1A F0 12 47
C3C0:AD 00 D0 C9 2D F0 03 4C 55
C3C8:08 C4 A9 00 8D 1B D0 4C 81
C3D0:08 C4 AD 0D CC F0 03 4C 90
C3D8:36 C5 18 AD 01 D0 69 20 09
C3E0:8D 01 D0 EE 13 CC AD 10 AF
C3E8:D0 D0 10 A9 C1 8D 0B CC D0
C3F0:8D 10 CC A9 C6 8D 11 CC D2
C3F8:4C 08 C4 A9 C6 8D 0B CC 2B
C400:8D 10 CC A9 CB 8D 11 CC 0C
C408:AD 13 CC 29 01 F0 08 A9 DE
C410:01 8D 12 CC 4C 1C C4 A9 92
C418:FF 8D 12 CC A5 C5 C9 3C 28
C420:D0 1A 4C FD C4 AD 12 CC CF
C428:C9 FF F0 08 A9 01 8D 10 B1
C430:D0 4C 45 C4 A9 00 8D 10 A2
C438:D0 4C 45 C4 AD 00 D0 F0 32
C440:E4 C9 FF F0 E0 18 AD 00 80
C448:D0 6D 12 CC 8D 00 D0 EE A1
C450:2F CC AD 0D CC F0 1E EE 80
C458:15 CC AD 15 CC C9 14 D0 2D
C460:30 A9 00 8D 15 CC 8D 0D 49
C468:CC 18 AD 01 D0 69 08 8D ED
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C478:0B D4 EE 2E CC AD 2E CC C3
C480:C9 0A F0 03 4C 91 C4 A9 9B
C488:00 8D 2E CC A9 81 8D 0B 81
C490:D4 AD 13 CC C9 05 F0 0D 70
C498:A2 0A A0 FF 88 D0 FD CA 58
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C4A8:C9 A8 D0 EC 4C DF C5 AD 45
C4B0:1C CC C9 39 F0 06 EE 1C E1
C4B8:CC 4C E5 C4 A9 30 8D 1C 0A
C4C0:CC EE 1D CC AD 1D CC C9 22
C4C8:3A F0 03 4C E5 C4 A9 30 96
C4D0:8D 1D CC EE 1E CC AD 1E 8E
C4D8:CC C9 3A F0 03 4C E5 C4 6B
C4E0:A9 30 8D 1E CC AD 1E CC 05
C4E8:8D 09 04 AD 1D CC 8D 0A 18
C4F0:04 AD 1C CC 8D 0B 04 A9 82
C4F8:00 8D 0F CC 60 AD 14 CC 43
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C500:C9 40 D0 27 AD 15 CC D0 39
C508:22 A9 FF 8D 0D CC 8D 14 B2
C510:CC A9 00 8D 16 CC AD 12 96
C518:CC C9 01 F0 11 A9 CC 8D 02
C520:F8 07 38 AD 01 D0 E9 08 F2
C528:8D 01 D0 4C 3C C4 A9 CB AD
C530:8D F8 07 4C 22 C5 18 AD 6C
C538:01 D0 69 08 8D 01 D0 A9 E1
C540:00 8D 0D CC 8D 15 CC A9 A1
C548:40 8D 14 CC 4C DA C3 A9 A5
C550:FF 8D 0D CC A9 00 8D 16 2C
C558:CC EE 01 D0 EE 16 CC A2 3F
C560:05 A0 FF 88 D0 FD CA D0 04
C568:F8 AD 16 CC C9 20 D0 E9 C5
C570:AD 12 CC C9 FF F0 08 A9 0B
C578:CB 8D F8 07 4C 84 C5 A9 86
C580:CC 8D F8 07 18 AD 01 D0 AF
C588:69 0A 8D 01 D0 A2 90 A0 DF
C590:FF 88 D0 FD CA D0 F8 20 E3
C598:E3 C8 A9 B0 8D 01 D4 A9 4C
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C5B0:8D 04 D4 A2 0D A0 FF 88 3C
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C5C0:AD 31 CC C9 16 D0 E2 20 7F
C5C8:E3 C8 A9 00 8D 24 CC 8D D1
C5D0:25 CC EE 24 CC D0 FB EE D2
C5D8:25 CC D0 F6 4C E8 C6 AD F4
C5E0:0D CC F0 09 18 AD 01 D0 1F
C5E8:69 08 8D 01 D0 A9 FF 8D A7
C5F0:0D CC A9 C0 8D F8 07 A9 7F
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C600:0F AA AD 23 CC 29 0F 8D 5E
C608:2B CC F8 18 AD 2A CC 6D 1C
C610:2B CC 8D 2A CC CA D0 F3 E1
C618:D8 AD 2A CC 4A 4A 4A 4A E9
C620:F0 05 09 30 8D 60 07 AD 35
C628:2A CC 29 0F 09 30 8D 61 99
C630:07 A9 30 8D 62 07 8D 63 38
C638:07 A9 01 8D 60 DB 8D 61 9B
C640:DB 8D 62 DB 8D 63 DB A9 84
C648:78 8D 08 D4 A9 09 8D 0C 5C
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C658:8D 0F D4 A9 15 8D 0B D4 6F
C660:A9 00 8D 24 CC 8D 25 CC 6A
C668:8D 26 CC EE 24 CC D0 FB C0
C670:EE 25 CC D0 F6 EE 26 CC F1
C678:AD 26 CC C9 02 D0 EC F8 C2
C680:38 AD 2A CC E9 01 8D 2A 40
C688:CC D8 20 AF C4 AD 2A CC AF
C690:D0 ED AD 22 CC C9 34 D0 A0
C698:2B AD 23 CC C9 34 D0 03 1C
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C6D8:CC AD 23 CC 8D 19 04 AD EF
C6E0:22 CC 8D 25 04 4C 77 C0 B7
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C6F0:43 9D F6 04 9D 36 06 A9 22
C6F8:07 9D F6 D8 9D 36 DA E8 42
C700:E0 1C D0 EB A9 42 8D 1D 6E
C708:05 8D 45 05 8D 6D 05 8D 30
C710:95 05 8D BD 05 8D E5 05 68
C718:8D 0D 06 8D 3A 05 8D 62 AE
C720:05 8D 8A 05 8D B2 05 8D 06
C728:DA 05 8D 02 06 8D 2A 06 F8
C730:A9 07 8D 1D D9 8D 45 D9 43
C738:8D 6D D9 8D 95 D9 8D BD EA
C740:D9 8D E5 D9 8D 0D DA 8D 5E
C748:3A D9 8D 62 D9 8D 8A D9 37
C750:8D B2 D9 8D DA D9 8D 02 C2
C758:DA 8D 2A DA A9 55 8D F5 5F
C760:04 A9 49 8D 12 05 A9 4A A0
C768:8D 35 06 A9 4B 8D 52 06 A2
C770:A9 07 8D F5 D8 8D 12 D9 A2
C778:8D 35 DA 8D 52 DA A2 00 93
C780:A9 20 9D 1E 05 9D 46 05 B2
C788:9D 6E 05 9D 96 05 9D BE BF
C790:05 9D E6 05 9D 0E 06 A9 12
C798:06 9D 1E D9 9D 46 D9 9D 4B
C7A0:6E D9 9D 96 D9 9D BE D9 97
C7A8:9D E6 D9 9D 0E DA E8 E0 64
C7B0:1C D0 CD AD 2C CC D0 1D 6A
C7B8:A2 00 BD B6 C9 9D 24 05 CE
C7C0:E8 E0 11 D0 F5 A2 00 BD 24
C7C8:C7 C9 9D 47 05 E8 E0 1A 7E
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C7D8:4B C9 9D 1F 05 E8 E0 15 C8
C7E0:D0 F5 A2 00 BD 60 C9 9D 4B
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C7F8:E0 1B D0 F5 A2 00 BD 90 5A
C800:C9 9D E7 05 E8 E0 11 D0 E8
C808:F5 A2 00 BD A1 C9 9D 0F 97
C810:06 E8 E0 15 D0 F5 A9 02 FF
C818:8D 98 D9 8D E8 D9 8D 10 84
C820:DA AC 2D CC A9 07 91 BC 06
C828:AD 2C CC D0 08 A9 FF 8D B6
C830:2C CC 4C 8B C8 AD 1E CC 53
C838:CD 21 CC 30 2A F0 02 10 BE
C840:14 AD 1D CC CD 20 CC 30 70
C848:1E F0 02 10 08 AD 1C CC 62
C850:CD 1F CC 30 12 AD 1E CC 7D
C858:8D 21 CC AD 1D CC 8D 20 C4
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C878:05 AD 1E CC 8D 57 05 AD 0A
C880:1D CC 8D 58 05 AD 1C CC EE
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C8C8:A9 31 8D 23 CC AC 2D CC 9F
C8D0:A9 07 91 BC A5 C5 C9 40 0F
C8D8:D0 FA 4C 8B C8 4C 58 C0 BC
C8E0:20 E2 FC A9 00 AA 9D 00 5B
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C8F8:1D EE 0C CC AD 0C CC C9 24
C900:03 D0 13 EE 0B CC AD 0B 8C
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C918:8D 14 CC 4C 31 EA AD 10 76
C920:CC 8D 0B CC 4C 0E C9 13 EC
C928:03 0F 12 05 3A 20 30 30 76
C930:30 30 30 20 20 20 20 0C BD
C938:05 16 05 0C 3A 20 30 20 08
C940:20 20 20 06 12 01 0D 05 04
C948:3A 20 30 08 09 07 08 20 1C
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C968:12 05 20 09 13 20 3A 20 88
C970:30 30 30 30 30 28 13 29 A2
C978:20 06 0F 12 20 13 0B 09 0D
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C988:20 31 20 32 20 33 20 34 E1
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C9B8:05 20 12 20 0D 20 09 20 36
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C9D8:20 20 20 20 20 20 20 20 6C
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CA18:AF AF AF AF AF AF AF AF AD
CA20:AF AF AF AF AF AF AF AF B5
CA28:AF AF AF AF AF AF AF AF BD
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CA38:12 AF AF BA 1F 92 A6 A6 9B
CA40:A6 A6 A6 A6 A6 A6 A6 A6 D5
CA48:A6 A6 A6 A6 A6 A6 A6 A6 DD
CA50:A6 A6 A6 A6 A6 A6 A6 A6 E5
CA58:A6 A6 A6 A6 A6 A6 A6 A6 ED
CA60:1C 12 CC AF AF 12 1C BA D5
CA68:9A 20 20 92 20 20 20 95 D7
CA70:A7 12 1E CF B7 B7 D0 92 EF
CA78:95 B4 20 20 20 20 20 20 ED
CA80:20 20 20 20 20 20 20 20 16
CA88:20 20 A7 12 1E CF B7 B7 A3
CA90:D0 92 95 B4 20 20 20 12 05
CA98:9A 20 20 1C CC 12 1C BA EA
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CAA8:A7 12 1E B4 30 41 A7 92 0E
CAB0:95 B4 20 20 20 20 20 20 26
CAB8:20 20 20 20 20 20 20 20 4E
CAC0:20 20 A7 12 1E B4 30 42 EA
CAC8:A7 92 95 B4 20 20 20 12 A8
CAD0:9A 20 20 1C CC 12 1C BA 23
CAD8:9A AF AF 92 9E A4 A4 A4 3C
CAE0:95 BA 12 1E CC AF AF BA 53
CAE8:92 95 CC 9E A4 A4 A4 A4 56
CAF0:A4 A4 A4 A4 A4 A4 A4 A4 86
CAF8:A4 A4 A4 A4 95 BA 12 1E C2
CB00:CC AF AF BA 92 95 CC 9E AE
CB08:A4 A4 A4 12 9A AF AF 1C DF
CB10:CC 1C 12 AF AF BA 1F 92 8B
CB18:A6 A6 A6 A6 A6 A6 A6 A6 AF
CB20:A6 A6 A6 A6 A6 A6 A6 A6 B7
CB28:A6 A6 A6 A6 A6 A6 A6 A6 BF
CB30:A6 A6 A6 A6 A6 A6 A6 A6 C7
CB38:A6 A6 1C 12 CC AF AF 12 08
CB40:1C BA 9A 20 20 92 20 20 95
CB48:20 20 20 20 20 20 20 20 DF
CB50:20 20 20 95 A7 12 9F CF F1
CB58:B7 D0 B7 B7 D0 92 95 B4 23
CB60:20 20 20 20 20 20 20 20 F7
CB68:20 20 20 20 20 12 9A 20 BC
CB70:20 1C CC 12 1C BA 9A 20 FA
CB78:20 92 20 20 20 20 20 20 AC
CB80:20 20 20 20 20 20 20 95 8D
CB88:A7 12 9F B4 4C A7 B4 4C 6E
CB90:A7 92 95 B4 20 20 20 20 80
CB98:20 20 20 20 20 20 20 20 30
CBA0:20 12 9A 20 20 1C CC 12 3F
CBA8:1C BA 9A AF AF 92 9E A4 F4
CBB0:A4 A4 A4 A4 A4 A4 A4 A4 48
CBB8:A4 A4 A4 A4 95 BA 12 9F 06
CBC0:CC AF BA AF AF BA 92 95 20
CBC8:CC 9E A4 A4 A4 A4 A4 A4 F2
CBD0:A4 A4 A4 A4 A4 A4 A4 12 D5
CBD8:9A AF AF 1C CC 12 97 AF EE
CBE0:AF BA BA BA BA BA BA BA F2
CBE8:BA BA BA BA BA BA BA BA 80
CBF0:BA BA BA CC CC CC CC CC B8
CBF8:CC CC CC CC CC CC CC CC 90
CC00:CC CC CC CC CC AF 13 00 E4
CC08:00 00 00 00 00 00 00 00 A1
CC10:00 00 00 00 00 00 00 00 A9
CC18:00 00 00 00 00 00 00 30 E1
CC20:30 30 00 00 00 00 00 00 DD
CC28:00 00 00 00 00 00 00 00 C1
CC30:00 00 00 1A 89 2B 57 03 16
CC38:D7 05 20 C6 F7 33 0C 43 57
CC40:A5 67 CC EA EA EA EA EA 92
```


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PROGRAMS

GUSTAVO FELIX HERRERA

GRAPHICS CONVERTER

CONVERT PRINT MASTER AND THE PRINT SHOP GRAPHICS FOR USE WITH GEOS WITH THIS UTILITY FOR THE 64

Have you ever created graphics with *Print Master* and then wanted to use them with GEOS? Maybe a certain graphic from *The Print Shop* has caught your eye, and you'd like to incorporate it into a GeoWrite file. If you've ever wished for these capabilities, then *Graphics Converter* is the program for you.

Graphics Converter converts *Print Master* or *Print Shop* graphics to GEOS format, saving them as photo scraps. This way you can include your artwork on Photo Manager, GeoWrite, GeoPaint, or any other application that supports graphics.

Typing It In

Graphics Converter is written entirely in machine language. To enter it, you'll need to use *MLX*, our machine language entry program (see "Typing Aids" elsewhere in this section). When *MLX* prompts you, respond with the values given below.

Starting address: 0247
Ending address: 09BE

When you've finished typing, be sure to save two copies of the program to a GEOS work disk before exiting *MLX*. One copy will be converted by *GeoConverter* 2.0 ("The GEOS Column," *COMPUTE!'s Gazette,* March 1990) into a GEOS desk accessory. The other is a backup copy in case you have a problem with the conversion.

If you don't already have a copy of *GeoConverter,* we have included the program listing here. Be sure to use *The Automatic Proofreader* (again, see "Typing Aids") to prevent typing mistakes when you enter the program. Save a copy of *GeoConverter* to the disk that contains *Graphics Converter.*

To prepare *Graphics Converter* for use with GEOS, load and run *GeoConverter.* When prompted for a filename, enter the name you used to save *Graphics Converter. GeoConverter* then converts the file into a GEOS desk accessory.

Using the Program

To use *Graphics Converter* from GEOS, just double-click on its icon. Since *Graphics Converter* is an application, the screen will change, and a menu will appear. From the GEOS menu you can select several options, as explained below.

Graphics Info

Graphics Info contains a dialog box with information about the author and the program's version number. This dialog box also contains a copyright message.

Photo Manager

After you have converted a graphic to the GEOS format, paste it in the Photo Manager and continue converting graphics until you've finished with all of them. If the Photo Manager is not on your disk or if there is insufficient disk space to use the Photo Manager, a dialog box containing an error message will appear onscreen. If you are sure Photo Manager is on disk and the dialog box still appears, you'll have to remove or delete files to make room on your disk before continuing.

File

If you want to convert a *Print Master* graphic, click on that name from the File menu. The program will search on the disk immediately after you select this option, so your data disk with your *Print Master* graphics must be in the drive. *Graphics Converter* will make a list of files that are three blocks long and end with .GRA. A list of these graphics will appear on a dialog box. You can choose the graphic you want by moving a rectangle with the up and down arrows. To load and display the graphic, click on the OK icon. Otherwise, click on the Cancel icon, which will cause the dialog box to disappear without making any changes. After you've clicked on the graphics you want to convert, close the file and move to the Convert menu.

Converting *Print Shop* graphics works in a similar manner. *Graphics Converter* will make a list of *Print Shop* files and display it on the screen. The only difference is that the list will consist of any two-block files, regardless of the filename. Select graphics for conversion in the same manner as explained above.

Quit

Once you have converted all the files you want and have pasted them in an album, select the Quit option to exit to the Desktop.

Convert

Once the graphic has been loaded and displayed on the screen, select the Convert option. *Graphics Converter* will save the graphic to disk as a GEOS photo scrap. The disk in the drive must be a GEOS disk; otherwise an error message will appear. Don't worry if that should happen; just change disks and try again.

Select

If you want to convert more than one graphic, you don't have to click on the File menu and then return to the *Print Shop* or *Print Master* option each time. You need only to click on the

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Select option, and a list corresponding to your last selection will be displayed on the screen. If the last converted file was from *Print Master* (the default format), the list will contain *Print Master* graphic files. Just be sure your data disk is still in the disk drive before you click on the Select menu.

Error Messages

For all the possible errors that may occur, the onscreen messages are kept simple for maximum clarity. If you should get an error message during an operation, check the following table for more complete information.

Error Message	Possible Cause
Photo Manager	Photo Manager not on disk. Disk nearly full. No disk in drive. Write-protect tab on disk.
Print Master	No disk in drive.
Print Shop	No disk in drive.
Select	No disk in drive.
Convert	Non-GEOS disk. No disk in drive. Write-protect tab on disk. Disk nearly full.

GRAPHICS CONVERTER

```
0247:5D 03 15 BF 01 FF FF 02 63
024F:00 01 02 18 71 02 28 09 42
0257:02 08 31 02 08 09 7E 1D 23
025F:71 80 00 01 80 06 01 80 EA
0267:0F 15 85 46 29 82 89 15 C8
026F:85 56 A9 9F E9 F9 84 00 3B
0277:21 84 00 21 87 FF E1 84 C3
027F:00 21 84 00 21 80 00 01 68
0287:FF FF FF 83 06 00 00 04 F7
028F:A6 0B 00 04 47 45 4F 43 1B
0297:4F 4E 56 45 52 54 45 52 B6
029F:56 31 2E 30 00 00 00 00 E3
02A7:46 43 4F 2E 20 46 45 4C 5D
02AF:49 58 20 48 45 52 52 45 54
02B7:52 41 5D 8D 00 00 A9 14 21
02BF:20 39 C1 20 9F C1 00 C7 28
02C7:00 00 3F 01 20 4B C1 A9 1F
02CF:1F 85 02 A9 04 85 03 A9 85
02D7:00 20 51 C1 60 00 0E 00 49
02DF:00 84 00 04 02 09 80 3B B5
02E7:04 07 09 80 4D 04 0C 09 74
02EF:00 BC 04 13 09 00 2A 08 79
02F7:00 0E 2A 00 00 55 00 82 9C
02FF:1B 09 00 67 04 28 09 00 1D
0307:78 04 00 0E 38 1D 00 66 C7
030F:00 83 36 09 00 C8 04 43 BB
0317:09 00 CC 04 4E 09 00 64 76
031F:04 00 4C 2C C2 20 90 C1 EC
0327:A9 53 85 02 A9 09 85 03 27
032F:20 56 C2 4C 0E 04 20 90 49
0337:C1 20 A1 C2 20 E1 C1 A9 3C
033F:71 85 0E A9 09 85 0F 20 58
0347:0B C2 8A D0 1F A9 00 85 07
034F:14 A9 84 85 15 20 17 C2 CC
0357:8A D0 11 20 9F C1 18 9B CA
035F:14 00 18 01 A9 00 8D 56 41
0367:0A 4C 0E 04 A9 61 85 02 67
036F:A9 09 85 03 20 56 C2 4C 99
0377:0E 04 20 93 C1 20 A1 C2 57
037F:8A D0 E9 4C E2 04 A9 00 7B
0387:F0 02 A9 01 8D 4B 0A 20 99
038F:90 C1 20 A1 C2 8A D0 D4 23
0397:AD 52 0A CD 4B 0A D0 13 5E
039F:A0 90 B9 00 3F D9 00 82 35
03A7:D0 09 C8 98 C9 AB D0 F2 8C
03AF:4C E5 05 AD 4B 0A 8D 52 C0
03B7:0A A9 00 85 05 85 0A A9 81
03BF:3F 85 0B A9 12 85 04 20 91
03C7:E4 C1 8A D0 9F A9 00 8D 40
03CF:4C 0A 8D 4D 0A A9 A1 85 C4
03D7:FD A9 0B 85 FE A9 12 A2 66
03DF:01 8E 51 0A 85 04 86 05 23
03E7:A9 00 85 FB 85 0A A9 80 5B
03EF:85 FC 85 0B 20 E4 C1 8A FB
03F7:F0 03 4C AE 04 20 5E 05 0E
03FF:18 A5 FB 69 20 85 FB 90 31
0407:F4 AE 01 80 AD 00 80 D0 9C
040F:D3 A9 A6 85 FB A9 0B 85 BA
0417:FC 4C E5 05 AD 4B 0A D0 3D
041F:47 A0 02 B1 FB F0 31 C8 1D
0427:B1 FB F0 2C A0 1F B1 FB C8
042F:D0 26 88 B1 FB C9 03 D0 33
0437:1F 20 9B 05 88 B1 FB C9 67
043F:41 D0 15 88 B1 FB C9 52 AA
0447:D0 0E 88 B1 FB C9 47 D0 CD
044F:07 88 B1 FB C9 2E F0 2B 07
0457:60 A0 15 88 B1 FB C9 A0 94
045F:F0 F9 C8 A9 00 91 FB 60 B0
0467:A0 02 B1 FB F0 34 C8 B1 D1
046F:FB F0 2F A0 1F B1 FB D0 2A
0477:29 88 B1 FB C9 02 D0 22 46
047F:20 9B 05 EE 4C 0A A0 05 DE
0487:B1 FB 91 FD C8 C0 14 D0 BB
048F:F7 A9 00 91 FD 18 A5 FD B0
0497:69 10 85 FD A5 FE 69 00 E4
049F:85 FE 60 A9 36 85 02 A9 46
04A7:0A 85 03 20 56 C2 C6 02 C5
04AF:F0 03 4C 0E 04 AD 4C 0A D4
04B7:F0 F8 AD 4D 5D 05 00 0A 0A
04BF:18 65 FB 85 FD A5 FC 69 EE
04C7:00 85 FE A5 FD 85 0E A5 33
04CF:FE 85 0F 20 0B C2 8A D0 E5
04D7:54 A9 00 85 06 AD 01 84 3A
04DF:85 04 A9 80 85 10 A9 40 E8
04E7:85 11 AD 02 84 85 05 A9 BA
04EF:03 85 07 20 FF C1 8A D0 AA
04F7:34 AE 4B 0A CA 8A F0 30 62
04FF:20 A2 C1 2A 60 2F 00 88 E3
0507:00 FF A9 0B 85 06 A9 34 C2
050F:85 07 A9 87 85 02 A9 06 D8
0517:85 04 A9 2B 85 05 A9 40 A0
051F:85 03 20 42 C1 A9 01 8D 19
0527:56 0A 4C 0E 04 4C AE 04 FB
052F:A5 FB 8D 53 0A A5 FC 8D 60
0537:54 0A A9 00 85 FD A9 44 DE
053F:85 FE A9 82 85 FB A9 40 D8
0547:85 FC A2 2D A0 00 A9 86 59
054F:91 FD 20 E7 06 A9 00 8D 88
0557:55 0A B1 FB 91 FD 20 E1 2B
055F:06 EE 55 0A AD 55 0A C9 14
0567:06 D0 EF CA D0 E0 20 EE 8C
056F:06 A9 06 85 06 A9 2D 85 B6
0577:07 A9 00 85 02 A9 44 85 8C
057F:03 AD 53 0A 85 FB AD 54 4D
0587:0A 85 FC A9 06 85 04 A9 2A
058F:2B 85 05 20 42 C1 A9 01 A0
0597:8D 56 0A 4C 0E 04 E6 FB 4E
059F:D0 02 E6 FC E6 FD D0 02 12
05A7:E6 FE 60 A9 14 20 39 C1 E0
05AF:20 9F C1 28 64 2D 00 89 CD
05B7:00 20 A2 C1 2A 58 2F 00 4B
05BF:60 00 FF 60 20 A2 C1 23 32
05C7:7D 37 00 96 00 FF 20 AB B3
05CF:C1 63 0A 14 46 02 10 A9 1A
05D7:00 85 19 A9 A7 85 18 A0 25
05DF:52 38 20 4E C1 4C A4 07 99
05E7:AD 05 85 29 80 D0 4D A5 D4
05EF:3A C9 A0 90 47 C9 AF B0 18
05F7:43 A5 3C C9 46 90 3D C9 E9
05FF:56 B0 39 C9 4E 90 36 AD F3
0607:4D 0A C9 05 F0 13 AE 4C 43
060F:0A CA 8A CD 4D 0A F0 24 99
0617:EE 4D 0A EE 51 0A 4C A4 0E
061F:07 AD 4C 0A CD 51 0A F0 FC
0627:13 18 A5 FB 69 10 85 FB C9
062F:A5 FC 69 00 85 FC EE 51 C9
0637:0A 4C A4 07 60 AD 4D 0A BE
063F:F0 09 CE 4D 0A CE 51 0A EC
0647:4C A4 07 AE 51 0A CA F0 A7
064F:EB 38 A5 FB E9 10 85 FB 6A
0657:A5 FC E9 00 85 FC CE 51 C1
065F:0A AD 4C 0A F0 D6 A9 00 3C
0667:8D 4F 0A 20 39 C1 20 9F 02
066F:C1 24 7C 38 00 95 00 A9 78
0677:2E 8D 50 0A A5 FB 85 FD CE
067F:A5 FC 85 FE A5 FD 85 02 70
0687:A5 FE 85 03 A9 00 85 19 78
068F:85 04 A9 38 85 18 AD 50 50
0697:0A 85 05 20 48 C1 18 AD D3
069F:50 0A 69 0F 8D 50 0A 18 4E
06A7:A5 FD 69 10 85 FD A5 FE A2
06AF:69 00 85 FE EE 4F 0A AD 87
06B7:4F 0A CD 4C 0A F0 07 C9 58
06BF:06 F0 03 4C C7 07 AD 4D 33
06C7:0A 0A A8 B9 57 0A 85 06 FF
06CF:B9 58 0A 85 07 A9 00 85 CC
06D7:09 85 0B A9 38 85 08 A9 57
06DF:95 85 0A 20 2A C1 60 20 94
06E7:93 C1 20 5B 08 20 A1 C2 AE
06EF:AD 8B 84 D0 03 4C AE 04 FD
06F7:A9 7F 85 02 A9 09 85 03 09
06FF:20 38 C2 A9 9A 85 14 A9 D9
0707:0A 85 15 A9 00 85 16 20 1B
070F:ED C1 8A D0 E0 4C 0E 04 3B
0717:AD 56 0A D0 05 68 68 4C C6
071F:0E 04 AD 4B 0A D0 56 A9 89
0727:00 8D 86 40 A9 38 8D 85 3C
072F:40 A9 0B 8D 84 40 A9 84 FE
0737:8D E1 0A A9 40 8D E2 0A 68
073F:A5 FB 8D 53 0A A5 FC 8D 74
0747:54 0A A9 0D 8D E3 0A A9 C1
074F:43 8D E4 0A A9 F7 85 FD D5
0757:A9 42 85 FE A9 84 85 FB D1
075F:A9 0A 85 FC A2 16 A0 00 F3
0767:B1 FB 91 FD 20 E1 06 CA BE
076F:D0 F6 AD 53 0A 85 FB AD 9A
0777:54 0A 85 FC 60 A9 00 8D E9
077F:FF 43 A9 2D 8D FE 43 A9 FE
0787:06 8D FD 43 A9 FD 8D E1 32
078F:0A A9 43 8D E2 0A A0 00 CE
0797:A9 06 91 FD 20 E7 06 A9 64
079F:00 91 FD 20 E7 06 A9 24 A2
07A7:91 FD 20 E7 06 A9 BF 91 68
07AF:FD 20 E7 06 A5 FD 8D E3 46
07B7:0A A5 FE 8D E4 0A 60 47 44
07BF:45 4F 53 00 46 49 4C 45 E3
07C7:00 53 45 4C 45 43 54 00 F7
07CF:43 4F 4E 56 45 52 54 00 9E
07D7:43 4F 4E 56 45 52 54 20 C6
07DF:49 4E 46 4F 00 50 48 4F 05
07E7:54 4F 20 4D 41 4E 41 47 D9
07EF:45 52 00 50 52 49 4E 54 E2
07F7:20 4D 41 53 54 45 52 00 23
```


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PROGRAMS

```
07FF:50 52 49 4E 54 20 53 48 EA
0807:4F 50 00 51 55 49 54 00 60
080F:01 1E 82 32 00 FF 00 0B A5
0817:17 12 8B 09 0E 00 01 1E C9
081F:82 32 00 FF 00 0B 14 12 63
0827:09 0A 01 13 4C 00 70 68 3B
082F:6F 74 6F 20 6D 61 6E 61 33
0837:67 65 72 00 50 68 6F 74 1A
083F:6F 20 53 63 72 61 70 00 A9
0847:1A 47 52 41 50 48 49 43 0E
084F:53 20 43 4F 4E 56 45 52 17
0857:54 45 52 20 D6 31 2E 33 3A
085F:1B 18 16 8E 00 3E 42 59 85
0867:16 6B 00 4D 1B 18 C6 D2 CB
086F:C1 CE C3 C9 D3 C3 CF A0 17
0877:C6 C5 CC C9 D8 16 5F 00 70
087F:67 1B 43 4F 50 59 52 49 3D
0887:47 48 54 20 31 39 39 30 EA
088F:20 43 4F 4D 50 55 54 45 05
0897:21 16 41 00 71 1B 50 55 D3
089F:42 4C 49 43 41 54 49 4F 7E
08A7:4E 53 2C 20 49 4E 43 2E 73
08AF:20 41 4C 4C 20 52 49 47 92
08B7:48 54 53 20 52 45 53 45 01
08BF:52 56 45 44 2E 00 18 43 60
08C7:41 4E 20 4E 4F 54 20 43 44
08CF:4F 4E 54 49 4E 55 45 2C B8
08D7:20 41 4E 20 45 52 52 4F 7B
08DF:52 16 6F 00 3C 48 41 53 65
08E7:20 4F 43 55 52 52 45 44 44
08EF:2E 1B 00 01 1E 82 32 00 4D
08F7:F0 00 01 11 0F 02 11 41 95
08FF:13 07 07 11 2B 07 5D 07 84
0907:00 00 24 5D 06 00 00 24 C7
090F:31 32 40 41 4F 50 5E 5F 3A
0917:6D 6E 7C A0 FF FF 80 01 17
091F:81 81 83 C1 87 E1 9F F9 DB
0927:BF FD 83 C1 83 C1 BF FD C5
092F:9F F9 87 E1 83 C1 81 81 46
0937:80 01 FF FF 0B 00 0B 00 38
093F:0B 00 0B 00 0B BF 0B BF 65
0947:0B BF 0B BF 0B BF 0B BF 59
094F:0B BF 7F 09 03 15 BF FF 43
0957:FF FF 80 40 01 80 60 01 49
095F:80 60 01 80 60 0D 80 50 7A
0967:35 80 50 D9 80 53 21 80 EF
096F:5C C1 80 59 01 87 CE 01 8A
0977:9F C8 01 B8 F8 01 B1 FC 63
097F:01 BF 6E 01 9C 66 01 80 E0
0987:66 01 80 6C 01 80 38 01 5F
098F:80 00 01 FF FF FF 83 04 0D
0997:5D 07 00 00 50 68 6F 74 91
099F:6F 20 53 63 72 61 70 20 2C
09A7:56 31 2E 31 00 00 00 00 0A
09AF:50 68 6F 74 6F 20 53 63 3F
09B7:72 61 70 5D A1 00 00 00 4C
```

GEOCONVERTER

```
DB 10 REM COPYRIGHT 1991 COMPU
      TE PUBLICATIONS INTL LTD
       - ALL RIGHTS RESERVED
SE 20 IF(PEEK(772)+PEEK(773)*2
      56)=42364THEN40
PD 30 LIST0,1:LIST4,1:LIST6,1:
      SA=PEEK(4625)*256+PEEK(4
      624):GOTO50
SX 40 POKE56,PEEK(46)+40:CLR:P
      OKE53280,0:POKE53281,0:S
      A=PEEK(56)*256+PEEK(55)
FA 50 PRINT"{CLR}{8}{N}{DOWN}"
      TAB(12)"{RVS}GEOCONVERTE
      R 2.0{OFF}{GRN}{3 DOWN}"
      :PRINTTAB(13)"COPYRIGHT
      {SPACE}1991{DOWN}"
JR 60 PRINTTAB(4)"COMPUTE PUBL
      ICATIONS INTL LTD{DOWN}"
JK 65 PRINTTAB(11)"ALL RIGHTS
      {SPACE}RESERVED{2 DOWN}"
MK 70 N=8:PRINT"DRIVE NUMBER "
      N"{4 LEFT}";:INPUTN:IFN<
      8ORN>11THEN70
QE 80 K$="N":PRINT"IS DRIVE"N"
      A 1581? "K$"{3 LEFT}";:I
      NPUTK$:IFK$<>"N"ANDK$<>"
      Y"THEN80
SB 90 T$=CHR$(18):S$=CHR$(1):I
      FK$="Y"THENT$=CHR$(40):S
      $=CHR$(3)
RS 100 INPUT"FILE TO CONVERT";
      NM$:OPEN15,N,15:OPEN1,N
      ,8,"0:"+NM$+",P,R"
BX 110 GOSUB440:IFEN<>0THENPRI
      NT"{RVS}"EN$" "EM$ET$EE
      $:GOTO400
FF 120 GET#1,K$,V$:IFK$<>CHR$(
      71)ORV$<>CHR$(2)THENCLO
      SE1:CLOSE15:GOTO220
BR 130 PRINT"{DOWN}DECOMPRESSI
      NG...":Z$=CHR$(0):GET#1
      ,ESC$:ESC=ASC(ESC$+Z$):
      AD=SA
RQ 140 GOSUB170:IFV<>ESCTHENPO
      KEAD,V:AD=AD+1:GOTO140
PP 150 GOSUB170:CT=V:GOSUB170:
      CT=CT+V*256:GOSUB170:GO
      SUB160:GOTO140
DH 160 FORI=1TOCT:POKEAD,V:AD=
      AD+1:NEXTI:CT=0:RETURN
PK 170 GET#1,V$:S=ST:V=ASC(V$+
      Z$):IFST=0THENRETURN
SJ 180 IFS<>64THENGOSUB440:PRI
      NT"{DOWN}LOAD ERROR -
      {RVS}"EN$" "EM$ET$EE$:G
      OTO400
AF 190 IFCT<>0THENGOSUB160:AD=
      AD-1
DG 200 PRINT"{DOWN}WRITING..."
      :CLOSE1:PRINT#15,"S0:"+
      NM$:CLOSE15
EF 210 OPEN1,N,8,"0:"+NM$+",P,
      W":FORI=SATOAD:PRINT#1,
      CHR$(PEEK(I));:NEXTI:CL
      OSE1
GP 220 PRINT"{DOWN}CONVERTING.
      ..":HD$="":FORI=1TO4:RE
      ADHE:HD$=HD$+CHR$(HE):N
      EXTI
CF 230 FORI=1TO5:READIE:ID$=ID
      $+CHR$(IE):NEXTI
DR 240 NL$="":OPEN15,N,15,"I0:
      ":OPEN2,N,2,"#"
MM 250 GOSUB410:GET #2,NT$,NS$
      :FORE=0TO7:D$=NL$:GET#2
      ,B$:I=1:IFB$=NL$THEN310
PE 260 IF ASC(B$)<>130 THEN310
AE 270 GET#2,HT$,HS$:I=3:IFHS$
      =""THENHS$=CHR$(0)
DJ 280 GET#2,B$:I=I+1:IFB$=""T
      HENB$=CHR$(0)
BM 290 IF(ASC(B$)=160)OR(I=19)
      THEN310
SF 300 D$=D$+B$:GOTO280
EB 310 FORI=ITO31:GET#2,B$:NEX
      TI:IFD$=NM$THEN340
JX 320 NEXTE:IFNT$=NL$THEN340
CH 330 T$=NT$:S$=NS$:GOTO250
GA 340 IFD$=NL$THENPRINT"
      {DOWN}DISK ERROR!":GOTO
      400
PD 350 DT$=T$:SS$=S$:T$=HT$:S$
      =HS$:GOSUB410:GET#2,MT$
      ,MS$:IFMS$=""THENMS$=CH
      R$(0)
GF 360 FORI=0TO65:GET#2,B$:NEX
      TI:GET#2,CT$,GT$:GOSUB4
      10:PRINT#2,HD$;:GOSUB42
      0
RX 370 T$=DT$:S$=SS$:GOSUB410:
      FORI=1TO32*E+2:GET#2,B$
      :NEXTI:PRINT#2,CT$;MT$;
      MS$;
MB 380 FORI=0TO15:GET#2,B$:NEX
      TI:PRINT#2,HT$;HS$;CHR$
      (0);GT$;ID$;:GOSUB420
GR 390 PRINTNM$" CONVERTED!"
HB 400 CLOSE1:CLOSE2:CLOSE15:E
      ND
DQ 410 U$="U1":GOTO430
CS 420 U$="U2"
PA 430 PRINT#15,U$;2;0;ASC(T$+
      "0");ASC(S$+"0"):RETURN
JJ 440 INPUT#15,EN,EM$,ET,EE:E
      N$=STR$(EN):ET$=STR$(ET
      ):EE$=STR$(EE):RETURN
EH 450 DATA 0,255,3,21,87,10,1
      ,0,0
```

TYPING AIDS

MLX, the machine language entry program for the 64 and 128, and *The Automatic Proofreader* are utilities that help you type in Gazette programs without making mistakes. These labor-saving utilities are on each *Gazette Disk* and printed in issues of *Gazette* through June 1990.

If you don't have access to a back issue or to one of our disks, write and we'll send you free copies of both of these handy utilities. We'll also include instructions on how to type in Gazette programs. Please enclose a self-addressed, stamped envelope.

Write to Typing Aids, COMPUTE!'s Gazette, 324 West Wendover Avenue, Greensboro, North Carolina 27408.

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RICHARD PENN

METALLIX

SEVEN COLORS PER CHARACTER ARE POSSIBLE WITH THIS EXCITING PROGRAMMING UTILITY FOR THE 64

With computers, often the more colors you can use, the better your graphics look. Unfortunately, you can only have three colors per character with the 64's multicolor mode, which consequently limits many special effects.

Raster interrupts can soup up text with a vertical four-color fading effect. While this is an improvement, it still leaves much to be desired. Characters are seven lines high, and ordinary interrupts are only fast enough to change colors every two lines.

Metallix provides a new graphics mode that displays seven colors per character—an independent hue on each raster line. This is the best vertical color resolution possible on the 64. The extra colors make metallic shading possible, giving your text a metallic luster. These enhanced metallic screens can be faded in and out for more eye-catching effects. Even sprites can be displayed with them. Through an innovative raster programming approach, *Metallix* truly gives 64 graphics an exciting new look. A self-running demo is included. (Note that a good, properly adjusted color monitor is required to clearly display *Metallix* colors.)

Getting Started

Metallix consists of two programs, both written in BASIC. Enter them using *The Automatic Proofreader* (see "Typing Aids" elsewhere in this section). The first program generates the actual machine language routine and saves it to disk as METALLIX.OBJ. Type it in and save it as METALLIX ML MAKE and then run it. You only need to run this program once to create the METALLIX.OBJ file.

The second program is a demo that shows how to use *Metallix*. After you've typed it in, save it as METALLIX DEMO to the same disk with METALLIX.OBJ. When you run the demo, it will automatically load and run METALLIX. OBJ. To use *Metallix* in your own programs, add line 30 of the demo program to the beginning of your BASIC programs.

Two Commands

Accessing *Metallix*'s features is easy, since you only need to learn two SYS commands to use it with your BASIC programs. The first command is SYS 51720, *border, background.* It clears the screen, selects the border and background colors (0–15), and fills the screen with reversed spaces. This command must be called before you print to the screen. It also changes the cursor color to the background color, so anything you print will be invisible. The only thing to remember while designing your displays is to avoid the leftmost three columns and to print everything in reverse field.

When you're ready to display a screen, use the command SYS 51890, *c1, c2, c3, c4, c5, c6, c7, [duration].* This command selects the seven character-shading colors (0–15) from top to bottom and fades a screen into view. Below are the three metallic shades used in the demo:

SYS 51890,11,15,1,7,10,8,2
SYS 51890,12,15,1,7,10,8,2
SYS 51890,15,1,7,10,8,2,9

The last parameter is optional; it selects the length of time the screen remains on before it is faded off (0–255). If omitted, a screen will remain visible until you press the space bar. Note that displaying a *Metallix* screen takes all of the computer's attention, so a BASIC program cannot continue until the screen has been turned off. More on this later.

As mentioned earlier, *Metallix* graphics can be combined with sprites if you follow some guidelines. The best way to use sprites and metallic text together is to set up a split screen where sprites and text are separate, as in the demo. Text can be placed beside sprites, but it must be on the rightmost side of the screen because the shading on the left will be distorted. Also, avoid placing sprites too high on the screen and placing too many on a single horizontal line, since doing this could slow *Metallix* down. Displaying sprites and text side by side is best done by trial and error.

When Longer Is Faster

Ordinary raster interrupts involve some overhead time. Of course, we're talking milliseconds here, but at the lightning speeds of a video display, these miniscule times become significant. Consequently, regular interrupts are too slow to interrupt at the beginning of every raster line.

Programmers know how to efficiently use loops to make the computer do more with less code. If you want to fill the screen with spaces, you don't print each space separately. If you did, you would need 1000 print statements. Instead, you write a one-line loop to do it. When writing *Metallix,* however, I did what programmers are never supposed to do. I wrote 1000 print statements—well, more like 200 raster comparisons and color changes.

There's a reason for this unorthodox coding. Even machine language instructions take time to execute. To have the 64 run fast enough to change colors on every raster line, I had to eliminate all unnecessary instructions.

A machine language loop chasing the raster is too slow because it must update a pointer and branch back. With 200 color changes arranged sequentially, there is no time-consuming

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looping. The program falls through to the next instruction in a straight line, and hence executes at the fastest possible speed (of course, you don't have to type in all 200 color changes, the machine language–maker program generates them for you with a loop).

METALLIX

```
DB 10 REM COPYRIGHT 1991 COMPU
      TE PUBLICATIONS INTL LTD
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EH 20 PRINT"{CLR}GENERATING ME
      TALLIX ML..."
SP 30 POKE49152,120:POKE49153,
      162:POKE49154,12:POKE491
      55,160:POKE49156,12
MA 40 X=49157
PC 50 FORT=50TO249
QS 60 POKEX,173:POKEX+1,18:POK
      EX+2,208
FC 70 POKEX+3,201:POKEX+4,T
MC 80 POKEX+5,208:POKEX+6,249
FH 90 POKEX+7,142:POKEX+8,33:P
      OKEX+9,208:T=T+1
GX 100 POKEX+10,173:POKEX+11,1
      8:POKEX+12,208
EM 110 POKEX+13,201:POKEX+14,T
CP 120 POKEX+15,208:POKEX+16,2
      49
KC 130 POKEX+17,140:POKEX+18,3
      3:POKEX+19,208:T=T+1:X=
      X+20
AJ 140 FORL=1TO6:POKEX,173:POK
      EX+1,18:POKEX+2,208
SR 150 READC:IFC=-1THENRESTORE
      :READC
XJ 160 POKEX+3,201:POKEX+4,T:P
      OKEX+5,208:POKEX+6,249
BH 170 POKEX+7,169:POKEX+8,C
BX 180 POKEX+9,141:POKEX+10,33
      :POKEX+11,208:T=T+1:X=X
      +12:NEXT
HJ 190 T=T-1:NEXT
HH 200 DATA15,1,7,10,8,2,-1
JS 210 READX:FORU=51457TO52120
      :READQ:POKEU,Q:CK=CK+Q:
      NEXT
XS 220 IFCK<>91398THENPRINT"ER
      ROR IN DATA":STOP
ME 230 PRINT"{DOWN}WRITING MET
      ALLIX.OBJ FILE TO DISK.
      ."
RC 240 SYS57812"METALLIX.OBJ",
      8,1:POKE193,0:POKE194,1
      92:POKE174,153:POKE175,
      203
PJ 250 SYS62957
DR 260 DATA76,154,201,173,134,
      203,201,1,240,56,201,2,
      240,107,173,18,208,201
JA 270 DATA251,208,249,169,6,1
      41,33,208,173,18,208,20
      1,15,208,249,173,18,208
HG 280 DATA201,14,208,249,238,
      135,203,173,135,203,201
      ,1,240,3,76,5,192,169
BS 290 DATA1,141,134,203,169,0
      ,141,135,203,76,5,192,1
      73,18,208,201,251,208
FR 300 DATA249,173,18,208,201,
      15,208,249,238,135,203,
      173,135,203,201,2,240,3
MJ 310 DATA76,5,192,169,2,141,
      134,203,169,0,141,135,2
      03,169,21,141,24,208
SF 320 DATA169,122,141,2,201,1
      69,201,141,3,201,76,5,1
      92,173,18,208,201,251
QR 330 DATA208,249,76,110,203,
      201,239,240,3,76,5,192,
      169,29,141,24,208,169
DE 340 DATA154,141,2,201,169,2
      01,76,147,203,173,134,2
      03,201,1,240,44,201,0
CM 350 DATA240,92,173,18,208,2
      01,251,208,249,173,18,2
      08,201,15,208,249,238,1
      35
HB 360 DATA203,173,135,203,201
      ,2,240,3,76,5,192,169,1
      ,141,134,203,169,0
QG 370 DATA141,135,203,76,5,19
      2,173,18,208,201,251,20
      8,249,169,6,141,33,208
BM 380 DATA173,18,208,201,15,2
      08,249,173,18,208,201,1
      4,208,249,238,135,203,1
      73
RQ 390 DATA135,203,201,1,240,3
      ,76,5,192,169,0,141,134
      ,203,169,0,141,135
BS 400 DATA203,76,5,192,169,0,
      141,33,208,88,96,162,26
      ,181,216,9,128,149
CF 410 DATA216,202,208,247,173
      ,18,208,201,12,208,249,
      32,155,183,142,32,208,1
      69
GP 420 DATA27,141,17,208,32,15
      5,183,142,33,208,142,13
      4,2,138,160,251,153,255
XM 430 DATA215,153,249,216,153
      ,243,217,153,237,218,13
      6,208,241,169,160,160,2
      51,153
PF 440 DATA255,3,153,249,4,153
      ,243,5,153,237,6,136,20
      8,241,169,18,133,199
DJ 450 DATA169,0,141,14,220,16
      9,51,133,1,162,16,160,2
      55,169,0,133,90,169
JX 460 DATA223,133,91,169,0,13
      3,88,169,63,133,89,32,2
      36,163,169,55,133,1
FG 470 DATA169,1,141,14,220,16
      2,0,189,0,48,41,170,141
      ,136,203,169,255,56
KK 480 DATA237,136,203,157,0,5
      2,189,0,49,41,170,141,1
      36,203,169,255,56,237
KC 490 DATA136,203,157,0,53,23
      2,208,219,169,29,141,24
      ,208,169,27,141,17,208
KD 500 DATA96,160,0,140,137,20
      3,32,155,183,138,172,13
      7,203,153,138,203,200,1
      92
PS 510 DATA7,208,238,169,4,141
      ,2,201,169,201,141,3,20
      1,169,173,141,129,201
HD 520 DATA169,1,141,130,201,1
      69,220,141,131,201,169,
      29,141,24,208,169,0,141
GB 530 DATA134,203,141,135,203
      ,169,5,141,145,203,169,
      1,141,48,201,141,238,20
      1
RP 540 DATA169,2,141,88,201,14
      1,186,201,169,33,133,25
      1,169,192,133,252,173,1
      38
FD 550 DATA203,141,2,192,141,4
      ,192,162,25,160,0,173,1
      39,203,145,251,200,24
SH 560 DATA165,251,105,12,133,
      251,165,252,105,0,133,2
      52,185,139,203,140,137,
      203
FF 570 DATA160,0,145,251,172,1
      37,203,200,192,6,208,22
      5,24,165,251,105,32,133
GK 580 DATA251,165,252,105,0,1
      33,252,202,208,201,169,
      44,160,0,209,122,240,3
HK 590 DATA76,0,192,169,76,141
      ,129,201,169,110,141,13
      0,201,169,203,141,131,2
      01
KA 600 DATA32,155,183,142,146,
      203,76,0,192,206,145,20
      3,240,3,76,5,192,206
KA 610 DATA146,203,240,8,169,5
      ,141,145,203,76,5,192,7
      6,139,201,0,0,0
XG 620 DATA5,11,15,1,7,10,8,2,
      0,0,141,3,201,76,5,192
```

METALLIX.DEMO

```
DB 10 REM COPYRIGHT 1991 COMPU
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HS 20 POKE53280,0:POKE53281,0:
      PRINT"{CLR}{9 DOWN}{RED}
      "TAB(9)"LOADING METALLIX
      . . . ."
GB 30 POKE147,0:SYS57812"METAL
      LIX.OBJ",8,1:SYS62631
FJ 40 FORT=8192TO8320:READX:PO
      KET,X:NEXT
GM 50 V=53248:POKEV+23,255:POK
      EV+29,0:POKEV+28,255
AP 60 FORT=V+39TOV+46:POKET,15
      :NEXT:POKEV+37,12:POKEV+
      38,11
AQ 70 X=139:FORT=VTOV+6STEP2:P
      OKET,X:X=X+24:NEXT
BH 80 X=139:FORT=V+8TOV+14STEP
      2:POKET,X:X=X+24:NEXT
QS 90 FORT=V+1TOV+7STEP2:POKET
      ,63:NEXT:FORT=V+9TOV+15S
      TEP2:POKET,105:NEXT
DJ 100 FORT=2040TO2046STEP2:PO
       KET,128:NEXT:FORT=2041T
       O2047STEP2:POKET,129:NE
       XT
SM 110 C1=11:C2=15:C3=1:C4=7:C
       5=10:C6=8:C7=2
MK 120 SYS51720,0,0:POKE53265,
       11:FORDL=1TO1000:NEXT:P
       OKEV+21,255:FORD=1TO10:
       NEXT
QX 130 POKE53265,27:PRINT"
       {HOME}{15 DOWN}"TAB(13)
       "{RVS}M E T A L L I X"
KD 140 PRINT"{2 DOWN}"
```


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PROGRAMS

```
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       PUTE PUBLICATIONS INTL
       {SPACE}LTD":GOSUB501
XP 150 A$="{RVS}ALL RIGHTS RES
       ERVED":GOSUB501
XM 160 SYS51890,C1,C2,C3,C4,C5
       ,C6,C7,20:SYS51720,0,0:
       GOSUB520
CF 170 PRINT"{HOME}"TAB(2)"
       {16 DOWN}{RVS}ADD A MET
       ALLIC LUSTER TO YOUR VI
       DEO"
HA 180 PRINTTAB(2)"{RVS}{DOWN}
       WITH THIS ELITE METAL S
       HADING EFFECT"
JB 190 SYS51890,C1,C2,C3,C4,C5
       ,C6,C7,50:SYS51720,0,0:
       GOSUB520
CG 200 PRINT"{HOME}"TAB(3)"
       {15 DOWN}{RVS}THIS NEW
       {SPACE}GRAPHICS MODE DI
       SPLAYS A"
HX 210 PRINTTAB(3)"{DOWN}{RVS}
       VERTICAL COLOR RESOLUTI
       ON OF SEVEN"
DP 220 PRINTTAB(2)"{DOWN}{RVS}
       COLORS PER CHARACTER, A
       N INDEPENDENT"
MD 230 PRINTTAB(1)"{DOWN}{RVS}
       HUE FOR EACH RASTER LIN
       E ON THE SCREEN!"
DX 240 SYS51890,C1,C2,C3,C4,C5
       ,C6,C7,50:SYS51720,0,0:
       GOSUB520
FS 250 PRINT"{HOME}"TAB(10)"
       {15 DOWN}{RVS}DONE WITH
        INNOVATIVE"
DJ 260 PRINTTAB(7)"{DOWN}{RVS}
       RASTER PROGRAMMING, THI
       S IS"
ME 270 PRINTTAB(4)"{DOWN}{RVS}
       THE BEST VERTICAL COLOR
        RESOLUTION"
PA 280 PRINTTAB(11)"{DOWN}
       {RVS}POSSIBLE ON THE 64
       "
KH 290 SYS51890,C1,C2,C3,C4,C5
       ,C6,C7,50:SYS51720,0,0:
       GOSUB520:POKEV+21,255
BQ 300 PRINT"{HOME}"TAB(8)"
       {14 DOWN}{RVS}COMPLETE
       {SPACE}WITH A VIDEO FAD
       E"
ED 310 PRINTTAB(19)"{2 DOWN}
       {RVS}AND"
QB 320 PRINTTAB(10)"{2 DOWN}
       {RVS}COMBINED WITH SPRI
       TES"
AJ 330 PRINTTAB(5)"{DOWN}{RVS}
       64 GRAPHICS NEVER LOOKE
       D SO GOOD!"
QH 340 SYS51890,C1,C2,C3,C4,C5
       ,C6,C7,50:POKEV+21,0:SY
       S51720,0,0:GOSUB520
MR 350 PRINT"{HOME}"TAB(4)"
       {DOWN}{RVS}THE COMMANDS
       "
AD 360 PRINTTAB(4)"{2 DOWN}
       {RVS}SYS 51720,BORD,BAC
       K"
ED 370 PRINTTAB(6)"{DOWN}{RVS}
       CLEARS THE SCREEN AND S
       ETS THE"
HX 380 PRINTTAB(6)"{DOWN}{RVS}
       BORDER AND BACKGROUND C
       OLORS."
JX 390 PRINTTAB(4)"{3 DOWN}
       {RVS}SYS 51890,C1,C2,C3
       ,C4,C5,C6,C7,[DUR]"
CF 400 PRINTTAB(6)"{DOWN}{RVS}
       SELECTS THE 7 CHARACTER
        COLORS."
JJ 410 PRINTTAB(6)"{DOWN}{RVS}
       THE LAST PARAMETER IS O
       PTIONAL"
PH 420 PRINTTAB(6)"{DOWN}{RVS}
       AND SELECTS THE DISPLAY
        DURATION."
DJ 430 PRINTTAB(6)"{DOWN}{RVS}
       IF OMITTED THE DISPLAY
       {SPACE}IS"
XM 440 PRINTTAB(6)"{DOWN}{RVS}
       STOPPED WITH THE SPACE
       {SPACE}BAR."
HS 450 SYS51890,C1,C2,C3,C4,C5
       ,C6,C7,50:GOSUB520
MH 460 Z=Z+1:IFZ>2THENZ=0
QA 470 IFZ=0THENC1=11:C2=15:C3
       =1:C4=7:C5=10:C6=8:C7=2
BC 480 IFZ=1THENC1=12:C2=15:C3
       =1:C4=7:C5=10:C6=8:C7=2
GE 490 IFZ=2THENC1=15:C2=1:C3=
       7:C4=10:C5=8:C6=2:C7=9
PP 500 SYS51720,0,0:POKEV+21,2
       55:GOTO130
RC 501 FOR XZ=1 TO (20-INT(LEN
       (A$)/2)):PRINT"{RVS} ";
       :NEXT:PRINTA$:RETURN
CF 510 REM DELAY SUB
DX 520 FORDL=1TO50:NEXT:RETURN
MC 530 REM SPRITE DATA
CP 540 DATA42,170,170,37,85,87
       ,37,85,87,38,170,151,38
       ,170,183,38,170,183
EH 550 DATA38,191,247,38,181,8
       7,38,181,87,38,170,87,3
       8,170,215,38,170,215
JR 560 DATA38,191,215,38,181,8
       7,38,181,87,38,170,151,
       38,170,183,38,170,183
DM 570 DATA37,255,247,37,85,87
       ,47,255,255,0,42,170,17
       0,37,85,87,37,85
JP 580 DATA87,38,170,151,38,17
       0,183,38,170,183,38,170
       ,183,38,190,183,38,182
DG 590 DATA183,38,182,183,38,1
       82,183,38,182,183,38,18
       2,183,38,182,183,38,182
MC 600 DATA183,38,182,183,38,1
       82,183,37,245,247,37,85
       ,87,37,85,87,47,255
DR 610 DATA255,42,64
```

READERSHIP SURVEY

Take a minute to tell us what you like most about Gazette. We also want to know what you don't like. We want the magazine to be as useful and interesting as possible and to provide you with the coverage you want. Please take a minute to fill out and mail us the questionnaire that appears elsewhere in this section.

ONLY ON DISK

There's something new on *Gazette Disk*. In addition to the type-in programs found in each issue of the magazine, we offer additional features and programs every month on *Gazette Disk*. Check out the original 64 and 128 artwork on display in "Gazette Gallery," and look for our bonus programs as well. These programs and their instructions appear only on disk. Here's a description of this month's bonus program.

BX BASIC

Daryl "Beaux" Knowles

BX BASIC provides VIC-type graphics functions in 80-column mode. This extension to C-128 BASIC will get both the novice and the experienced programmer doing graphics in full 640 × 200 resolution within minutes. It also comes with extra features that support structured programming techniques, programming aids, and "blitter object" commands.

One outstanding feature of *BX BASIC* is a command that lets you use virtual sprites on an 80-column screen. A simple shape command allows easy formation of simple, regular 3-D polygons on the 80-column bitmap.

Remember that you can still get a one-year's subscription to *Gazette Disk* for only $49.95. Send check or money order to Gazette Disk, COMPUTE, P.O. Box 3244, Harlan, Iowa 51593-2424.

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UP YOUR CASH FLOW 3.0

It's sad but true; many small businesses fail. According to financial experts, two principal causes of failure are insufficient capital and poor management. Careful attention to fiscal matters is essential to good management, and *Up Your Cash Flow* was created to ease this task and help you maintain the health of your small business.

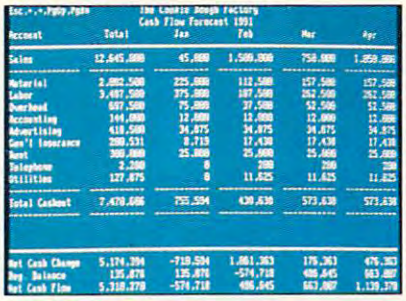
The developers of the program believe that many managers of small businesses make little or no use of computer programs for financial planning because they're confronted with formidable manuals, massive in size and difficult to use. *UYCF* is designed to avoid this barrier; it has no manual and requires no training.

Menu-driven, the program helps you, the manager of a small business, prepare a forecast of the fiscal position of your operation and analyze the results.

The opening screen, or main menu, contains 34 items, and as you scroll down the list, you see an explanation of each item. Most of the items lead you through the input of the data for your forecast. As you proceed through the menu items, you are prompted to forecast the separate components of your bookkeeping. These include such matters as your starting balances, sales, expenses, cost of goods sold, payroll, depreciation, loans/interest, proprietary draws, and taxes.

Many of the main menu items have further menus, and one of the attractive features of the program is the options it offers for level of detail of the forecast. You can make off-the-cuff estimates based upon percentage changes from last year or fixed changes. You can make an estimate of annual costs and spread them uniformly over the year or adjust by month. If you prefer, you can go into detail, and the program suggests that you consult your accountant in this option.

In the major categories of sales, cost of goods sold, and payroll, you may deal with overall costs, or you may choose to use spreadsheets for sales and costs by product line and for payroll by employee. The spreadsheets accept detail by month if you choose to provide it.



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When you've completed your forecast, you can turn to the very valuable program features offering analysis of your data. These include profit and loss, cash flow, balance sheets, and six significant ratios: the ratios of assets to liabilities, debt to equity, net income to equity, inventory turnover, accounts receivable turnover, and net income to sales. Each ratio screen carries an explanation of the significance of the ratio. Finally, you can see and print graphic presentations of sales, net income/loss, gross profit, cash flow, and sales/expenses for each month.

I found the program easy to use (even for someone with little accounting background), prompt in its execution, and illuminating in its analysis. I would fault only its lack of mouse support. A bonus item included in *UYCF* is a 170-page text that discusses the items of the forecast.

UYCF is marketed by Granville Publications, which maintains a toll-free technical support line. The personnel are most cooperative and competent. The program would be a very valuable addition to the library of any manager of a small business.

CHARLES IDOL

Ease of Use	★★★★
Documentation	★★★★
Features	★★★★
Innovation	★★★

IBM PC and compatibles, 512K RAM, DOS 2.0 or higher, hard disk—$99.95

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10960 Wilshire Blvd., Ste. 826
Los Angeles, CA 90024
(800) 873-7789
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DRAGON STRIKE

Easy to learn, fast-moving, and action intensive, *Dragon Strike* is the perfect game to pick up when you're looking for a few hours—or a few minutes—of diversion at the computer. *Dragon Strike* is a game calculated to please fans of both the fantasy and the flight-simulator genres.

Set in the climactic stages of the War of the Lance, *Dragon Strike* pits the good dragons of Krynn in a desperate counteroffensive against the evil dragon armies that have nearly subjugated the land. You play the part of a lancer, one of the elite knights that ride the good dragons into battle.

Test your mettle in 22 different missions, flying them on an individual basis or in chronological order as part of a campaign. In the latter mode, your continued success and survival bring you honors, new magical equipment, and better mounts. ▷

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Predictably, you also face more powerful foes as the campaign progresses. But the missions are cleverly crafted, and their escalating difficulty stems not only from the presence of stronger and more numerous adversaries; the situations you face also become more intricate.

With no electronic gadgetry or crowded instrument panel to worry about, piloting a dragon through the air is a very simple affair. A dragon maneuvers somewhat like a horse, albeit one able to move in the vertical, in addition to the horizontal, plane.

Combat typically takes place up close, waged with tooth and claw, sword and lance. Of course, a dragon's most deadly weapon is its breath, but even this armament loses its effectiveness at anything other than short range. Overall, though, flying a dragon into battle is not as primitive a business as it sounds. Magic replaces technology in the Dragon Lance world. If you think of your crystal ball as a kind of radar and your arrow of enemy detection as a crude weapons guidance system, you should have no trouble making the transition from the jet cockpit to the dragon saddle.

Joystick jockeys burned out on Migs and Messerschmitts should find battling Death Dragons and Draconians a whimsical and welcome departure. And dungeon-crawlers who have lost their enthusiasm for 100+-hour quests should also be satisfied with the game's fast-action thrills and rewards. *Dragon Strike* blends the first-person viewpoint and immediacy of the simulator with a sense of the exotic adventure of the fantasy game, in effect giving players the best of both worlds.

JEFF SEIKEN

Playability	★★★★
Documentation	★★★
Originality	★★★★★
Graphics	★★★

IBM PC and compatibles; 512K RAM; CGA, EGA, MCGA, VGA, and Tandy graphics; supports the Ad Lib sound board—$49.95

STRATEGIC SIMULATIONS
Distributed by Electronic Arts
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San Mateo, CA 94404
(800) 245-4525

HEADROOM 2.0

With today's RAM-hungry programs, effective memory management is essential. *HeadRoom* 2.0 from Helix Software overcomes RAM cram, letting you make the most of your computer's memory, even if the computer's an XT.

HeadRoom offers two main services. First, it copes with your collection of memory-resident (TSR) programs, swapping them to disk, extended memory, or expanded memory. When you want to use the TSR program, it pops up at the press of a hot key. *Headroom* saves your valuable memory while it prevents conflicts between these pesky but valuable programs. Second, it lets you swap up to 32 applications to disk or extra memory, returning them to the screen with a keystroke, just as they were before. You might, for example, switch back and forth between a database program and your word processor. Helix even includes a utility that lets you cut and paste text between programs.

The one-step installation program is simple. Configuration, however, is another matter. Even if you're a power user, you'll need to study the manual carefully to make *HeadRoom* do all its tricks.

Once you've mastered the configuration complexities, however, you'll love *Headroom*. Fully configured, it takes over when you boot up, loading all your favorite programs and TSR utilities. From that point on, you can use hot keys you selected when you configured *HeadRoom* to pop up a TSR or run any program.

When *HeadRoom* switches between programs, you'll find them exactly as you left them, ready for you to continue your work. If you've chosen to swap the programs to your hard disk, you can even shut off the computer and then pick up any program as it was when you quit.

If you swap your programs to extended or expanded memory, switching is almost instantaneous. Switching between programs swapped to your hard disk takes just a few seconds.

Keep in mind that each program you swap to disk uses up to 640K of hard disk space. You need to be careful when handling multiple programs with *HeadRoom* to avoid running out of disk space.

You're not limited to hot keys for switching applications. Just press the Alt-Enter key combination to pop up *HeadRoom*'s main menu. Using this menu, you can switch programs, reconfigure *HeadRoom*, change hot keys for your TSR programs, or add a new program to the current list. You can also display a clear map of your current memory usage.

The *HeadRoom* program itself takes up about 60K of your valuable RAM, but if you normally use large TSR programs like *PC Tools* or *SideKick*, swapping them out of memory with *HeadRoom* can save enough space to run even memory-hogging programs like *Ventura Publisher*.

If you use many TSR programs or need to switch quickly among multiple applications, *HeadRoom* could be the perfect solution, especially if you haven't upgraded to a 386 machine yet.

GEORGE CAMPBELL

Ease of Use	★★★
Documentation	★★★★
Features	★★★★
Innovation	★★★★

IBM PC and compatibles, 128K RAM (at least 640K+ RAM recommended for optimum performance), hard drive; supports LANs—$129.95

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FLIGHT OF THE INTRUDER

Climb into the cockpit of an F4 Phantom or an A6 Intruder and prepare to fly a series of combat missions over North Vietnam. This is *Flight of the Intruder*, a complex aerial combat simulation based on the novel of the same name by Stephen Coonts.

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❑ **Total Recall (1245)** - This program helps you quickly memorize words and information on any subject.

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❑ **Pre-Calculus (1218)** - Excellent precalc tutor. Reviews algebra and trig.

❑ **Play n' Learn (1236)** - A collection of learning games for children. CGA

❑ **KinderMath (1262)** - An excellent math tutor for children. Three levels of difficulty. Very entertaining. CGA

❑ **WordWhiz (1252)** - A challenging word game that tests your vocabulary.

❑ **Word Gallery (1256)** - Teaches kids to associate written words with objects.

❑ **Our United States (1255)** - Test your knowledge of United States trivia.

UTILITIES

❑ **Auto Menu (1409)** - A professional hard disk menu system. Run any of your programs from a customized menu.

❑ **ViruScan (1440)** - Make sure your computer is virus-free with this valuable utility. Highly recommended!

❑ **Tree View (1418)** - A superior DOS command shell with pull-down menus.

❑ **Telix (1422)** - The best telecommunications program available. HD

SPREADSHEET

❑ **On Side (1506)** - Prints your spreadsheets (or any file) sideways.

❑ **As-Easy-As (1805)** - A fantastic Lotus 1-2-3 compatible spreadsheet.

❑ **Lotus Learning Sys. (1810,1811)** A complete package that makes it easy to learn Lotus 1-2-3. (2 disks) HD

MS WINDOWS 3.0

These programs require Windows 3.0.

❑ **Almanac (1470)** - An excellent calendar/information utility.

❑ **Icons (1480)** - Customize your Windows operating environment with this collection of over 300 icons.

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❑ **Active Life (1472)** - A powerful system for managing your active business and personal life.

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❑ **Home Budget Manager (1103)** - Tracks all your household expenses and helps you set budgets and goals.

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❑ **Brother's Keeper (1120,1121)** - A great genealogy program that allows you to trace your family history. (2 disks)

❑ **Edna's Cookbook (1118,1119)** - An electronic cookbook with several great recipes - add your own! (2 disks)

❑ **Will Kit (1343)** - Create your own will valid in all 50 states.

❑ **C.A.R.S. (1126)** - Keeps a complete record of your auto expenses.

❑ **Cash Control (1127)** - Manage your bank accounts the fast and easy way with this great program. 320K

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❑ **WP 5.0/5.1 Clip Art (1875,1876)** - A large collection of clip art to add spice to your documents. (2 disks)

❑ **PC Write 3.03 (1851-1853)** - A very popular full-featured word processor. (3 disks) HD, 512K

❑ **WP 5.1 Learning System (1865-1867)** - Be a more proficient WP user. (3 disks) HD, 512K

❑ **Readability Plus (1340)** - A computerized writing style analyzer.

APPLICATIONS

❑ **Trip Planner (1331)** - A computerized road map. Computes best route. Very popular!

❑ **Melody Maker (1918)** - A fun and easy-to-use program for new or experienced music students. Comes with several songs.

❑ **PC Beat (1909)** - Turns your computer into a drum machine. A lot of fun!

❑ **Calendar Mate (1344)** - A full-featured program designed to create personalized calendars.

❑ **Lotto! (1313)** - Win the lottery with the help of your computer!

❑ **By the Numbers (1342)** - Provides you with a complete numerological interpretation. HD, 340K

❑ **Stress Management (1334)** - Learn how to assess and regulate your stress.

GRAPHICS

❑ **PrintShop Graphics (1503)** - A large collection of PrintShop clip art.

❑ **Picture Label (1501)** - An excellent label printing program that uses PrintMaster or PrintShop graphics.

❑ **Banner Maker (1502)** - Prints banners in various sizes, styles, and fonts.

❑ **PC Art (1509)** - Color painting & drawing program. CGA

GAMES

❑ **Scrabble (1957)** - Test your word power with this always fun game. CGA

❑ **Double Blocks (1970)** - A TERRIFIC Tetris clone for 1 or 2 players. Records top scores. You will love this!!

❑ **Super Pinball (1941)** - Great sound and action in 5 different games. CGA

❑ **Video Poker/Ultima 21 (1945)** - The BEST poker and blackjack games!

❑ **Kingdom of Kroz (1952)** - An excellent award-winning adventure game.

❑ **Miramar Flight Simulator (1967)** - You are in control of all the speed and fire-power an F-18 has to offer! (will not work with Tandys) CGA

❑ **Pharaoh's Tomb (1974)** - Face monsters and traps as you explore the pyramid. Your goal is to survive.

❑ **SUPER Arcade I (1906)** - A collection of famous arcade hits like Q-Bert, Centipede, Pango, and more. CGA

❑ **SUPER Arcade II (1902)** - More arcade favorites! This disk contains clones of Jump Man, Frogger, and more! CGA

❑ **Insanity (1936)** - Find your way out of this maze before going insane! CGA

VGA GAMES

❑ **Shooting Gallery (1990)** - Seven variations of a shooting range on your computer screen. VGA, mouse

❑ **VGA Sharks (1992)** - Recover lost treasure in shark infested waters in this action arcade game. VGA

❑ **Beyond Tetris/Joust (1997)** - Beyond is like Tetris with a twist. Joust is a VGA rendition of the classic. VGA

EGA GAMES

❑ **Bass Tour (1925)** - An amazing game with excellent graphics. Fish in your choice of lakes. Very realistic. EGA

❑ **EGA Coloring Book (1963)** - A graphically beautiful and easy-to-use coloring program that kids love! EGA

❑ **Frac (1991)** - A three-dimensional Tetris-like game. Challenging! EGA

❑ **EGA Golf (1929)** - A challenging golf game with beautiful graphics. EGA

❑ **Poker Slot (1989)** - Plays just like the video poker machines you see in casinos. Great graphics! EGA, mouse

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Intruder cockpits, a route map similar to the ones pilots actually carried on their knees while flying in missions over Vietnam, and a hefty player's manual. This thorough volume includes an index and a glossary, as well as two tutorials that guide you through your first Phantom and Intruder missions. For those of you who would rather act as CAG (Commander Air Group), there's a section describing how to plan and create your own missions from scratch.

Animation in Spectrum Holobyte's *Flight of the Intruder* is smooth and quick.

Flight of the Intruder isn't the type of simulation you can boot up and play with only a quick glance at the player's manual. Only by reading through all of this material carefully at least once (preferably twice) will you be able to successfully complete any of the missions.

Another factor that makes *Intruder* particularly difficult to master is the relatively complicated keyboard command layout used to control the weapon and navigation systems of the Phantom and Intruder. Of the 101 keys on a standard AT keyboard, only 16 serve no function at all, while many of the others serve multiple functions when combined with Ctrl, Alt, or Shift.

One of *Intruder*'s strong points is its authentic missions. During each mission, you're simply doing your part in a much larger operation, and as the mission unfolds, radio communication with other sections lets you know how the operation is progressing. For example, to wage a massive attack on Hanoi, you must complete two operations—Iron Rain I and Iron Rain II. Each operation comprises four separate missions, allowing you to serve as air cover or escort in a Phantom or to take an Intruder in on a specific strike mission.

Graphically, the VGA version of *Flight of the Intruder* isn't as impressive as you might expect because only 16 colors are used rather than 256. However, the detailed instrument panels of both planes are quite impressive, and in the F4 you actually have to change your view to see all of the instruments. Throughout the game, the animation is particularly smooth and quick.

Players who like uncomplicated simulations that you can simply boot and play or those who like to see a lot of pretty scenery from the cockpit window should definitely skip *Flight of the Intruder*. On the other hand, serious gamers willing to spend a little more time in flight school should give *Intruder* a shot, particularly because it covers a major period in U.S. military history that has been largely overlooked by other simulations.

BOB GUERRA

Playability	★★★
Documentation	★★★
Originality	★★★★
Graphics	★★★
Sound	★★

IBM PC and compatibles; 640K; CGA, EGA, VGA, or Hercules; supports Ad Lib sound board; joystick or mouse optional—$59.95

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Amiga

POWERMONGER

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The creators of *Populous* have outdone themselves with their latest release, *PowerMonger*. While it may seem that going from being a god to being a king without a kingdom is a demotion, *PowerMonger* is a much richer game than its predecessor. With over 20 different commands within your reach and hundreds of lands to conquer, *PowerMonger* will keep you coming back for more.

You start the game with only a castle and 20 followers to your name. From this meager beginning you must gain power and develop skills to eventually conquer the 195 territories that make up the continent.

With your army in tow, you approach the first town. You can take a passive, neutral, or aggressive stance as you enter the village. Attack isn't the only option—you can also try to establish an alliance or trade with the locals. However, since the inhabitants of this first island are weak and no real challenge to a conqueror of your skill, you attack. You could be aggressive, but slaughtering the entire population would be a waste of valuable resources—better to subjugate the populace. You take a passive stance instead and take control through intimidation, saving swordplay for later. Changing to a neutral stance, you recruit half of the town's residents into your army. You command the others to invent new weapons. Meanwhile, you and your now larger army go off hunting for food—winter is approaching, and if you don't stock up now, hungry soldiers will desert you when food gets scarce. After slaughtering a herd of sheep for food, you come back to the town to find that the villagers have carved an armory full of bows and arrows for your use. With your stock of food and new weapons, you quickly defeat the other village on the island. You reign supreme.

Of course, what great conqueror has ever been satisfied with a single triumph? You move on to extend your empire. As you do, you find that not only do the lands get bigger, but the villagers also get much more resistant to conquest. Not only that, but it also seems you're not the only one with global conquest on your mind—there are other armies roving around the lands you must bring under your reign, trying to capture the same territories. The world won't be conquered in a day.

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challenge. While sheer brute force will work early on in the game, in later scenarios you'll need to stop and plan out a detailed strategy or your army will be quickly overwhelmed. You have to plan your attacks, balance your resources, invent weapons, and recruit both soldiers and captains.

Conquer the world in *PowerMonger*.

PowerMonger is played on a 3-D angled board similar to that found in *Populous*. However, this board is much more detailed, and the variety of structures, characters, and items you'll find is increased tenfold. The landscape is populated with peasants, soldiers, villages, sheep, trees, iron mines, lakes, roads, and more. All of these play important roles in the game: Sheep are useful for food, trees and mines are necessary for creating inventions such as boats and swords, and roads speed travel. You can get detailed information about anything in the game world by clicking the Question icon and then the object—you even find out the names, ages, and occupations of individual peasants. The world can be viewed from any angle, and you can zoom in and out on it.

As you conquer lands, you can also win enemy leaders over to your side. Use them as spies, or have them recruit armies of their own and use them to conquer multiple cities simultaneously. Be careful to plan ahead, though—your commands are transmitted to your captains using carrier pigeons, and if you change your mind, you commands may not reach your subordinates in time. When you've defeated a territory, you can move onto any adjacent land on the main map. However, when you move on, you must leave your new recruits, captains, and supplies behind. You have to start out fresh with only basic weapons and a few soldiers.

Graphics are a step up from *Populous,* with better color, more detail, and faster screen updates. The number of sounds that Bullfrog managed to cram on a single disk is nothing short of amazing; sheep bleat, birds' wings rustle, and captains respond to commands with yeahs of varying enthusiasm.

PowerMonger is a program with few flaws. Perhaps my biggest complaint about the game is that you must start over with a small army and none of your possessions after each conquest. While this keeps the game from getting out of hand, it would be fun to play the game on an imperial scale, where you would mass giant armies and take on larger and more powerful opponents. Also, the program uses a custom disk format that can't be duplicated without a commercial disk copier program, and it also requires you to look up a number in the manual each time you boot. The two-tiered copy protection is doubly inconvenient.

If you enjoy strategy games, *PowerMonger* is a must-buy. It incorporates the best elements of war games with a simple but powerful user interface. The lands become increasingly hard to conquer, but casual players can always stick to the easier sections of the map. Die-hard war gamers who defeat all the computer-controlled levels can try the two-player modem option that, while a bit quirky, lets you take on both computer-controlled armies and a devious human opponent simultaneously, the ultimate challenge.

Far more than a rehash of *Populous, PowerMonger* is the war game for the masses. If you buy one game for your Amiga this year, buy *PowerMonger.*

DENNY ATKIN

Playability	★★★★★
Documentation	★★★
Originality	★★★★
Graphics	★★★★★
Sound	★★★★★

Amiga—$49.95

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POCOMAN

If you're ready for a game that's completely different from the usual heavily protected, impossibly hard games that have no sense of humor, try *PocoMan.* It's a delightful departure from the moronic, the too easy, and the impossible. *PocoMan* doesn't force you to reboot, it isn't copy protected, it's both a snap to learn and incredibly challenging, and it works with accelerator cards.

The concept of *PocoMan* is simple: He's a little guy who is trapped in a land of mazes. He's cute and quick, but, unfortunately, he's not very smart. You have to help him navigate these mazes, pushing objects into a corral. Only when he's saved every treasure in a maze can he escape to the next level, and there are 50 levels, each one more confounding than the one below it.

"OK, big deal, this is easy," you say to yourself as you look at the first maze. But there's more to this than you first thought. Little *PocoMan* has a bad back, so he can only push objects, not pull them, and he can only push one at a time. If an object gets wedged into a corner or up against a wall where he can't get behind it to push on it, you're both stuck, and you have to start that level over again. Each new level looks impossible, but it really isn't—every level can be solved if you stick with it. *PocoMan* forces you to think logically and think ahead.

If you pause for a while, *PocoMan* might look bored and tap his toes. Sometimes he dons a pair of shades and clenches his fist while his cape blows in the breeze, trying to play the superhero he isn't.

You don't get to see the next level until you've finished the current maze. Your highest level is saved to disk with your name, so many people can play from the same game disk (although each person's high-level save is not password protected—the ONLY flaw I found with the game).

The programmers have made *PocoMan* a joy. It installs easily on a hard drive and multitasks. The graphics are enchanting, as are the speech and sound effects. A press of the Help key brings up a list of keystroke alternatives. You can play *PocoMan* with

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your cursor keys (the best way), mouse, or joystick. Documentation is brief but thorough. There's no level editor, and you can't create your own mazes.

PocoMan is for those of you who spent endless hours furrowing your brow and scrunching up your face in frustration when you first got your hands on a Rubik's Cube. This game will eat up unimaginable amounts of your time.

HARV LASER

Playability:	★★★★★
Documentation:	★★★★
Originality:	★★★★★
Graphics:	★★★★
Sound:	★★★★

Amiga—$39.95

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CHAMPIONS OF KRYNN

Isn't there a saying about the third time being a charm? It's true with *Champions of Krynn,* the third Advanced Dungeons & Dragons epic from SSI.

The first two games in the series took place in the world of Forgotten Realms, and although they were solid games, the combat was difficult and the games took too long. Eventually, I became bored with these games and played only for a little while at one sitting. *Champions of Krynn,* the latest role-playing epic in the series, has a lot more to offer than the first two, and it keeps the interest level up.▷

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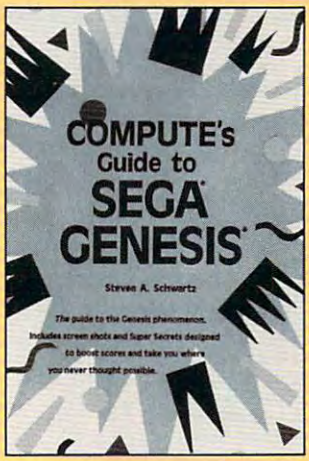

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REVIEWS

First, the amount of combat is greatly reduced in *Champions of Krynn*. Instead of having to fight dozens or hundreds of monsters, you may only have to fight a handful at a time. You confront a variety of enemies in *Champions,* but not at every turn. If you like, you can let the computer handle combat for your characters, but I wouldn't recommend it except in the game's early stages when doing battle with weak monsters.

The other major change introduced in *Champions* concerns mages. Each mage must declare loyalty to a god and receives certain powers as a result of that pledge. Also, a mage's abilities are enhanced depending on the phase of the moon that reflects his or her alignment. There are three moons (white for good, red for neutral, and black for evil) that go through phases along the top of the screen. In some cases, it's worth waiting a few game hours to cast certain spells or perform certain activities.

Champions of Krynn introduces the Kender race and the Solamnic Knight class to gamers. Kenders like to taunt enemies into a frenzy, reducing their ability to injure members of your party. Solamnic Knights are chivalrous and dedicated to their order. There are three orders of Solamnic Knights: Knights of the Crown, Knights of the Sword, and Knights of the Rose.

Your goal in *Champions of Krynn* is to discover the source of evil in Northeast Ansalon and suppress it. The

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game takes place after the War of the Lance in the Dragon Lance game world. You'll come across some of the characters from the Dragon Lance novels in the game, and they'll help you in your quest as nonplaying characters in your party.

As usual, SSI has done an excellent job with the packaging and the instructions. The manuals are well organized, clearly written, and exhaustive in describing the game's options. You get an Adventurer's Journal that includes race and class descriptions, spell tables, journal entries, and bar stories that you must refer to during the game to further develop the plot. A rule booklet explains the options, and a data card gets you started. SSI even threw in a poster of the excellent cover art.

The graphics in *Champions* are very good. Animation and 3-D views spice up the screen and keep your eyes entertained. There are actually four views in *Champions:* combat (an oblique or slanted perspective), outdoor (an overhead perspective), area (an indoor slanted perspective) and 3-D. All of the graphics are colorful and clean, making full use once again of the 64's capabilities.

You'll have no trouble picking up the game system. It's almost entirely joystick-controlled and consists of selecting options from vertical and horizontal menus and lists.

Champions is big enough to keep you occupied for months, but the problems are linear in nature—so you don't need to buy the clue book unless you're really stuck or you hate drawing maps. My hope for the AD & D series is that SSI continues what it has established with *Champions of Krynn.* This is the game SSI really set out to create from the start.

RUSS CECCOLA

Playability	★★★★
Documentation	★★★★
Originality	★★★
Graphics/Sound	★★★

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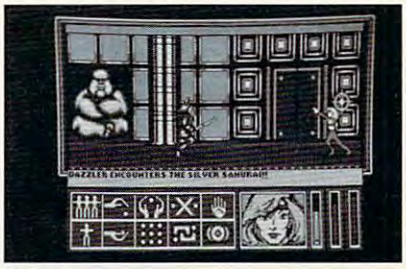
X-MEN: MADNESS IN MURDERWORLD

One of the most popular titles in the Marvel Comics lineup is *X-Men.* It was only a matter of time before these mighty mutants made their way from the comic pages to home computers. It is only fitting that Paragon Software, the publisher of Amazing Spider Man and Captain America in *Dr. Doom's Revenge,* put together a title revolving around the popular characters. And what a great game it is!



Help the mighty X-Men mutants battle the evil Magneto and Arcade.

In *X-Men: Madness in Murderworld,* you control a group of the more popular X-Men in Marvel Comics' history. X-Men are mutant superbeings who possess different powers. They were discovered by Professor Charles Xavier, a mutant himself who has taken up the job of teaching the X-Men how to use their powers for the good of mankind. In this scenario, Xavier has been captured by the evil Magneto and another dastardly criminal named Arcade. Arcade designed a dangerous amusement park called Murderworld, where the Professor is being held captive. It is up to you to help the team of six X-Men find and defeat the various villains in the Murderworld complex and save the professor.

You control the X-Men with a joystick and select their actions, other than fighting and moving, with a set of icons found at the bottom of the screen. The rest of the screen is taken up with a side view of the currently active mutant in a particular location. The icons are Status, Change to a different mutant, Drop object, Take object, Inventory, Micro-cerebro (check for nearby evil mutants), Use object, and Use special mutant power.

The game is easy to control but really taxes your exploratory skills. There are over 100 rooms in the game, and many possible paths will lead you to success. The X-Men in the game are Nightcrawler, Storm, Cyclops, Colossus, Dazzler, and the most popular mutant, Wolverine.

There are simple puzzles in *X-Men* that mostly involve using the right object in the right location. Other puzzles require the special power of one of the X-Men. For example, to get through bars, you can become Colossus or Wolverine and use their special power, strength, and adamantine claws, respectively. The best part of the game is being able to assume the role of one of the X-Men. I'm told that in the next Paragon title featuring the X-Men, you'll be able to form a team using any of the many X-Men of past and present. What a game that should be!

X-Men should easily satisfy the many comic book fans who have computers. One problem that should have been corrected is how quickly your power goes down when you're fighting an evil mutant or other creature. There are potions in the game that will restore power, but there are not enough of them throughout the different levels of Murderworld. Other than that, I recommend *X-Men* without hesitation. Now if I could only get to use some of those powers in the real world!

RUSS CECCOLA

Playability:	★★★★
Documentation:	★★★★
Originality:	★★★★
Graphics:	★★★

Commodore 64 or 128; joystick—$34.95

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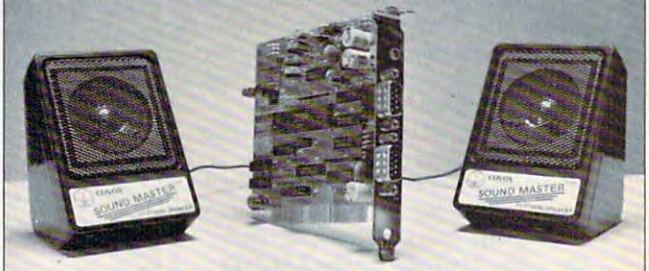

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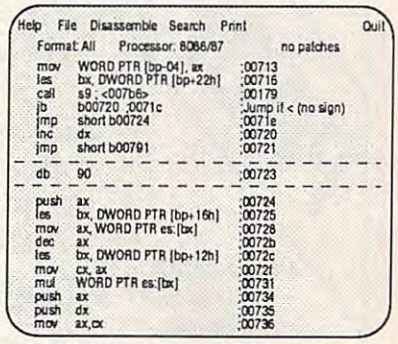

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HOTWARE

SOFTWARE BESTSELLERS FROM AROUND THE COUNTRY

HOME PRODUCTIVITY

1. Quicken 4.0
Manage your finances.
Intuit
IBM

2. The New Print Shop
Make signs, cards, banners, and more.
Brøderbund
Apple II, Apple IIgs, Commodore 64/128, IBM, Macintosh

3. The New Print Shop Companion
Expand your *Print Shop* graphics collection.
Brøderbund
IBM

4. Quicken 1.5
Manage your finances on the Mac.
Intuit
Macintosh

5. Express Publisher
Powerful desktop publishing at an affordable price.
Power Up
IBM

6. Managing Your Money
Allocate your income.
MECA
Apple II, IBM, Macintosh

7. Calendar Creator Plus
Create many different calendars.
Power Up
IBM, Macintosh

8. My Advanced Mail List
Track your friends and clients.
My Software
IBM, Macintosh

9. Microsoft Works
All-in-one productivity.
Microsoft
IBM

10. Address Book Plus
Keep track of your addresses.
Power Up
IBM, Macintosh

HOME ENTERTAINMENT

1. Entertainment Pack for Windows
Open new windows on fun.
Microsoft
IBM

2. SimCity
Run the world's first simulated city.
Maxis
Amiga, Commodore 64/128, IBM, Macintosh

3. ChessMaster 2100
Board strategy that isn't boring.
Electronic Arts
Apple II, Apple IIgs, Commodore 64/128, IBM

4. Wings of Fury
Fly a World War II Hellcat fighter.
Brøderbund
Amiga, Apple II, Commodore 64/128, IBM, Macintosh

5. Wing Commander
Take off for interstellar combat action.
Origin IBM

6. Flight Simulator
Head for the wild blue yonder.
Microsoft
IBM, Macintosh

7. Flight Simulator Aircraft & Scenery Designer
Design your own plane.
Microsoft
IBM

8. Stellar 7
Classic arcade action brought into the 1990s.
Sierra On-Line
IBM

9. Command HQ
The balance of power is in your hands.
MicroProse
IBM

10. Test Drive III
Pass even the fastest cars.
Accolade
IBM

HOME LEARNING

1. Mavis Beacon Teaches Typing
Learn to touch-type.
Electronic Arts
Apple II, Apple IIgs, Commodore 64/128, IBM, Macintosh

2. The Playroom
Kids explore and learn on their own.
Brøderbund
IBM

3. Where in Time Is Carmen Sandiego?
Can you find Carmen in time?
Brøderbund
IBM

4. Where in the USA Is Carmen Sandiego?
The chase moves to the USA.
Brøderbund
Amiga, Apple II, Commodore 64/128, IBM, Macintosh

5. Reader Rabbit
Helps children learn to read.
The Learning Company
Apple II, Commodore 64/128, IBM, Macintosh

6. New Math Blaster Plus!
Teaches basic math concepts.
Davidson & Associates
Apple II, Apple IIgs, IBM

7. The Children's Writing & Publishing Center
Desktop publishing for kids.
The Learning Company
Apple II, IBM, Macintosh

8. Donald's Alphabet Chase
ABC's around the corner.
Disney
Apple II, Commodore 64, IBM

9. Math Rabbit
Build early math skills.
The Learning Company
Apple II, Commodore 64/128, IBM, Macintosh

10. Outnumbered!
Super Solvers is back.
The Learning Company
IBM

COMPUTE's Hotware lists were prepared by Egghead Discount Software and are based on retail sales of Apple II, IBM, and Macintosh software from September 15 through October 13, 1990, at 188 Egghead stores in the United States and Canada.

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Ad Lib Sound. Listen, and you'll never see your games the same way again.

SCR-E-E-E-CCH!! Your wheels lock up and squeal as you fly into the hairpin turn.

BA-BOOM... BA-BOOM! You bob and weave furiously to avoid the deafening and deadly anti-aircraft guns.

TA DA-DA DAAA! And that black hole seems a whole lot darker with this music playing.

What?! You mean your games don't sound anything like this? Then listen up, because you need the Ad Lib Card. It's the digital synthesizer card that makes your games come alive!

Check this out. Ad Lib brings room-filling music and a huge range of digitized and synthesized sound effects right to your favorite PC games.

No more beeps and buzzes—the Ad Lib Sound is rich and full.

In fact Ad Lib sounds *so* awesome, it's become the industry standard for PC games. Today's top publishers are creating fantastic new games using Ad Lib Sound right now. But accept no substitutes—because when it comes to sounding great and working with the hottest games, no one can touch Ad Lib.

Look for ads and games that have the "Ad Lib Sound" sticker or logo at your software dealer. Or call us for the ever-growing list of games with spectacular Ad Lib Sound at 1-800-463-2686.

Add the missing dimension to your games with the Ad Lib Card. Then get ready to open your ears, and blow your mind.

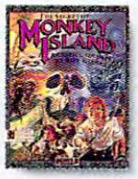
Ad Lib®

Ad Lib Inc., 50 Staniford Street, Suite 800, Boston, MA 02114. ***1-800-463-2686*** in U.S. or Canada. ***1-418-529-9676*** International. Fax: ***1-418-529-1159***.

New Games with Ad Lib Sound.

Here are just some of today's hottest games that use the Ad Lib Card:

LIVE Studios'® FUTURE CLASSICS® COLLECTION



Lucasfilm's The Secret of Monkey Island

Electronic Arts' Stormovik: Soviet Attack Fighter SU-25

Virgin Mastertronic's SPOT™

MicroProse's Lightspeed

DigiTek's DINOWARS

System Requirements: IBM® PC, XT, AT, 386, 486 or compatible with 256K RAM, DOS 2.0 or higher, CGA, EGA, VGA or MGA, and headset or external speaker.

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Circle Reader Service Number 214

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"I can't say how much it hit me to be sitting up there, a couple of miles high, looking down on the battlefield, in fact, on four or five battlefields, and sweeping them all in one glorious bird's-eye view."

World War I Pilot

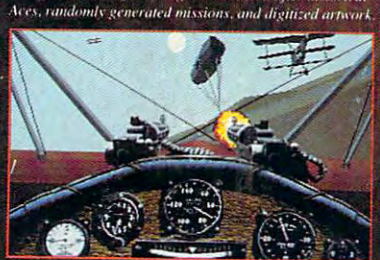
Red Baron™

It goes without saying that a good flight simulator recreates, in perfect detail, the elements that make an aircraft what it is — elements such as flight characteristics, weaponry, and the ability to sustain damage. To do less would be an affront to simulation purists everywhere.

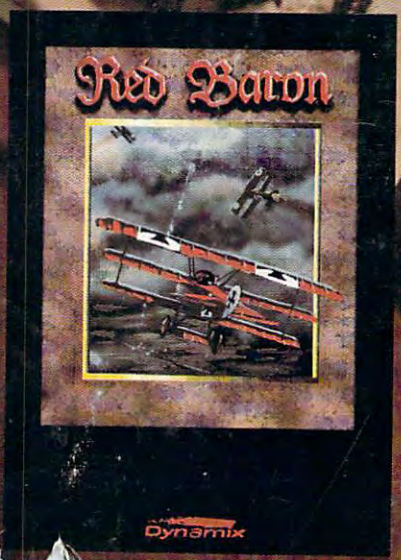
Red Baron **takes the experience one step further by recreating not only the obvious details, but the *flavor* of the time. The humanity, the romance, the emotion that once filled the hearts of *"those daring young men in their flying machines."* It takes you backward in time to an age when aviation was in its infancy, and young pilots such as Eddie Rickenbacker, Billy Bishop and Manfred von Richthofen took to the air and invented the skills that would keep them alive. A time when fighter pilots of all nations formed a brotherhood that transcended allegiance. These men were the last true heroes — the legendary Aces.**

Red Baron **is more than a good flight simulator. It's an opportunity for you to discover what it was *really* like to be a fighting Ace in the war that launched aerial combat — World War I.**

28 different aircraft, intelligence modeled after historical Aces, randomly generated missions, and digitized artwork.



Fly on either side of the war. Save, replay and change your games with the Mission Recorder.



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