

Free EDTASM: How to Get It for Your Model 4

August 1984  
USA \$3.50

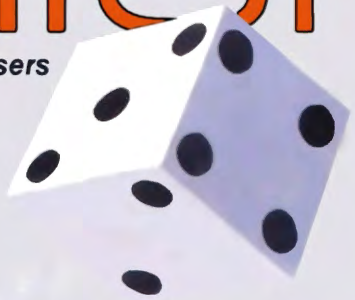
# 80micro

A CWC/I PUBLICATION

the magazine for TRS-80\* users

80micro

8/84



# GAMES



**Arcade  
And Adventure:  
80 Micro Chooses  
Gems from Its Vaults**

**Also:  
Inside CP/M+  
Basic for Beginners  
Introducing 2000 Plus**

#55



*John P. ...*

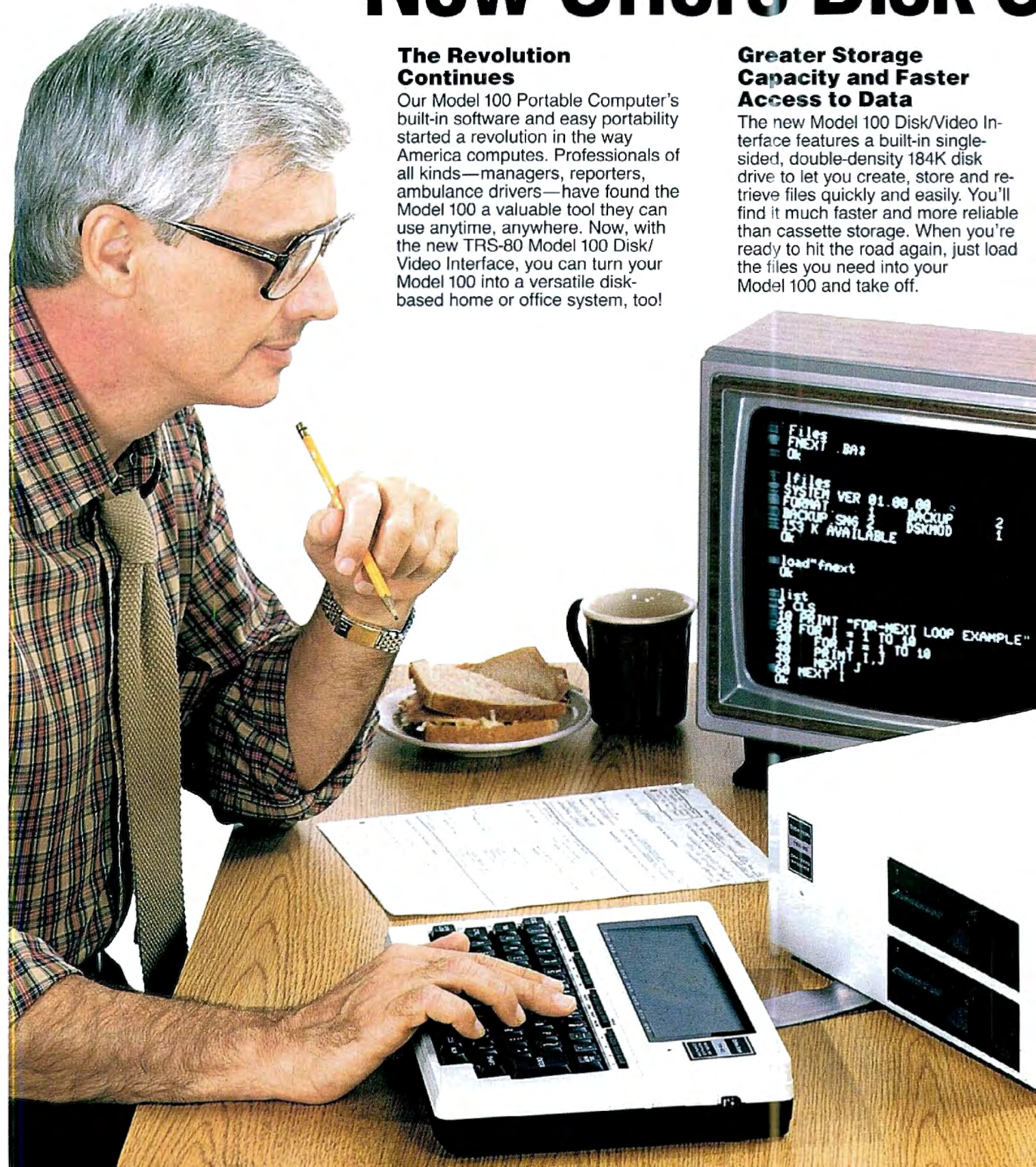
# Radio Shack's TRS-80 Now Offers Disk S

## The Revolution Continues

Our Model 100 Portable Computer's built-in software and easy portability started a revolution in the way America computes. Professionals of all kinds—managers, reporters, ambulance drivers—have found the Model 100 a valuable tool they can use anytime, anywhere. Now, with the new TRS-80 Model 100 Disk/Video Interface, you can turn your Model 100 into a versatile disk-based home or office system, too!

## Greater Storage Capacity and Faster Access to Data

The new Model 100 Disk/Video Interface features a built-in single-sided, double-density 184K disk drive to let you create, store and retrieve files quickly and easily. You'll find it much faster and more reliable than cassette storage. When you're ready to hit the road again, just load the files you need into your Model 100 and take off.



# Model 100 Computer storage and Video!

## Attaches Easily to Any Television

The Disk/Video Interface also lets you enjoy a big 40-character by 25-line screen display on any TV. The larger screen is perfect for writing notes and reports or developing your own programs in BASIC. When accessing data by phone, you can read a full 25 lines of information without scrolling. And you can utilize all of Model 100's graphics characters.

## No Computer Wizardry Required

It couldn't be easier to use. Just plug the Disk/Video Interface into an AC outlet, connect your TV and a Model 100 with a minimum of 16K—all cables are included. One simple command switches all the output to the video screen. There's no new operating system to learn, either—the command structure is exactly the same.

## Easily Expandable

You can add a second 184K disk drive (#26-3807, \$239.95\*) to the Disk/Video Interface for even more versatility. Best of all, the Disk/Video Interface doesn't use any of Model 100's standard connectors, so you can add a printer, bar code reader, RS-232C communications device or cassette recorder. You can make your Model 100 a high-performance desktop system.



## Get Down to Business With an 80-Column Display

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The Disk/Video Interface can turn your Model 100 into a professional desktop system for the office, too. With any standard video monitor, you get a large 80-character by 25-line display that's equal to other desktop computers. You'll also get the rapid access to files and storage reliability that are so necessary in today's business world.

### Perfect "Second System"

A disk-based Model 100 system is an economical alternative to a second office computer. And you'll still have the advantage of portability when you need it.

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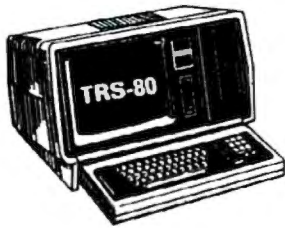
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a low-miles MGB convertible!

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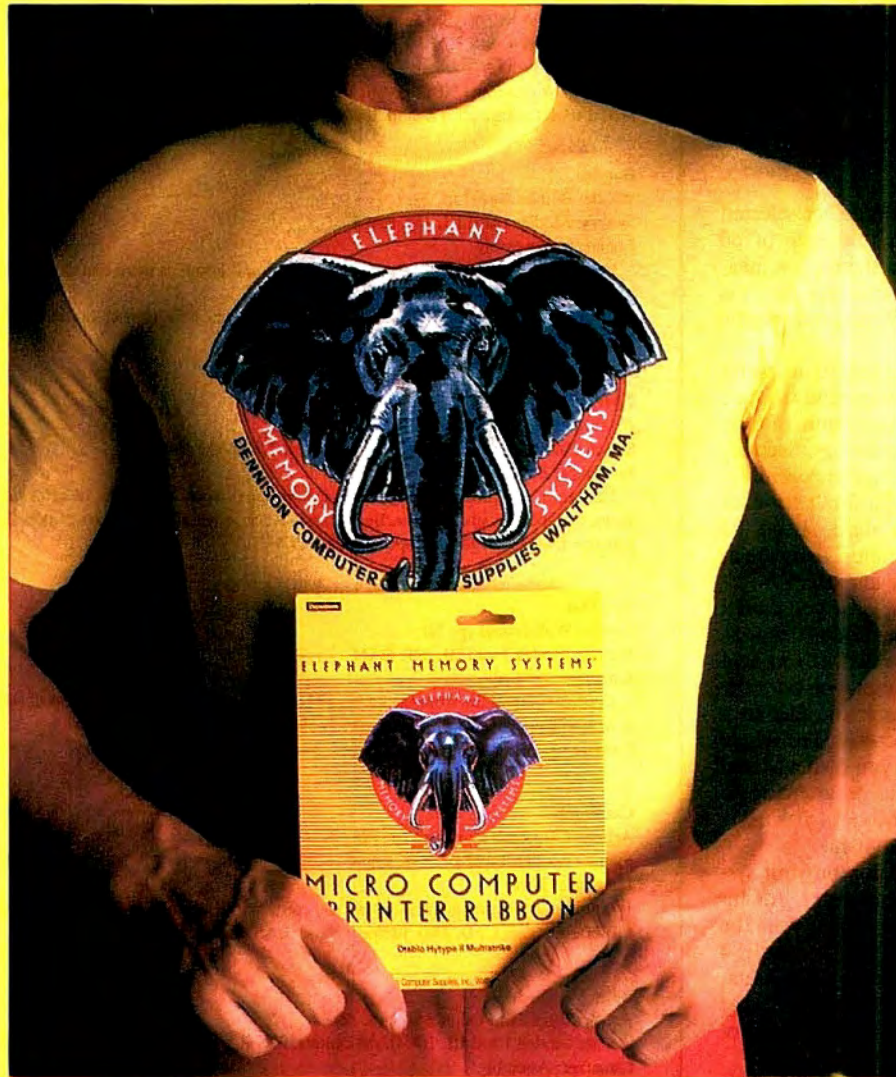
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80 formats its program listings to run 64-characters wide, the way they look on your video screen. This accounts for the occasional wrap-around you will notice in our program listings. Don't let it throw you, particularly when entering assembly listings.

Article submissions from our readers are welcomed and encouraged. Inquiries should be addressed to: Submissions Editor, 80 Pine Street, Peterborough, NH 03458. Include an SASE for a copy of "How to Write for 80 Micro." Payment for accepted articles is made at a rate of approximately \$50 per printed page; all rights are purchased. Authors of reviews should contact the Review Editor, 80 Pine Street, Peterborough, NH 03458.

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# LOAD 80

**L**oad 80 gathers together selected programs from this issue of *80 Micro* and puts them on a magnetic medium for your convenience. It is available on tape or disk, and runs on the Models I, III, and 4.

Load 80 can be useful to you in several ways. First, all programs are ready to run, and can therefore save you hours of time typing in and debugging listings. Second, Load 80 will give you access to Assembly-language programs if you don't have an editor/assembler. And third, Load 80 can let you build a substantial software library for later reference and use.

Using Load 80 is simple. If you own a tape system, you load the Load 80 tape as per the instructions provided. If you own a Model I or III disk system, you boot the Load 80 disk and transfer the files to a TRSDOS system disk according to simple on-screen directions. If you own a Model 4, you must convert the programs from Model III TRSDOS to Model 4 disk using the Model 4 CONV command.

Not all programs will run on your system. Some Model III programs, for instance, will run on the Model 4 in the Model III mode, but not in the Model 4 mode. You should check the keybox that accompanies the article to find out what system configuration individual programs require.

Space permitting, we try to provide both the object and the source code for Assembly-language programs. The source code will let you examine and modify the program if you own an editor/assembler; the object code will let you run the program directly from your TRSDOS disk.

This page contains a list of this month's Load 80 programs. If you have any questions about them, call Keith Johnson at 603-924-9471.

Yearly subscriptions to Load 80 are \$199.97 for disk, or \$99.97 for cassette. Individual loaders are available on disk for \$21.97 or on cassette for \$11.47, including postage. Direct subscription problems or orders for Load 80 to Lori Eaton, c/o *80 Micro*, 80 Pine St., Peterborough, NH 03458.

## Directory

### EDITOR4

Article: Model 4 EDTASM for Free (p. 42)

System: Model 4, 64K RAM

Language: Assembly

Modify your Model III programs so they'll run in Model 4 mode. This program works on most Model III software and is a modification of Radio Shack's EDTASM.

### Bomber

Article: Bombs Away! (p. 74)

System: Models I and III, 16K RAM

Language: Assembly

Fly a plane or helicopter over enemy territory and bomb as many buildings, bridges, and oil supplies as you can while you dodge enemy missiles.

Disk filespec: Bomber/SRC (source code), Bomber/CMD (object code). Source code requires EDTASM.

### XMART

Article: Attention Shoppers! (p. 75)

System: Models I and III, 16K RAM cassette, 32K RAM disk

Language: Basic

Find your way through a labyrinthine department store, obtain the 12 items on your list, pay for them, and exit the store to win. But be careful not to get arrested or get caught shoplifting!

Cassette filespec: B. Disk filespec: XMART/BAS.

### Noc Out

Article: Wall Games (p. 76)

System: Models I and III, 32K RAM

Language: Assembly

Control two paddles from the keyboard to knock all the bricks out of the wall with a bouncing ball. A new wall appears after you completely clear all bricks from the first one.

Cassette filespec: Nocout. Disk filespec: Nocout/CMD.

### Catacomb

Article: Catacomb Conquest (p. 78)

System: Models I and III, 32K RAM

Language: Basic

Graphics adventure game in which you recover stolen treasures from the evil wizard, Medcres.

Cassette filespec: C, D. Disk filespec: Maze/BAS, Catacomb/BAS.

### Bugs

Article: Bugs from Outer Space (p. 88)

System: Models I and III, 16K RAM cassette, 32K RAM disk

Language: Assembly

The final installment of this six-part arcade game creates a scoreboard and clears up some minor problems that you might have encountered.

Cassette filespec: Text6A, Text6B, Text6C, and Text6D (all source code). Disk filespec: Text6A/SRC, Text6B/SRC, Text6C/SRC, and Text6D/SRC (all source code). Requires EDTASM.

### Sales

Article: For Sales (p. 142)

System: Models I and III, 16K RAM cassette, 32K RAM disk

Language: Basic

Produce a neatly formatted sales report, along with an illustration bar graph.

Cassette filespec: E. Disk filespec: Sales/BAS.

### BBS Express Receiver

Article: BBS Express (p. 149)

System: Models I and III, 48K RAM. cassette or disk

Language: Assembly

Build the receiver module for your BBS Express bulletin board system in the third installment of this series. Cassette filespec: LIST2A (source code). Disk filespec: LIST2A/SRC (source code). Requires EDTASM.



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# Review Policy: Information with Integrity

A computer magazine's worth is related directly to the credibility of its product reviews. Readers want objective and accurate information. The quickest way to lose a reader's respect is to publish a glowing review of a product that the reader knows from experience is junk.

We've always prided ourselves on being an independent magazine. We feel we have for the most part provided accurate product evaluations, giving praise when deserved and criticism when necessary.

It hasn't always been easy, and we've made mistakes. The microcomputing industry is unique in a number of ways, and we must take extra precautions to make sure we're getting fair evaluations from our reviewers.

What are some of the problems we face? First, the microcomputer community is small and intimate. Everyone knows everyone else. Some authors find it difficult to criticize a product when they're friendly with the manufacturer. Others will agree to write a glowing review of a friend's product to help the friend out.

Also, because magazine authors may be software authors as well, they will approach a package as a programmer rather than as a consumer. They sympathize with the problems a fellow programmer might have encountered in writing a package, and are hesitant to cast stones.

Third, the microcomputer industry is fiercely competitive. Many entrepreneurs are scrambling to stay alive. Some will resort to questionable practices to gain an edge over their competition. They'll commission a friend to submit a positive review to a magazine, hoping the magazine won't discover the connection. They'll give reviewers superlative after-sale support that regular customers won't receive. They'll give them products that aren't yet available to the public, in hopes that advance sales will finance their



development and promotion. And they'll threaten to pull their advertising if we don't review a product or if we publish a negative review of a product.

Finally, as a system-specific magazine, we must deal with the fact that our success is closely linked to that of Tandy. Some reviewers are squeamish at the prospect of criticizing Tandy products. They fear that *80 Micro* won't publish negative reviews, and that if we do Tandy will in some way retaliate.

## From the Muck and Mire

We've wrestled long and hard with these problems. The solutions are sometimes unclear. But out of the muck and mire have emerged some guidelines we think will help *80 Micro* provide independent and honest product reviews.

- *80 Micro* no longer accepts unsolicited reviews from freelance authors. The reason is simple: We have no way of knowing whether the author has any connections with the manufacturer.

- *80 Micro* has developed a stable of reviewers who we know are independent and reliable. All our reviews are now written by one of these reviewers at our request.

- We will not accept any reviews written by manufacturers or public re-

lations firms, or by programmers connected with the product's manufacturers. This includes authors who have written software or documentation for the manufacturer, who have software being considered for publication by the manufacturer, or authors who beta-test the manufacturer's products.

- We will not review preliminary or beta-test copies of software. We will not review any product that is not immediately available to the consumer.

We've been deluged by mail concerning Omikron, several of whose products we reviewed were not ready for release. We feel strongly that you should be able to buy a product on the same day you read a review of it.

- We will not accept a review from an author who has written a commercial program that competes with any product of the company whose product is being reviewed.

- The *80 Micro* editorial staff decides whether to review a product. This decision is based solely on whether we think the product will be of interest to you, not because a manufacturer threatens to withdraw advertising.

- We ask authors to maintain minimal contact with a manufacturer while reviewing a product. This is to prevent the reviewer from developing a friendly relationship with the manufacturer that might bias his judgment of the product. It also prevents manufacturers from using reviewers as consultants to help them develop unfinished products.

We recognize our responsibility to let manufacturers respond to negative reviews. We thus send out copies of the reviews two months prior to publication, inviting the manufacturer to respond.

- We will not hold back criticism of a product because it is made by Tandy. While Tandy's products are generally of high quality, they have their share of turkeys, and you need to know what they are. ■

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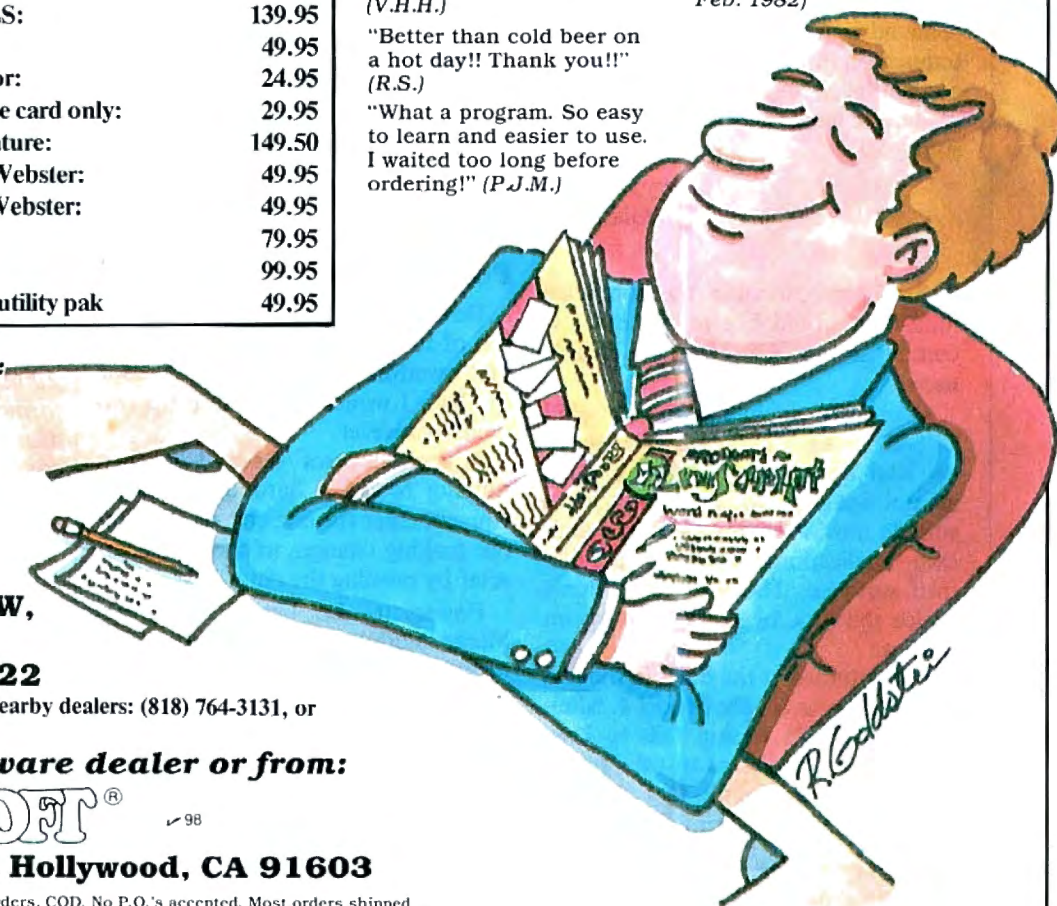
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**CP/M Brouhaha**

As a longtime user of TRSDOS and CP/M, I heartily agree with George Antunes' "What's So Good About CP/M?" (April 1984, p. 42) that CP/M is reliable.

I have had no luck with TRSDOS; my disks fail regularly on my Model I, even though I use my computer for only an hour each day. With CP/M I have had no disk failures in four years.

*Phill Wolf  
Fairport, NY*

Antunes tries to demonstrate the superiority of TRSDOS by focusing on CP/M's failings. CP/M is an ancient operating system with many shortcomings, but its failings are negligible compared to those of TRSDOS.

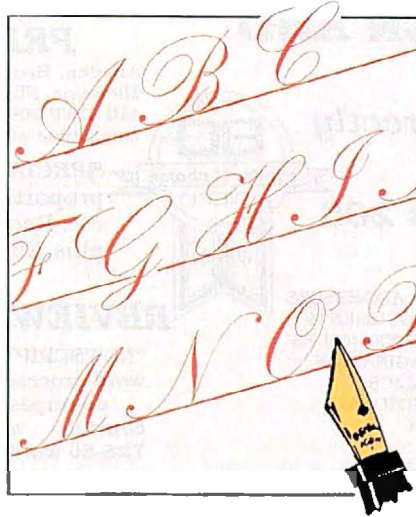
For the inexperienced user with limited requirements, TRSDOS offers some advantages, but for the user interested in program development or compatibility beyond his next upgrade, the limitations of TRSDOS are stifling.

*Gary McGath  
Hollis, NH*

As a professional in the computer industry I would like to make a few comments on CP/M and TRS-80 users.

I provide maintenance for 150 TRS-80 systems. Those of our customers who do their own programming are not using CP/M. Those customers who do use CP/M don't produce their own applications, but run off-the-shelf software. Therefore, they don't notice the lack of Basic or program utilities.

I am stunned at the holes in the two CP/M systems for the Model 4. Montezuma Micro's version fails to keep track of line feeds sent to the printer. Application programs that send a CHR\$(12) to the printer only run



properly if you have a newer Radio Shack printer.

Radio Shack's CP/M supports only 40-track, single-sided disks that are impractical for a serious business operating system.

Digital Research made a solid operating system. I don't understand why companies adapting it to a machine can't do the whole job.

*Michael E. Voumazos  
President  
Digital Hardware Support Inc.  
Springfield, OH*

**Powerful Mail**

David Engelhardt did a thorough job of reviewing our Model 4 version of PowerMail Plus in the May issue (p. 204). I would like to clear up two points, however.

PowerMail uses drive 4-7 when running Model 4 hard drives. Also, you can enter the line edit mode without making changes to the first character by pressing the enter key.

Powersoft also has a new TextMerge module that lets users create form letters using their word processor and merge them with names in PowerMail Plus to create "personalized" form letters.

*Dennis A. Brent  
Powersoft*

**Disk Flipping**

People who use single-sided disks should be aware of kits available to let them use the flip side of their disks. Disk conversion kits, such as Flip-It, make the conversion quickly and easily.

Since dealers can double their profits by selling you two boxes of single-sided disks, it isn't surprising that you don't see or hear about these conversion kits. I recouped my investment after converting one box of disks, and I have had no problems whatsoever.

*Willard Smith  
Waban, MA*

*Since you asked, Flip-It is available from D-Punch Co., P.O. Box 201, Newton Highlands, MA 02461.—Eds.*

**80 ALERT**

*Occasionally, 80 Micro receives letters from advertisers who have changed their status, or from readers who have had difficulties with our advertisers. Most of these problems are resolved to the satisfaction of all parties, but some problems appear to be insoluble.*

*As a service to our readers and advertisers, 80 Alert posts the names of advertisers we are unable to reach, or who have changed their address or status. Anyone who has current information about a manufacturer or distributor, or who has an advertiser complaint, should write to 80 Alert, c/o 80 Micro, 80 Pine St., Peterborough, NH 03458.*

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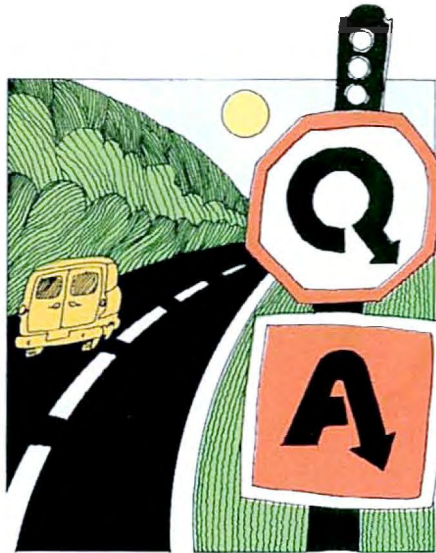
**Q.** I'm having problems with J.L. Hackman's invoice program (October 1982, p. 342). I was confused by the article and tape instructions regarding what to delete and what to add. The article's Key Box said the program requires NEW-DOS80 2.0, and I'm using NEWDOS 2.1. The Load 80 tape doesn't have a complete program for tape or disk and must be modified for either version. I couldn't get the tape version to run either.

I think I corrected all the typographical errors and the program should run on disk, but it bombs on the Save Data routine: Syntax Error in Line 450. I can't find any error and have retyped that line several times without changing the results. I even changed it from: OPEN"R",1, "INVNUMBR", "MU" to: 450 OPEN"R", 1, "INVNUMBR/MU". Maybe there's a difference in DOS commands?

This made line 450 work, but now line 460 bombs. I don't think my DOS has line 590's command: CMD "F=KEEP",G\$,G1\$. If not, what can I do? (Ray Woods, Grass Valley, CA)

**A.** When the Key Box says a program requires a particular DOS, usually only that DOS can run the program. Your errors are incompatible commands between NEWDOS 2.1 (which is actually a fixed-up version of TRSDOS 1.1) and NEW-DOS80 2.0, which is an entirely rewritten DOS.

NEWDOS 2.1 doesn't support the "MU" option ("A marked-item file segmented into records of varying length, where the length is determined



by searching for either an end of file, or the next record's SOR item"). Neither does it support the CMD "F=KEEP",G\$,G1\$ command.

Trying to adapt the program would require a major rewrite. Your best bet is to take the tape version and modify it for DOS, using sequential file access. Good luck.

**Q.** Why does a variable, when incremented by .1 in a loop, start to display a number greater than one place to the right of the decimal after about 78 loops (i.e., 7.89999 instead of 7.8)?

I'm trying to develop a program to calculate wages and time in increments of .1 hours; when incrementing the time pointer, I get numbers that are not even multiples of .1 at various times in the loops. Is something wrong with the machine or have I lost my grasp of simple math? (Skip Wilson, Hawthorne, CA)

**A.** In binary math, you can't accurately manipulate the number .1, just as you can't accurately use  $\frac{1}{3}$  in decimal math (.33333...). As a result, the accumulated error shows up after a sufficient number of calculations.

The best and easiest solution, as long as you don't have any times

greater than 3,276 hours, is to define the counter as an integer and use an increment of one, dividing the counter by 10 for display and other calculations. This way the computer only deals with whole numbers and the error doesn't appear.

**Q.** I have a 64K Level II Model I with three disk drives and a Centronics 739 printer. I've been using Electric Pencil 2.0z for about a year, and I'd like to incorporate printer control codes into text to fully use the printer's capabilities.

"Pencil-Plus 2.0" by Dan Robinson (May 1983, p. 154) seemed like a great idea; unfortunately, I've run into some problems that neither he nor I can correct. I'm hoping someone else can offer some suggestions.

Specifically, calling the Pencil-Plus print menu with the CLEAR-2 command deletes the first 84 words of text. The printer ignores the control code for compressed font (027,020), while the other codes (expanded font, subscript, and superscript) work fine. Graphics codes also function properly, but trying to send the compressed font codes as graphics codes doesn't work.

I sent Dan my disk, explaining the problem. He copied his own PENCIL07/SYS, CONFIGUR/CMD, and PENCILP/SYS to my disk, but now the problems have multiplied; not only do the first 84 words vanish, but previously cleared text (CLR, CAA, or CAB Pencil commands) magically reappears. Even rebooting to DOS Ready and restarting doesn't fix this.

I'd appreciate comparing notes with anyone who's had Pencil-Plus problems similar to mine. (Joe Burnett, Lafayette, CO)

**A.** Have you tried moving the starting address of Electric Pencil upward in memory to a point above those 84 words? It might be that

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something is overlaying the bytes occupied by the beginning of your file; moving your file up out of the way might help.

Second, have you tried sending compressed font commands twice in a row, in the hope the second one might catch? And I would go back to my previous disk to avoid the additional problems.

Can anyone else help J.B.?

**Q** ■ I just finished your review of three CP/M boards ("CP/M III Ways," December 1983, p. 122), and have a few questions. I own a Model I and would like to know if a board is available from Holmes Engineering for my computer.

Also, I understand that a user can transfer files between CP/M computers, but will the programs themselves be portable between computers? Finally, please expand on reverse video. (*Armando Perruc, Jupiter, FL*)

**A** ■ Yes, Holmes makes a board for the Model I, but in order to use it you'll have to upgrade your monitor and buy the Holmes Engineering expansion box. For more information and current prices, contact them at 5175 Green Pine Drive, Salt Lake City, UT 84107, 801-261-5652.

The beauty of CP/M is that almost any program honoring its BIOS and BDOS calls works on any other CP/M computer. The exceptions are those programs that make direct video, disk, RS-232, and keyboard calls instead of using the CP/M routines. This is usually done to speed up a program, or to take advantage of a specific computer's hardware. In general, most CP/M programs run on most CP/M computers.

Reverse video is simply black characters on a white background instead of the TRS-80 standard of white characters on a dark background. Some people find reverse video characters easier to read.

**Q** ■ Can I use a single power transformer to power my Model I and a Micro-Design Expansion Interface?

Will a large computer-grade capacitor on the +5 volt supply be useful to

suppress transients? (*Mike Sanders, Eatontown, NJ*)

**A** ■ The standard Radio Shack Model I power supply is too small to drive both pieces of equipment by itself. A standard power transformer with the appropriate amperage rating (about 5 amps) could do the job.

Putting a larger capacitor across the +5 volt line certainly wouldn't hurt, but where would you put it in the computer? The Model I power supply puts out only ac power to the keyboard, and the keyboard area is rather cramped around the on-board +5 volt supply area.

**Q** ■ I have a Line Printer VI and would like to know if any vendors offer upgrades to this unit so I can print letter-quality characters with true descenders, or if any software packages work around this hardware problem. I originally bought the printer for accounting reports and the uppercase dot-matrix characters are fine for this application.

But I also purchased Scripsit for business letters. I cringe when I see the g, p, q, and y printed without normal descenders.

My question is, do any vendors supply a new EPROM character generator for the LP VI? Perhaps, in addition, a modification could make the printer double-strike each character for better quality. Do you have any other suggestions on what I can do? (*Richard Ball, Glendale, AZ*)

**A** ■ I've run into this before, and now help is in the offing: Electronic Closet is in the business of custom programming EPROMs to order (see their letter toward the end of this column). If Electronic Closet can't help, I don't think you can do anything else, either with software or hardware.

**Q** ■ I zapped MULTIDOS's VFU/CMD so it automatically enters the Execute mode and displays the drive-1 directory, permitting quick selection of the desired program. This led to combining programs on disks according to functional features (e.g.,

games, business, and so on). I copied these primarily from disks formatted under NEWDOS80 1.0 and 2.0 and TRSDOS.

To my dismay, I discovered that many machine-language programs, particularly Radio Shack's, work fine under one DOS but not another. This phenomenon results in a confusion of disks and in inefficiency.

Obviously, jumps and calls to DOS subroutines are the culprits, since these differ between DOSes. Please provide, in tabular form, address cross-references to the most common DOS jumps and calls for the various Model I DOSes, so I can zap machine-language programs to work under other DOSes.

Also, in "Assembly Language Shortcuts—Part II" (December 1983, p. 116), Bob Bowker described some of the reasons why some Models I and III programs aren't compatible with each other. Please provide a more complete description of the differences so that those who upgrade can benefit from their purchases by zapping their favorite programs to work with the Model III. (*John Williams, Alamogordo, NM*)

**A** ■ Sorry, but each of your requests would take far more room than is available for this entire column, even if I had all the information on all the DOSes (I'd need the source code).

Even if all that information were available, you'd still find programs you couldn't transport between the DOSes because the programs would require features supported by one DOS but not supported by others. In fact, sometimes programs that work under one version of a DOS won't work with another (NEWDOS 2.1 versus NEWDOS80 1.0 and 2.0 is just one example).

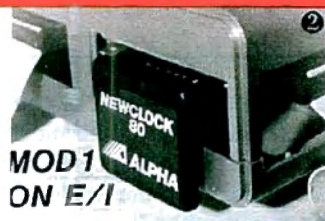
The same is true of Model I/III conversions; you just can't convert some programs. If someone were to come up with cross-referenced tables like you describe, I'm sure it would be of interest to *80 Micro*.

**Q** ■ In the December 1983 column, you refer to the older Model I keyboard/Expansion Interface and other Radio Shack peripher-



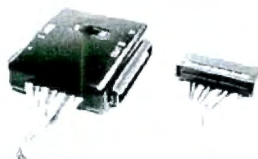
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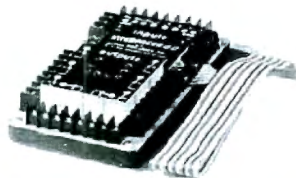
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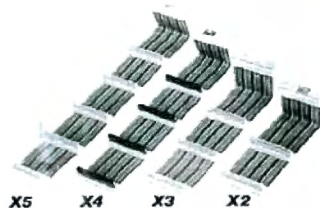
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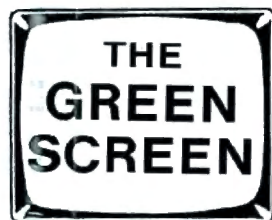
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## FEEDBACK LOOP

als. Does an index exist or could someone create a list of the older models based on serial number arrangement to indicate when the vendor made certain modifications?

I recently had Radio Shack install the board so I could load cassettes with much greater ease. I noticed you recently mentioned it, but with a different modification number. A list might help all of us know whether we're getting the latest modification available. (Bob Ideker, Sherwood, AR)

**A:** The best reference I know of on the Model I and its various modifications is Dennis Kitz's book, *The Custom TRS-80*, from IJG (see address at the end of this column). As yet, no list of Model I modifications is available. Sorry.

**Q:** The Kill command operates from Basic, but the Copy command does not. Do you know a way to copy files from one disk to another short of loading or reading the file into memory and saving or writing it to a second disk? (Michael Lipson, Reston, VA)

**A:** It depends on what DOS you use. Several DOSes (MULTIDOS and NEWDOS80, to name two) let you execute the DOS Copy command from Basic. TRSDOS won't. With TRSDOS, you must return to DOS to use the Copy command, or use the two methods you mention in Basic.

**Q:** I read with interest your discussion in the February 1984 issue (p. 20) concerning a character generator for the Tandy Line Printer VII.

Last August I told you I operate a part-time business that prototypes and produces small quantities of character generator ROMs for the Model I (replacing the chip originally used by Tandy). My business address is Electronic Closet, 8187 Blakely Court W., Bainbridge Island, WA 98110. As a result of a mention in your column, I've expanded my work to the Model III and LNW systems.

I'd be interested in applying my expertise to solving the problem with the

LP VII. I don't have a replacement ROM for that printer yet, but I would appreciate it if you could pass on to your readers that I prototype character ROMs for the Models I, III, LNW, and other devices such as the LP VII. (Tim Worcester, Bainbridge Island, WA)

**A:** Consider it done.

**Q:** I have a 48K, single-drive Model I, with buffered cable, umbilical MUX cord, and cassette XRX modification.

I'd like to convert my system to double density. I remember reading that the drives with Radio Shack part number 26-1160 won't accept double-density operation. Can I make some kind of alteration to the drive to make it compatible with double density? I'm fairly skilled with a soldering iron and am not afraid of tinkering with my equipment.

Also, I have a Line Printer I. As you know, it prints only uppercase characters. Is there a way to make it print both upper- and lowercase?

Third, you've mentioned piggy-backing a 2102 RAM chip on top of the video RAM chip (Feedback Loop letter from T.W., December 1983, p. 282). Which chip is that? I'd also like to know whether T.W.'s modification requires a software driver.

Last, do you know of a software routine to generate speech through the cassette port? (Mario Camou, Sierra Nevada, Mexico)

**A:** Almost all the Radio Shack Model I drives were capable of double-density operation. If you get the double-density modification, try your drive out. If it doesn't work, you're one of the unfortunate few with a single-density drive.

The conversion is difficult, requiring new electronics and a new drive head. It would probably be cheaper and faster to buy a new 40-track, double-density drive than to convert your old one. Several suppliers sell new drives for around \$200—check the ads in *80 Micro*.

One company used to sell a modification board that plugged into the character generator socket and gave

the Line Printer I both character sets, but I can't locate them. Does anyone know of a source for this modification?

The 2102 is the type of chip in which you're interested. You can order it from many IC parts supply houses. If you mean which is the RAM chip, it's the one labeled Z45 on the circuit board. Dennis Kitz's IJG book, *The Custom TRS-80* (see IJG's address at the end of this column), explains how to install lowercase capability in your Model I. All Model I upper-/lowercase conversions require both a hardware modification and a software driver of some kind.

Yes, you can generate sound and speech through the cassette port. Articles on generating sound from the Model I cassette port appear in several *80 Micro* issues: January 1980, p. 36; April 1980, p. 68; May 1980, p. 130; 1983 Special Anniversary Issue, p. 253 (corrections in the June and November 1983 issues); and March 1983, p. 310.

You can order back issues from the *80 Micro* offices in Peterborough, NH. Generating speech is more difficult, but similar in concept to music generation.

---

*Terry Kepner is a freelance writer and programmer, and the vice-president of Interpro. He's been writing about microcomputers since 1979.*

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### Frequently Needed Numbers

Radio Shack, National Parts Division, 900 E. Northside Drive, Fort Worth, TX 76102, 817-870-5662. M/C and Visa accepted; each order has \$1.50 handling charges.

IJG Inc., 1953 W. 11th St., Upland, CA 91786, 714-946-5805. Publisher of *TRS-80 Disk and Other Mysteries* (\$22.50), *Microsoft Basic Decoded and Other Mysteries* (\$29.95), *The Custom TRS-80 and Other Mysteries* (\$29.95), *Basic Faster and Better* (\$29.95), *Machine-language Disk I/O and Other Mysteries* (\$29.95), *TRSDOS 2.3 Decoded and Other Mysteries (Model I)* (\$29.95), *How to do it on the TRS-80* (\$29.95), and the *Electric Pencil Word Processor* (\$89.95).

Welcome to the second issue of *In Touch*. This month, let's answer some common questions about the VS-100 voice synthesizer.

# In Touch

## The Alpha Newsletter

### ■ How good is the voice?

We think it's incredible for the price, but you can judge for yourself by calling our 24 hour Demo Line: (212) 296-0399.

### ■ What does it take to make my BASIC programs talk?

With *TALKER 1.4*, it's simple. With *TALKER 2.0*, it's incredibly easy. If you add an asterisk after a "PRINT" command, the PRINT now speaks. (e.g. PRINT★ "Hello Judy" will speak, not print). If you add an exclamation point instead of an asterisk, the PRINT command will print as usual, and in addition, it will speak! To add speech to your favorite BASIC program simply sprinkle a few "★" and "!" where you want speech. Could it be any easier?

### ■ Is it compatible with my DOS?

The software and hardware do not rely on any DOS feature, therefore the VS-100 system works with any Model I or III DOS.

### ■ Do I need any cables?

No, the VS-100 plugs directly into your TRS-80. It uses the expansion port on your computer, so it doesn't interfere with any printer, disk drive, or RS232 device. On the Model 4P, the card edge is recessed; be sure to order the special 50-pin extender cable

### ■ Do I need an amplifier?

No, the amplifier with volume control is built into the VS-100. All you need is a small speaker; we recommend our handsome mini-speaker (\$5.95).

### ■ Which port does it use?

All communication between the computer and the VS-100 is done using port 11.

### ■ Can I purchase the user manual alone?

Yes, it is available for \$5 plus \$1 shipping and handling. (The \$5 is applicable towards purchase of the VS-100).

### ■ How many words can the VS-100 say?

There are two ways to make speech synthesizers. One is to use a limited look-up dictionary. The VS-100, on the other hand, uses a much more powerful approach: the "text to speech" automatic translator. This means that any word will be pronounced. The text to speech translator, with its 400 pronunciation rules, achieves a 96% success rate.

### ■ Can I get speech automatically, without doing any programming at all?

Yes, Talker 2.0 has very powerful "automatic keyboard echo" and "screen echo" options. Everything that is typed and/or printed on the screen can also be spoken.

We would like to thank all our customers for the very nice feedback that we receive. (Such as the letter at right).



What is your reason for keeping your TRS-80 mute?



17

**ALPHA** Products

79-04 Jamaica Ave., Woodhaven, NY 11421

To Alpha Products, 79-04 Jamaica Ave., Woodhaven, NY 11421

Gentlemen:

I seldom write manufacturers of Computer products. However, I am so pleased with my purchase of the VS-100 Voice synthesizer, I felt I must let you know it.

The unit performs EXACTLY as advertised. The documentation furnished is clear, understandable and straightforward. The disk software seems absolutely flawless in use.

The VS-100 is simple to program and flexible enough in programming to accomplish exactly what I wish. I have incorporated it into all my computer tutorials. Congratulations on your product!

Sincerely yours,

  
Wendell R. Henry

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## Peelings II

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— F.M. Remley, 7/83

## InfoWorld

The Newsweekly for Microcomputer Users

"T/Maker is a superb product! I have yet to see anything that comes close to its level of system integration, overall ease of use and general sophistication."  
— Tim Daneliuk, 7/11/83

Performance	✓
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"...if you regularly prepare documents combining text, charts, and lists, ...if you belong to an organization that uses several different kinds of microcomputers...if you want to reduce the training burden and improve the capability of sharing files...T/Maker can become the key program in your software library!"  
— Frank J. Derfler, Jr, 4/84

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— Michael J. Miller, 12/83

COMPUTING FOR BUSINESS

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— Michael Heck, 3/84

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# UPC, 3 of 9, . . . And Tandycode?

## New Threads

**Radio Shack tailor-made its Model 100** for bar code applications. The lap-size portable features a socket that accepts a bar code wand, and Tandy markets a wand and bar code reader program for under \$100.

But conventional bar codes, like the UPC, 3 of 9, and Plessey codes, present a significant problem in terms of size. Encoded characters use more space on a page than typewritten characters.

To resolve this problem, Tandy developed its own bar code format called Tandycode. Tandycode is a super-high-resolution bar code that prints 2,000 bytes of information per page. You can store a data file of 100 20-byte records on one 8½- by 11-inch page.

Bill Walters, Tandy's Model 100 product manager, predicted that Tandycode would be on the market by the time this report reaches the newsstands. He also noted that printer drivers for Radio Shack's high-pin-density DMP printers will be available to print the Tandycode bar code.

Walters also said that Tandy was moving slowly with bar code applications for the Model 100, but they're committed to promoting bar code applications.

## Tandyland

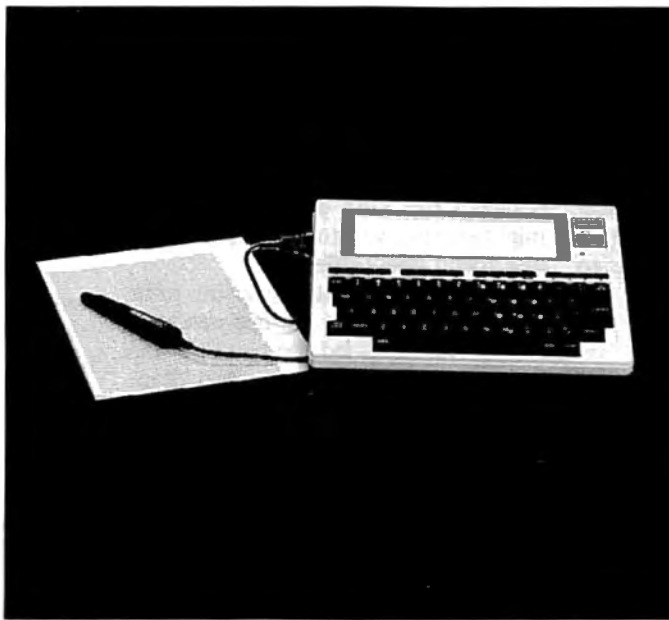
**Educational support is an important part of making it in the microcomputer business** and all the major players try, in one way or another, to woo the educational market. One of Tandy's efforts (are there others?) is the TRS-80 Educational Grants Program. The program awards hardware

and software prizes for the top proposals submitted by educational institutions on specified subjects.

The program began in April 1983 and prizes have been awarded on topics such as "Applications of the TRS-80 Model 100 in an Educational Environment," "Computer Literacy Among Teachers," and "The Use of Microcomputers for the Handicapped and Disadvantaged."

Educational institutions can obtain further information on the program

edited by Bradford N. Dixon



*Tandy's Model 100 and bar code wand.*

by writing to Tandy TRS-80 Educational Grants Program, Radio Shack Education Division, 1400 One Tandy Center, Fort Worth, TX 76102.

**Speculation ran rampant through the TRS-80 grapevine** this spring about an upgrade to the Model 100, Tandy's respected portable computer. Controversy on CompuServe regarding whether users should wait for the next-generation Model 100 prompted Ed Juge, director of market planning, to respond.

"Don't hold your breath," Juge said. "There will be additional portables from Tandy, but reports of their imminent appearance are *greatly exaggerated*. If [a new portable comes out] this year, it's going to be very late. And that's a very big if."

Bill Walters, product manager for the Model 100, went one step further than Juge by stating that Tandy will not introduce an upgraded Model 100 in 1984.

## MicroTrends

**When Tandy introduced the Model 2000** at the November 1983 Comdex show in Las Vegas, NV, the specter of the 80186 chip shortage haunted the super micro's potential sales. Consumer apprehension was justified; by February Tandy was running 30 days behind in 2000 delivery.

In March, Intel Corp., the 16-bit chip manufacturer, announced an agreement with Advanced Micro Devices (AMD) whereby they will produce some of the chips in an attempt to alleviate the pressure on Intel. In addition, Intel announced a 10-fold increase in their own chip production to meet the micro market's demand.

AMD plans to have samples of the 80186 ready for testing by the end of this month and volume production by the fourth quarter.

At this point, with the 2000 out for nine months and its microprocessor is in questionable supply, Tandy can only hope consumers will be willing to wait for Intel and AMD to come across with the chips they need—a full year later.

**A study by Strategic Inc. of San Jose, CA,** points out that Microsoft might leave Digital Research Inc. in the dust

in operating systems market share unless DRI takes a more universal approach to product development.

The study says that Microsoft is taking over the operating systems market and thereby setting itself up for an improved position in applications software, languages, graphics, data bases, multi-tasking, and integrated software.

Strategic Inc. predicts no contest in deciding the eventual winner in the battle between Digital Research's CP/M-86 and a Xenix compatible version of MS-DOS, especially if IBM decides to sell the Microsoft product under its own name for PC users.

Once again, the industry looks to Big Blue to make a decision that the rest can follow (ComputerWorld, March 12, 1984).

**If you've been looking for new TRS-80 I/III/4 books lately, chances are you've found very few. Publishers Weekly's "Spring Announcements" issue (Feb. 3, 1984) listed 389 system-specific titles, but only 10 concerned the I/III/4. That 2.6 percent of the list was only good for 12th place (see Table 1).**

Why aren't there more books for the I/III/4? As an editor at Prentice-Hall told us recently, "Why should we publish books that aren't going to sell?"

System	Number Of Titles	Percent Of Titles
IBM PC	77	19.8
Apple	60	15.4
Commodore	57	14.7
Atari	32	8.2
PCjr	24	6.2
Vic 20	19	4.9
TI 99/4	18	4.6
Timex/Sinclair	18	4.6
TRS-80 Color Computer	16	4.1
Adam	15	3.9
Model 100	11	2.8
Models I/III/4	10	2.6
Pocket Computers	9	2.3
BBC Acorn	7	1.8
Macintosh	6	1.5
Lisa	3	.8
Kaypro	3	.8
Epson HX-20	2	.5
Compaq	1	.3
DEC	1	.3

Table 1. System-specific books in print.

According to Sofsearch International of San Antonio, TX, Tandy microcomputers are supported by the second largest software base overall. The 5,047 available products rated second only to Apple's 6,428 software products.

IBM PC software accounted for 4,111 products, placing that system in third place. However, Sofsearch's report notes that the PC segment of the market is growing fastest.

You might want to take Sofsearch's figures with a grain of salt; they indicate that 689 amusement and entertainment packages are available for TRS-80s (again, second only to Apple). In light of the fallout in TRS-80 game suppliers, where are those packages coming from?

**Brand name recognition is an important part of advertising a product, and computers are no exception. Almost anyone who spends an evening or two a week in front of the television can identify the spokesperson for his particular computer favorite. What the average viewer doesn't realize, is how much all the TV advertising costs.**

The TV Bureau of Advertising compiles this kind of information. It might surprise you to see what companies spend (see Table 2).

In terms of advertising in the print media, the numbers are not nearly as impressive. DEC led the pack in 1983 with expenditures of about \$9 million. The other manufacturers who followed DEC's lead were Apple, Texas Instruments, IBM, Televideo, and Tandy.

Company	1983 TV Ad	
	Expenses In Millions	Percent Above 1982
Texas Instruments	\$34.3	286
IBM	34.2	73
Commodore	27.4	94
DEC	13.1	1256
Tandy	12.9	155
Apple (before Mac)	12.7	365
Warner (Atari)	10.5	-9
NCR	7.9	0
Burroughs	5.0	256
Epson	4.4	1307

Table 2. Television advertising expenditures for major computer companies.

## Update

**If you've been waiting for Tandy to introduce the TV/joystick interface promised for the Model 2000, you can stop.** According to Don White, Model 2000 product line manager, Tandy has decided not to provide the add-on product, which would have cost \$249.95. Perhaps Tandy is finding out that the 2000 really is a business machine, not one that might find its way into the home.

**This is a quiz. What software company markets the MultiMate word processor?**

Give up? MultiMate is now produced and distributed by MultiMate International Corp. of East Hartford, CT. However, the company has used that name only since March 1984. SoftWord Systems Inc. wanted to link themselves more directly with their highly respected product.

In fact, MultiMate International has put the MultiMate name on all its products: MultiMate Data Manager, MultiMate List Manager, and MultiMate jr. Name recognition is important to the company according to Wilton H. Jones, founder and CEO of the new MultiMate International Corp.

The name SoftWord Systems Inc. "was great when all we had was a top ranking word processor," says Jones, "but it doesn't reflect the full scope of the company anymore."

Now for the second part of the quiz. Which Tandy computer runs MultiMate? Tandy's MS-DOS machine, the Model 2000.

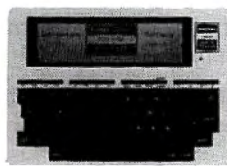
**In a soup commercial for television a few years ago, an anxious child asked his mom, "Is it soup yet?" The mom smiled and served the soup to the eager tyke.**

Similarly, Model 2000 owners are asking Ovation Technologies Inc. of Norwood, MA, "Is it software yet?" Ovation might be smiling, but their integrated software by the same name is not about to be served.

Since Ovation's introduction at last November's Comdex show in Las Vegas, industry watchers have awaited the appearance of this powerful integrated software. The original release date was March, but an April 25, 1984 Wall Street Journal article indicated that the new release date is June.

From Computer Plus to YOU...

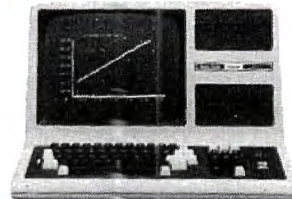
# PLUS after PLUS after PLUS



Model 100 8K \$535  
Model 100 24K \$715



Color Computer II  
w/16K Ext. Basic \$165  
w/64K Ext. Basic \$210



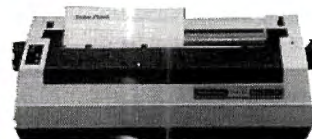
Model 4 16K \$799  
Model 4 64K  
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DMP200 \$520



Color Computer Disk Drive  
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Model 12 64K 1 Drive	2360
Model 12 64K 2 Drive	2950
Model 16B 1Dr 256K	3375
Model 16B 2Dr 256K	3965

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Hayes Smartmodem II	225
Hayes Smartmodem 1200	539
Novation Smartcat 1200	410
Novation J-Cat	115
AC-3	125
DC Modem I	89
DC Modem II	160

### PRINTERS

Silver Reed EXP400 D.W.	309
Silver Reed EXP550 D.W.	515
DWP410	1159
Gemini Powertype	345
CGP115	159
CGP220 Ink Jet	545
DMP110	305
DMP420	735
Toshiba 1340 (24 wire head)	779
Gemini 10X	289
Gemini 15X	409
Panasonic P1091	305
Smith Corona Fast Ext.	195
Prowriter 8510	345
Okidata	CALL
Epson	CALL

### DISK DRIVES

Model III/4 Drive 0	475
Model III/4 Drive 1	195

Model III/4 Drive 2	259
Model III/4 Drive 3	229
Primary Hard Disk M12	2239
Hard Disk M2000	1525

### ETC.

CCR-81 Recorder	52
Cassette Tapes (10 PK)	9.95
16K Ram Chips	25
64K Ram Chips	62.95
Model 4 64K Upgrade Kit	79.95
M100 Bar Code Reader	89
64K Printer Buffer	199
Printer Stand	25

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For Model 2000 owners, the bad news doesn't stop there. The first version of Ovation will be available for the IBM PC. The program for the 2000 might not be available until the third quarter, almost a year after the Comdex splash.

In an industry where companies and products come and go so quickly, how does Ovation plan to remain viable on the mere promise of their product?

**"This program is provided as is without warranty of any kind—the entire risk as to the quality and the performance of the program is with you, the user."**

Take a look at some of your software and see if any of it has this or a similar disclaimer in case the program doesn't work. According to Bill Schoneman, vice president of XXCAL Inc., an independent software testing firm in Los Angeles, CA, statements like the above are common and do nothing to inspire confidence in buyers.

Schoneman thinks substandard software is on the market because little in-house and third-party testing is done on new software. "Sooner or later," Schoneman says, "consumers and the government are going to start insisting on some assurances about the reliability of software products."

Consumers rely on a variety of methods to determine what software they should buy. Magazine reviews, newsletters, and word of mouth are a few of the ways people decide which programs are best for them. Unfortunately, some software companies never go to the trouble and expense of testing their work outside the company's confines, and don't know how a new user will approach their product.

Schoneman feels strongly enough about the current trend in software testing to state, "future successful software firms will be those that recognize the value of testing, either through their own demanding in-house process or through third-party services."

The question arises: Should the software industry find some way to regulate itself or should a third party (Uncle Sam?) get involved?

**Model 100 mass storage is a hot item** in discussions about Tandy's totable, and Holmes Engineering of Murray, UT is keeping up with the talk.

Larry Holmes, president of Holmes Engineering, announced the company's upgrade to their popular PMD-100 wafer tape storage system. It's called the Bullet, and Holmes claims that it's a vast improvement in speed over the old system while it maintains the same price (\$369.99).

Choosing wafer tape storage over disk storage makes sense for people concerned with keeping their 100 portable. The only other portable alternative is from the Portable Computer Support Group in Dallas, TX: a 3½-inch portable disk drive that lists for considerably more money.

## Who's Got Clout with Tandy?

**Many TRS-80 users become frustrated** when they can't get answers about computer problems from their local Radio Shack Computer Center. Their next step is to call Tandy's Fort Worth headquarters directly. But anyone who's tried that knows the phone is almost always busy at the Tandy Towers.

Two years ago, frustrated business users organized the Tandy Computer Business User's Group (TCBUG) to exercise some muscle and get some answers about their computers.

TCBUG held its second annual conference in Fort Worth during the first week in April 1984 to find out how Tandy intends to support the computers they sell to businesses. Some heavy hitters, like Coca-Cola and Southern California Gas, and many smaller businesses were represented.

Concerns about Tandy products included increased Xenix support for the Model 16, better micro-to-mainframe communications, and a more efficient way to back up files stored on hard disk systems.

The head honchos for every system used by the business community listened to the group's gripes. Bill Walters discussed the present and future of the Model 100, Don White fielded questions about the Model 2000, and David Frager handled questions concerning the Model 4/4P.

But listening is one thing, and taking action is another. Before the two-and-a-half-day conference started, the Tandy officials prom-

ised to provide answers to all the group's questions. The answers weren't always what the group wanted to hear, but the promise was kept.

The best example of how Tandy values its business buyer's needs came from the question-and-answer period after Don Stanfield talked about Xenix and the Model 12/16 line of business machines. Several of the 150 businesspeople in attendance cried out for a larger hard disk for their systems.

Don Stanfield said that a 36-megabyte hard disk was being used in his office and considered for release, but Tandy had not yet developed an efficient method of backing up the data and felt they couldn't sell it. The crowd responded with massive support for such a product, stating they'd rather have the storage now and wait for back-up developments later.

By the end of the afternoon, Stanfield returned to the TCBUG group and announced a new product available on a special order basis: a 36-megabyte hard disk. TCBUG told Tandy what they wanted and Tandy delivered.

When asked about the influence TCBUG has over Tandy, Ira Tolmich, TCBUG president, said "We [business users] represent a group of Tandy customers that spend a lot of money on their computers. They realize this and are willing to listen to what the business buyer has to say. Of course, sometimes they listen and act, and sometimes they don't."

Interested parties can receive more information about TCBUG by writing to Tandy Computer Business User's Group, Mike Hames, Membership Director, One Tandy Center, Fort Worth, TX 76102. ■



# CP/M<sup>®</sup> Model 4

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	Montezuma Micro	Radio Shack
Transient Program Area (TPA)	55K	43K
Bytes Free in MBASIC	30,776	18,488
Bytes Free on Formatted Disk (Not including reserved tracks)	166.5K	154K
64K Memory Drive	YES	NO
Double-Side Drive Support	YES	NO
Format, Read/Write Other CP/M Formats	YES	NO
Communication Program Included	YES	NO
Time To Boot	3.6 sec.	9 sec.

Now, for the first time, unleash the powerful features resident in your Model 4 or 4P computer. Open up the vast store of CP/M software such as WordStar and dBASE II along with thousands of others. Our implementation of CP/M has earned higher review ratings than any other for the Model 4/4P. Check out the many features and you will see why.

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**INTERCHANGE**, a utility that allows copying, reading and writing 25 different manufacturers' soft sector disk formats such as DEC, Cromemco, IBM-PC(CP/M-86), Kaypro, Morrow, NEC, Osborne, TeleVideo, Zenith, Xerox plus many others.

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## Directory Assistance

I've made changes in Thomas Longstaff's "Model III One-Liner" program (February 1984, p. 40). As written, the program produces a directory of all disk files on any printer. With my alterations, the program runs on the Model I using NEWDOS Plus. However, this program will not run under TRSDOS.

Because I group my disks by subject and leave gaps in the numbers for future expansion, I input the disk numbers by hand. Also, I use both sides of the disk, and designate them A and B.

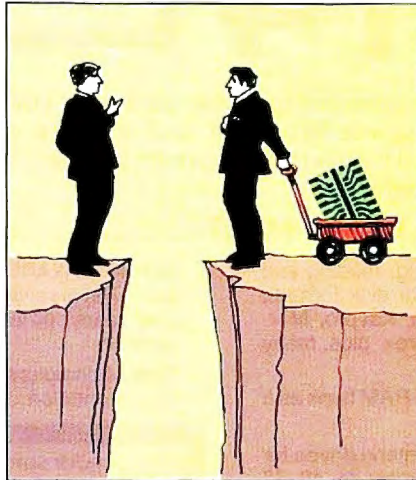
```
10 CLS
20 LPRINT TIMES:LPRINT
30 INPUT "CHANGE DISKETTE; ENTER
DISKETTE NR (BREAK TO END)";N$
40 LPRINT"DIRECTORY FOR DISKETTE
NR. "N$
50 POKE 16414,&H8D
60 POKE 16415,5
70 CMD"DIR"
80 CMD"FREE"
90 POKE 16414,&H58
100 POKE 16415,4
110 LPRINT:GOTO 10
```

*Wyn Freeman*  
734 Bluewood Drive  
Huntsville, AL 35802

## WordStar Speedup

Thank you for the excellent review of WordStar for the Models I and III (May 1984, p. 38). I solved the problem of slow screen output on my aged Model I by carefully reading the WordStar manual; it says that you can improve output speed considerably by selecting memory-mapped video rather than the conventional protocol-driven mode. To do so, specify the starting and ending addresses of the video memory (3C00 and 3FFF, respectively). I've found that WordStar runs faster than on almost any 4MHz machine during screen output.

*Phill Wolf*  
28 Potter Place  
Fairport, NY 14450



## Help!

I'm looking for a software package for designing and drafting electrical and electronic diagrams and schematics; it must run on a 4P.

I would also like a driver for a C.Itoh F10-40 printer.

*Dave Smith*  
Canada Training Group  
Box 1143, Station J  
Calgary, Alberta  
T2A 6A8

I'd like to hear from anybody with information about Southwestern Technical Products Corp.'s 6800-based machine.

*Scott Hamilton*  
228 Grandview St.  
Bennington, VT 05201

## DEBUG

To get the sound for "Strip Blackjack" to work, you must make another correction in the system modifications (August 1983, p. 257, and January 1984, p. 18). Change line 1600 to:

```
1600 DEFUSR = Z!G = USR4(-399):
G = USR(ASC(Q$)AND15):RETURN
```

*John Aquino*  
496 Kendrick St.  
Paramus, NJ 07652

I'm looking for a patch for Radio Shack's EDTASM 1.1 editor/assembler so I can write my programs to a floppy disk instead of to tape. It must work with LDOS 5.1 or TRSDOS 2.3.

*Byron Stephen*  
502 S. 7th St.  
Upper Sandusky, OH 43351

## Error Trap

My letter to Input (May 1984, p. 11) included an out-of-date price for Homebrew Software's password program. The current suggested list price for PWBREAK is \$29.95 plus \$2 shipping.

*Al Fischer*  
President  
Homebrew Software  
P.O. Box 511  
Miami, OK 74355

I received several letters informing me of a typographical error in the listing for my program FORMGEN (March 1984, p. 160). In line 490, the value that should follow the last SC = is missing. The value is 7, so line 490 should read:

```
IFSC = 1ORSC = 13ORSC = 21ORSC = 4
ORSC = 5ORSC = 3ORSC = 9ORSC = 8
ORSC = 10ORSC = 7GOTO480
```

LOAD 80 doesn't include the error; I loaded the program as it appears on the tape and it worked perfectly.

*Rev. Glenn Parkinson*  
605 Manor Road  
Severna Park, MD 21146

## Editors' Note

Because of the complex nature of Roger C. Alford's current hardware project, the design and implementation of a printer buffer, Project 80 doesn't appear in this issue. Instead, the project will comprise a two-part series in his September and October columns.

## Drive, He Said

We at Powersoft get a lot of calls from people who have new Model 4's with hard drives running in the Model III mode. Apparently, they don't know you can run the hard drive in Model 4 mode. Also, you can use both the Model 4's TRSDOS 6.0 and the Model III-mode LDOS 5.1 operating systems on a Model 4 with a hard drive so that, depending on which disk you boot, you'll run a Model III or 4 DOS.

There is some justification for putting both DOSes on a hard drive. The software base for TRSDOS 6.0 is not yet as large as that for LDOS 5.1, and it can be to your advantage to run LDOS 5.1 applications unavailable for TRSDOS 6.0. Also, a hard drive provides extensive storage capacity as well as increased operating speed over floppy disks.

Both operating systems can read the files on the hard disk. LDOS 5.1 and TRSDOS 6.0 can read each other's directories and disk formats without special software.

LDOS 5.1 and TRSDOS 6.0 let you split up a hard drive into one or more logical drives, and the logical drive numbers need not be the same as their physical positions on the hard disk. The hard disk partition assigned as drive zero for LDOS 5.1 need not be the same as the one assigned as drive zero for TRSDOS 6.0. Two independent logical drive zeros can exist on a single hard drive, one for each operating system. Each operating system sees only its own drive zero, reading the other one as something else.

Consider the setup of a 5-megabyte hard drive system. Each hard drive contains two disks or platters, each with two surfaces, for a total of four surfaces. Each surface has its own read/write head. When you execute the Model 4 hard disk initialization program, you split the hard disk into four logical drives, the first surface being drive zero, the second drive 1, the third drive 2, and the fourth drive 3.

Nothing in either operating system dictates that the first surface must always be logical drive zero. So you can run a modified initialization file under LDOS 5.1 that reverses the order of

logical drives zero and 3. That is, surface four becomes drive zero and surface one becomes drive 3. Thus, you can have two different drive zeros on the hard drive. The drive zero that's the system drive when you run TRSDOS 6.0 becomes drive 3 under LDOS 5.1 and vice-versa (see the Table). So the two operating systems share the same hard drive. Because only one operating system runs at any one time, no conflict arises between them.

The user of a shared system must clearly mark the programs that run under only one operating system.

Below is a three-step procedure to format the hard disk as described. You must have the hard drive initialization disks for both TRSDOS 6.0 and LDOS 5.1. Back up every file on your hard drive before you try it, because you're reformatting the hard drive.

- Boot up your TRSDOS 6.0 hard drive initialization disk. This automatically executes the initialization program. Follow the steps described in your *Hard Disk Startup Manual*. Tell the program that you want to create a hard drive system with equal partition sizes, the hard disk to be the system device, and the hard disk to be searched first when looking for a file. This will give you the hard disk logical drive numbers as 0, 1, 2, and 3. Format the hard drive, move files over to it, and create your boot disk.

- Make a back-up of your LDOS 5.1 hard drive initialization disk. Boot up this disk but don't execute the initialization procedure yet. You must modify the Model III hard disk initialization files, using LDOS's Patch command. First type in BUILD INITHD3/FIX. Then type in the patch lines below:

```
.Patch to INITHD3/JCL to reverse head order
and skip FORMAT
D09,B8="1"
D09,EB="4"
D0E,6F="."
D0E,9C="."
D0E,C9="."
.End of Patch.
```

Now press the break key. The patch goes to the disk.

	Disk side or drive number			
Physical surface	1	2	3	4
TRSDOS 6.0 sees	0	1	2	3
LDOS 5.1 sees	3	1	2	0

*Table. Hard disk partitions in a shared system.*

You need to apply one more patch; because it's short, don't build a separate patch file for it. On the command line, type:

```
PATCH HD1/CFG.CCC(D02,F7=
13:D03,15=10)
```

and press the enter key. The patch goes to a file named HD1/CFG.

You have just patched the LDOS 5.1 hard disk initialization files to reverse the order of logical drives zero and 3 on the hard disk and skip the formatting process (you've already formatted the hard drive under TRSDOS 6.0).

- Execute the patched LDOS 5.1 hard disk initialization with the command:

```
DO INITHD3 (NEW,PW=PASSWORD,
HARD1,FLOPPY2,ABS).
```

Refer to the *Model III Hard Disk Startup Manual* (p. 31) for more details.

LDOS 5.1 and TRSDOS 6.0 now share a hard drive. Selection is automatic depending on which boot disk is in the floppy drive when you push the reset button. When you run TRSDOS 6.0, note that your logical drive 3 contains the LDOS 5.1 system files. When you run LDOS in Model III mode, logical drive 3 has the TRSDOS 6.0 system files on it. Logical drives 1 and 2 are the same no matter which operating system you're running; that way, you don't have to change any programs that reference files on these two drives.

Unfortunately, this method of dividing up the 4/4P's hard disk doesn't work with CP/M Plus, because it lacks the capacity to split a hard drive into several logical drives.

Dennis A. Brent  
Powersoft Products  
11500 Stemmons Expressway,  
Suite 125  
Dallas, TX 75229

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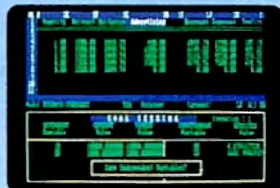


1



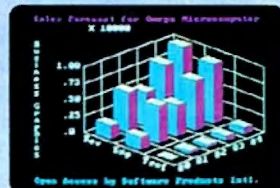
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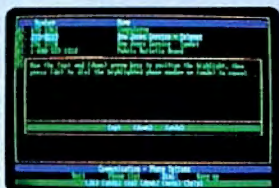
360

4



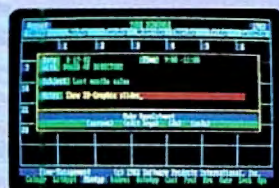
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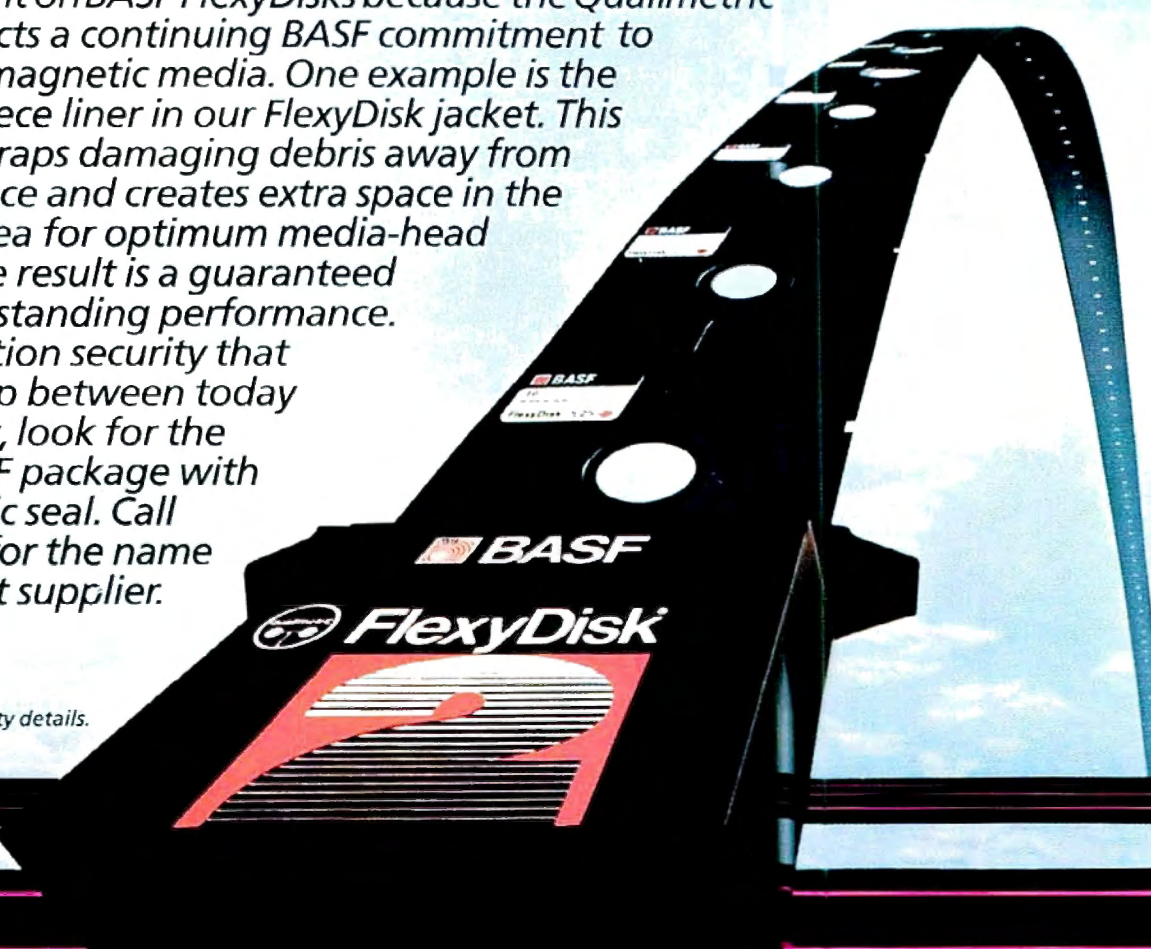
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# A Great Plus: CP/M for the Model 4

by John B. Harrell III

edited by Susan Gubernat

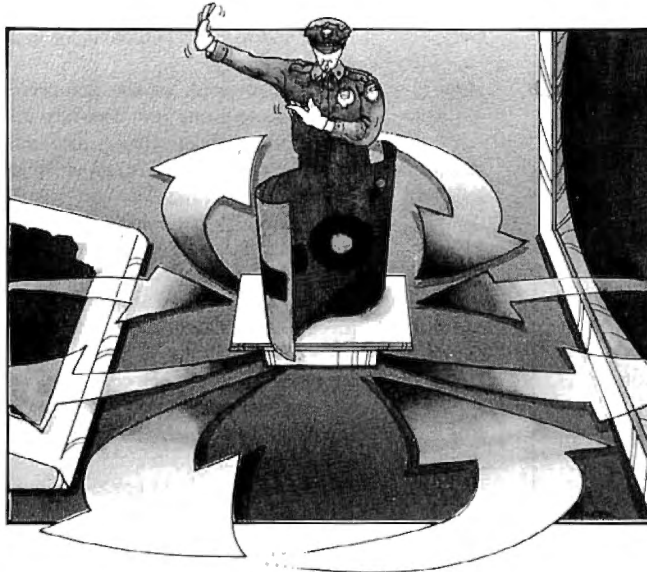
**C**P/M Plus (version 3.0) isn't a panacea for those of us who've experienced CP/M 2.2 and found it lacking. Yet, the differences between implementing this updated version of the CP/M disk operating system (DOS) and its predecessor are as astounding as those between using a cassette recorder and using a disk drive. CP/M Plus has grown up into a full-featured operating system that I recommend.

While not a package for beginners—it lacks a Basic interpreter, and its documentation is formidable—CP/M Plus provides the programmer or advanced user with an exceptionally powerful package. This version's additional utilities alone are worth more than the price of the entire system.

## The Package

The CP/M package contains a wealth of software. Five system disks provide full support for up to 16 floppy or hard disks with a capacity of 512 megabytes each, several Model 4 utilities, an absolute and a relocating macro assembler, libraries of the CP/M system source code, linkage editors for the relocatable code output of the assembler, an on-line help facility, and a simple debugging tool.

The package contains two versions of CP/M Plus: banked and non-banked. The latter, intended for the 64K Model 4, though it also operates on the 128K machine, is more limited than the banked version, so I'll focus on the full system that the banked version provides.



Memory organization of the CP/M Plus operating system is similar to that in earlier versions. In fact, the system's single most important asset is the stringent requirement to maintain upward compatibility with earlier versions of CP/M. All operations with the larger memory contained in the banked system are transparent to your program; that is, CP/M switches banks as it needs to access information.

Using CP/M Plus, the Model 4 system's basic memory organization is divided into four basic banks: the common bank, bank zero, bank 1, and bank 2. The common bank and bank 1 comprise the transient program area (TPA), identical in function with earlier versions of CP/M. The Basic disk operating system/Basic input-output system (BDOS/BIOS) is split into two modules: one always resides in the common bank and one in bank zero, switched in only when you need these functions.

While the banked version requires more storage for the larger operating

system, it also provides you with more program space. The transient (user) program "sees" only bank 1 and the common bank. The program has a larger area during execution because the computer stores most of the operating system within bank zero. Actual work space sizes for the Model 4 are 44K for the nonbanked version and 55K for the banked version.

In addition to the functions listed in Table 1, CP/M Plus comprises a variety of enhanced features, including command-line editing, full-file and disk password protection, file directory entry

updates with date and time stamps, extended error messages and recovery, and more sophisticated directory-accessing techniques. Using the banked system, CP/M Plus buffers both directory and data sectors in alternate banks. So, instead of manipulating disks, you can access sectors from the data banks, thus speeding up disk input/output.

You can specify multiple commands on the command line as well as redirect data flow from the keyboard. You can construct powerful job control procedures, including conditional execution and parameter substitution for use with the Submit command.

CP/M Plus departs most radically from CP/M 2.2 in its directory maintenance functions. It provides full password protection of disks and files so you won't experience mysterious and costly error messages when you change disks without reinitializing the system. CP/M Plus also provides a more efficient hashing access method capable of locating files rapidly and

## REVIEWS

determining if you've swapped disks. The system logs in disks automatically, preventing loss of valuable data.

Because of the "guarantee" of upward compatibility, most CP/M 2.2 software operates successfully under CP/M Plus. But if the software contains nonstandard BIOS calls or features not implemented through the standard BDOS definition, all bets are off. So far, only one application program failed to run for me under CP/M Plus: a public domain utility for disk sector manipulation that makes nonstandard system calls. The rest of CP/M software I've tried—including WordStar, MBasic, CBasic, and dBase II—has run faultlessly.

The least publicized yet one of the most powerful features of CP/M, the resident system extension (RSX), is a relocatable module that the system loader recognizes and loads just below the beginning of the BDOS. Once loaded, the operating system patches an RSX into the BDOS call chain and intercepts calls to the BDOS to either perform the applicable function or modify the result of the BDOS function action. An RSX can modify any BDOS call. This feature, used in several of the CP/M Plus system commands, provides enhancements impossible otherwise; for example, the extension to the Submit command allows "nested" Submit invocations by using repetitive installations of the Submit RSX.

### CP/M Plus



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Command	Function
COPYSYS	Copies system track(s); copies the file CPM3.SYS to new disk
Date	Sets and displays system date and time
Device	Displays current assignment of CP/M logical devices/physical devices; allows reassignment of system resources to logical devices
DIR	Displays disk file directory and file attributes associated with each file; works with a transient extension to display sorted full size directories (including file size and date/time stamps)
Dump	Displays file in hexadecimal and ASCII formats
ED	Fulfills a limited volume of your text processing needs
Erase	Removes one or more files from disk; uses extensions to let you confirm file removal
GENCOM	Converts a page-relocatable file into RSX format and attaches it to a COM file for stand-alone loading or loading in conjunction with another program
Get	Loads and redirects console input to a file (effective until the next program terminates)
Help	Provides powerful, on-line summary of CP/M Plus commands; provides tools to create your own help information files and to extract and edit information contained in distribution copy
HEXCOM	Converts assembler (HEX) input file into an executable "COM" file
INITDIR	Initializes or removes date and time stamps in directory; destroys compatibility of directory with earlier versions of CP/M
LIB	Constructs library of compiled/assembled files for the linkage editor
Link	Executes the linkage editor to process relocatable object modules and resolve all external references, creating a single executable "COM" file
MAC	Invokes the CP/M 8080 Macro Assembler; produces only absolute machine code
Patch	Displays or installs patch code segments in the CP/M Plus system or system commands
PIP	Invokes CP/M's peripheral interchange program for transfer of data between files and/or system devices
Put	Redirects output from console or printer to a file similar to the GET command
Rename	Changes file names within directory; uses "wildcard" file selection, to name selected classes of files within the directory
RMAC	Invokes CP/M 8080 relocatable assembler
Save	Copies specified number of "pages" (256 bytes) from the user program area to the selected disk file
Set	Initiates password protection, date and time stamping of files, setting of file and drive attributes, and establishing a disk master label and password
SETDEF	Displays or defines disk drive searching order and file type searching order and selects special display modes for the system
Show	Displays selected information about disk drive installation parameters and space allocation
SID	Invokes the symbolic instruction debugger for monitoring and testing programs under development
Submit	Invokes CP/M's job control processor which includes conditional execution based on return code from a previous procedure and parameter substitution
Type	Displays contents of selected file
User	Selects the particular user number
XREF	Reads output files from MAC and RMAC and produces cross-referenced listing of symbols from the assembly
Commands supplied by Radio Shack and tailored for the Model 4:	
Assign	Reassigns logical disk drive "names" to floppy or hard disks
Backrest	Backs up and restores data on hard disk; allows file dump/restore operations greater than single-disk capacity
Copydisk	Formats and backs up floppy disks; supports mirror-image back-ups only for system tracks, data tracks, or both (the entire disk)
CPMINIT	Initializes hard disk drive (disk format identical with normal TRSDOS disk format)
Setup	Tailors the CP/M operating system environment to your own needs

*Table 1. CP/M Plus DOS commands.*



# LOGICAL SYSTEMS

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1. \*TBA is a text pre-processor that translates structured BASIC "source" into interpreter executable programs. Supports long variable names and named references/procedures, along with conditional translation. \$79.

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6. \*The LSI HELP System is a complete series of packages to provide on-line help information to LDOS/TRSDOS 6 users. Packages are available for DOS/BASIC help, Technical help, and the development of additional "HELP" information files. Prices start at \$29.

7. \*\*LS-HOST/TERM is a complete Mod 4 communications system. Includes ADDS25 terminal emulator, XMODEM file transfer utility for error-free transfer, HOST program with password protection and much, much more. Ideal for use with XENIX. \$199.

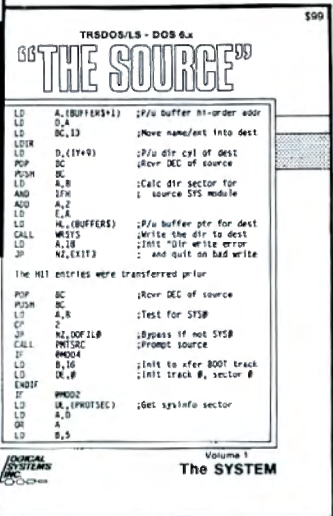
8. \*LED is the LSI full-screen text Editor. Uses all LDOS special features (KSM, filters/drivers, ...). Excellent for editing KSM and JCL source files. T6 version includes "block write to disk" and "insert file at cursor". \$49.

9. \*\*LS-QFB/Comp consists of two utilities. QFB performs a "fast" mirror-image backup of a disk, formatting the destination disk in the process. Comp will compare any two disks or files, with differences to display or printer. \$49.

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### Publications



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Manual	Description
User's Guide	Introduces CP/M Plus and explains individual system commands; requires familiarity with the Model 4
TRS-80 Model 4 Reference Manual	Details keyboard configuration, video terminal emulation, printer characteristics, and other features specific to the Model 4; describes operation of nonstandard utilities supplied by Radio Shack
Programmer's Guide	Contains specific information on accessing CP/M Plus from applications programs; describes CP/M internal memory organization, disk management structures; provides detailed description and calling sequence for BDOS functions; presents programming examples ranging from simple to complex functions
System Guide	Describes the system's structure; explains BIOS function calls; discusses basic CP/M Plus modules supplied in source code on distribution disks
Programmer's Utility Guide	Describes remaining utilities on distribution disks
Symbolic Instruction Debugger	Lets you manipulate machine-language code with symbolic references and establish "permanent" pass points (like break points)
Programmer's Utility Guide	Describes operation of assemblers (MAC and RMAC), linkage editor, cross referencer, and library manager

*Table 2. CP/M Plus's documentation.*

## Documentation

For those of us who've seen and used earlier Digital Research documentation, CP/M Plus's excellent documentation is a refreshing change. Most of the manuals are written in crisp, easily understandable prose, with examples highlighted in color. The seven manuals (see Table 2) come in two three-ring binders packaged within a box you can store on your shelf.

## Drawbacks

One of CP/M Plus's most significant drawbacks is the strange disk format on the distribution disks. Each disk data/program area is formatted in eight sectors of 512 bytes each, yielding a total available user disk storage of 154K bytes. Since the operating system itself and the command processor are resident in the user data area, the usable data area is reduced to 127K—the same amount of user storage available on a TRSDOS 6.2 disk containing only system files.

When you consider the alternative available on a Model 4 CP/M 2.2 disk format of 166K RAM or a Kaypro format of 193K RAM, this seems like a paltry disk size. It's even less enticing when you realize that the Kaypro uses the same sector size and writes two

more sectors to each track, adding 1K additional storage for each of 40 tracks.

An even more serious disadvantage than storage is the fact that you can't use CP/M software from sources other than Radio Shack with CP/M Plus. The Radio Shack distribution system doesn't contain any uniform transfer program to let CP/M read another system's disk format, a common utility on almost every other CP/M system.

Thirdly, while plenty of software comes on the distribution disks, they lack a Basic interpreter. The companion product being marketed with CP/M Plus, Digital Research's CBasic, is a poor choice, especially for most entry-level users attempting to work with CP/M. CBasic isn't compatible with the industry standard, MBasic, nor is it a true compiler: it compiles to a compressed interpretive code. In fact, results of benchmarks run on CP/M 2.2 with CBasic and MBasic indicate CBasic is slower than interpretive MBasic.

Finally, the Model 4 reference manual in the CP/M Plus package is disappointing: It is plagued with confusing, even misleading, typographical errors. Much to my chagrin, Radio

Shack hasn't responded to my repeated phone calls and correspondence about this manual.

## Conclusion

Criticisms aside, CP/M Plus is not only one of the best software deals available but also, with the exception of the accompanying Model 4 manual, one of the best documented systems on the market. I recommend you use this system with the full memory expansion option installed to benefit fully from its capabilities. ■

## Integrated Software: As Easy as A-B-SEE

by Gary Ludwick

**I** recommend you get your hands on A-B-SEE before its author, David Dahl, realizes how seriously underpriced it is.

A-B-SEE is an ingenious, thoroughly professional Model III file editor, word processor, screen graphics, and telecommunications program. Because of its integrated nature and flexibility, this package can do the job of a half-dozen individual utilities and programs.

As a matter of fact, I wrote this review with A-B-SEE's word processor, then handily transmitted it to the 80 Micro offices using the package's telecommunications program.

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**System Overview**

A-B-SEE arrives as an unprotected TRSDOS 1.3 formatted data disk. On boot-up, you immediately know you have something special because A-B-SEE starts off with an on-screen, interactive tutorial acquainting you with the program's screen and command structure, and with all the basic conventions you'll need to start working.

But the tutorial is no substitute for the documentation itself. Here's a manual that's going to get a work-out. The 200-page documentation, contained in a three-ring looseleaf binder, equals in thoroughness any I've encountered—with nine full chapters of information and 12 appendices.

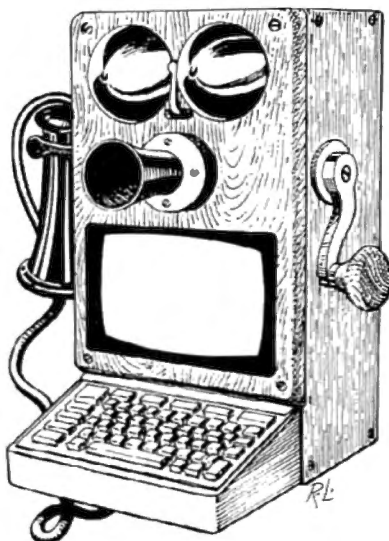
The author has taken an unusual approach when designing the manual by dividing color-coded sections into various levels of difficulty. The initial sections cover the basics of A-B-SEE, particularly its word processing capabilities. The next section delineates advanced "word processing tricks." Once you're comfortable with word processing and its command structure, you're ready to handle the material on binary file editing, telecommunicating, creating and printing graphics, and customizing A-B-SEE to your own needs and equipment.

**Integrated Software?**

Is A-B-SEE really an integrated package? The answer depends on your definition of the term "integrated." A-B-SEE does not pass information back and forth among its programs as Lotus 1-2-3 does. Yet the A-B-SEE program is always in control; it's a shell program within which all the others work. Once you load A-B-SEE, you can go anywhere—to the smart terminal program, to the graphics program, to DOS, to Basic—and you can always return to the main program's control.

At the heart of A-B-SEE is a sophisticated full-screen editor that edits any type of file on your system: ASCH, Basic, word processing, Fortran, Assembly, or binary. You can also change a file from one type to another—binary to ASCII, for instance.

A-B-SEE is so flexible that you can alter almost any parameter of the system. Have a printer with some unique code requirements? No problem for A-B-SEE. You can modify the pro-



gram to suit any DOS, any printer, and to define, for example, your own file types, help menus, and keyboard features.

A-B-SEE's special keyboard driver generates all 256 ASCII characters and also stores strings of keystrokes—called "macros"—to perform complex tasks with less input from you.

**Word Processing**

A-B-SEE's screen-oriented word processing program has most of the expected bells and whistles, as well as a few surprises. Among its features are word-wrapping, fixed or proportional spacing, odd and even top and bottom page titles, soft hyphens, widow-line suppression, and the ability to embed macro commands for editing, file processing, printing, and much more.

One nice touch is Tidy, a text formatting command. With Tidy and your screen's horizontal and vertical scrolling, the lines you see on screen are what you're going to get on paper. You can opt for flush left, flush right, or fully justified text. You can also specify line lengths and paragraph indentations, among other text formatting features.

Yet, with all these advantages, A-B-SEE's word processor isn't another Newsprint or Lazywriter. It's not as quick, it's not as convenient, and it requires more work on your part to arrive at the exact printout you want. But remember that, unlike a dedicated word processor, a large, integrated program like A-B-SEE must use every byte of memory in the most efficient way.

To that end, the author has made some compromises. Codes for margins, line spacing, italics, and such must all be embedded, rather than simply chosen from a menu. The good news is that with A-B-SEE's unique keyboard driver you can send all of those ASCII characters directly from your text. And with macro commands, you can create a macro file that will probably take care of most of your text-formatting needs.

All in all, A-B-SEE provides a good workhorse word processor that more than equals those of the Scripsit variety.

**Creating and Printing Graphics**

A-B-SEE's surprisingly sophisticated graphics program, Snapshot, lets

*Continued on p. 41*

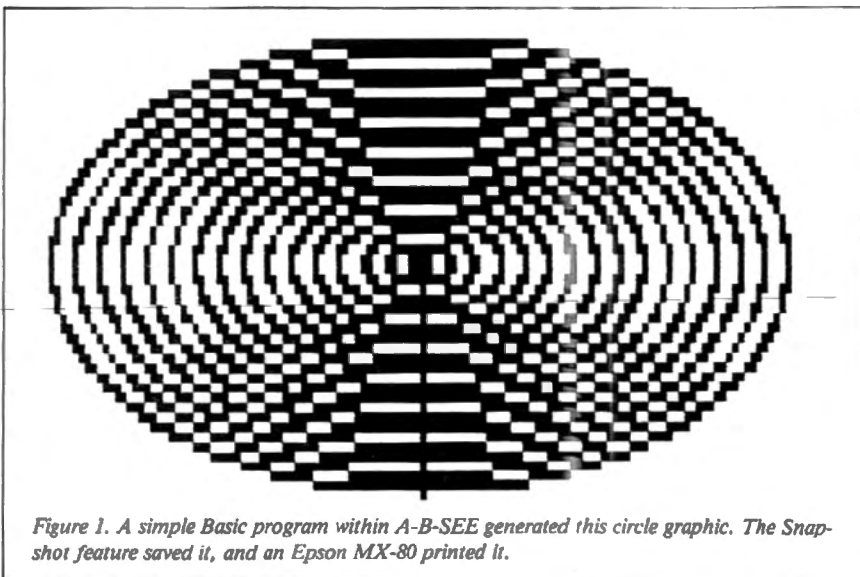


Figure 1. A simple Basic program within A-B-SEE generated this circle graphic. The Snapshot feature saved it, and an Epson MX-80 printed it.

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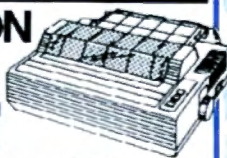
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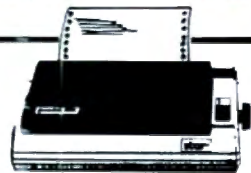
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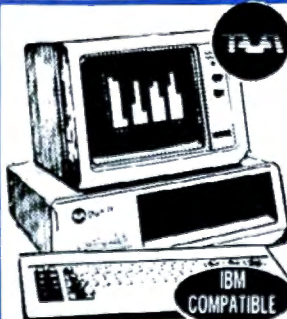
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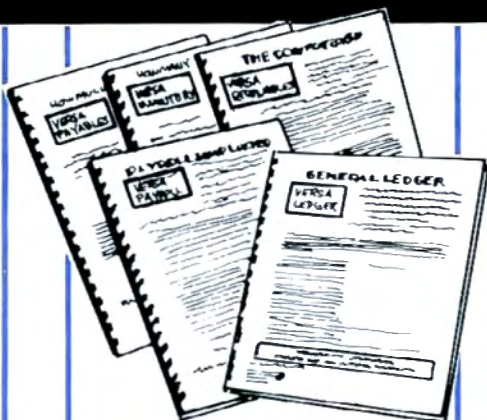
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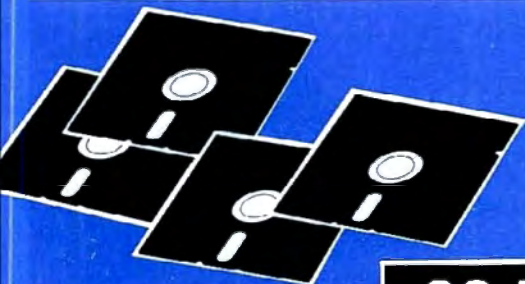
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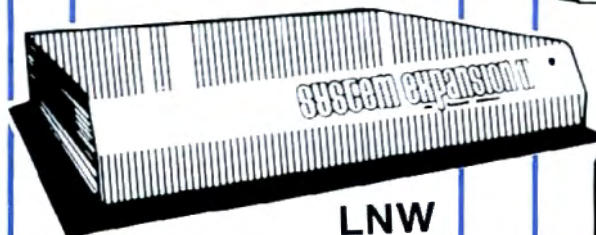
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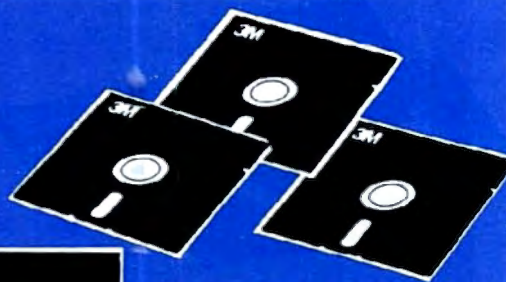
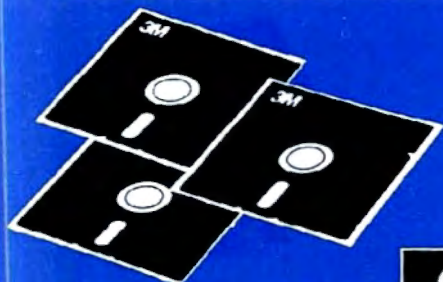


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Continued from p. 36

you capture any graphic displayed on your screen and, with two keystrokes, place that graphic in a special variable length binary file. A second graphics program, Draw, lets you save and print out any graphics your Model III can create, including those from the special character sets. (See Figs. 1 and 2.)

In addition to Snapshot and Draw, A-B-SEE comprises two other graphics programs: Grid, which supplies a layout chart for full-page illustrations, and LPrint, which translates this graphics file information into instructions your dot-matrix printer can use.

Combine these graphics capabilities with some sophisticated macro commands and you can have the word processing program call up an illustration or graphic and print it in the middle of a text document. It takes some experience to pull off some of these tricks, but the power is there.

### Smart Terminal

By itself, A-B-SEE's video terminal mode is nothing out of the ordinary. It lets you communicate with other computers through CompuServe or the local bulletin board. It supports uploading and downloading, and all data received resides in memory for later viewing or saving to disk.

As in the word processing module, the telecommunications program indicates that some trade-offs have been made for the sake of conserving memory work space. For instance, because of memory priorities and esoteric functions like refresh rates (the amount of time it takes for the screen to clear), the first four or five characters constantly flicker as the lines scroll vertically during data reception.

Additionally, as a line approaches the 50-character mark, the screen be-

gins scrolling horizontally. In fast transmissions from CompuServe, this screen activity can make your head spin, with lines going sideways and up and down almost simultaneously.

A-B-SEE's terminal program derives its real power from two things: its inherent flexibility and the ease with which you can change any of its operating parameters, and the A-B-SEE keyboard's ability to construct and use macros.

### Mighty Macros

Since A-B-SEE's keyboard driver can generate all 256 ASCII codes—including enter and break functions—anything you can type in from the keyboard can be a macro command. If you've never worked with the concept of macros before, it might help to think of them as Build or do-files.

Some computers offer limited macros in the form of function keys. A-B-SEE includes several powerful macros. When you invoke the Connect Macro (designed for smart modems like Hayes'), the computer initializes the RS-232 port with whatever you've stored under the TRSDOS SETCOM command. Then it turns on the modem, dials your favorite bulletin board number, and signs you on with both membership number and password. All of that happens with just three keystrokes.

Another demonstration macro calls the Dow Jones News/Retrieval Service, signs you on, gets the current prices of three different stocks, downloads, and signs you off—again, with just three keystrokes and only a few minutes of board time.

The explanation in the A-B-SEE manual makes writing your own macros relatively easy. An hour's worth of practice was about all it took for me to feel comfortable with the concept.

### File Editing

The text or file editing portion of A-B-SEE is perhaps its most powerful application. What makes it so special is its ability to translate any type of disk file into a common memory format for full-screen editing. And it does this while still observing each file's specific disk storage format.

A-B-SEE can read six different file types: word processing files, Basic, ASCII, and Build files, editor/assembler assembled files, Fortran compiler files, Command files, and experimental X files that the author has developed. It also has printer drivers to match. The experimental X file is a special variable length binary file that handles the user-composed graphic files, and translates those files to the dot-matrix printer.

### Programming Ease

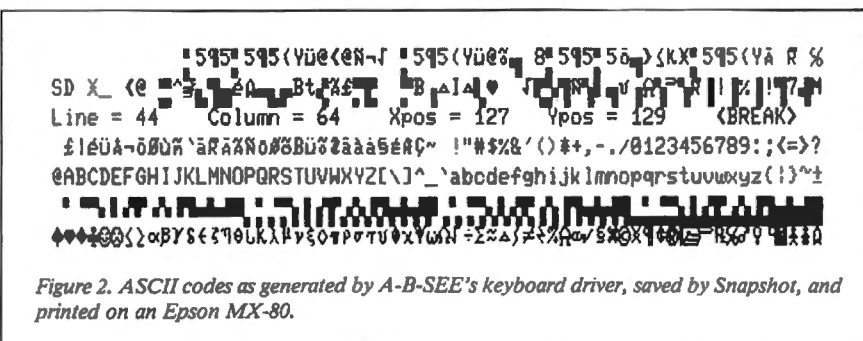
What does all this mean? If you're a programmer, your editing tasks have just become much easier. No matter what kind of file you're working on, A-B-SEE can load it, allow you a full range of editing options, and then rewrite it to disk in the proper format. Couple these abilities with either local (line by line), or global (entire program) macros, and many of editing's most tedious chores are reduced to simple keystrokes.

For example, on a Basic program, A-B-SEE can count each instance of a particular string—such as a variable designation—then it searches and replaces automatically. You can even specify a "veto" option that stops at every occurrence of that string and asks you for a yes or no answer before making the replacement.

In the same manner, A-B-SEE can selectively print out lines containing a desired string. It can freeze lines on screen to avoid manually moving about the file when you need to refresh your memory. And, in the middle of all this, you can drop into DOS, check the directory, load a new file or editor/assembler, and then return to the editing job in progress. During these various operations you never leave A-B-SEE's control.

Other features of this powerful editor include partial saving and loading; running assembler files within A-B-SEE; editing Fortran (Microsoft

Continued on p. 184



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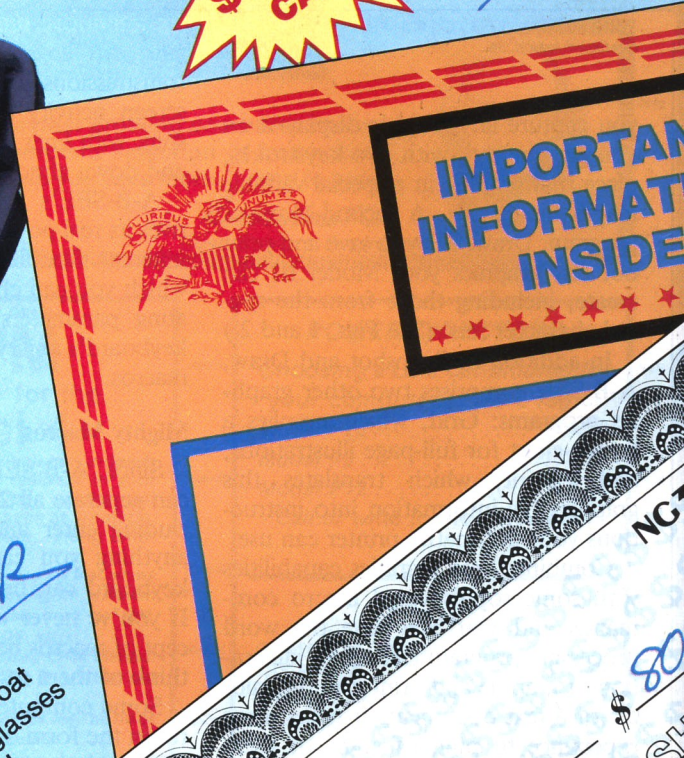
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# MODEL 4 EDTASM FOR FREE

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**Simply type in the accompanying listing and your Model 4**  
**editor/ assembler is READY TO GO. As an ADDED BONUS,**  
**we've included a NEW SYSTEM COMMAND. So ACT TODAY!**



When I bought my Model 4, I didn't want to have to buy a new editor/assembler. So I modified Radio Shack's Model III EDTASM to work on my Model 4.

The job was well worth the effort—the Model 4 version runs exactly as its progenitor does, but it uses the Model 4's larger screen display and includes a new System command.

To make the conversion yourself, you'll need EDTASM 1.0 and TRSDOS 1.3. I'll show you how to do it, and I'll also give you some pointers on how to modify other Model III Assembly-language programs.

### \*\*\*\*\* EDTASM Transfer \*\*\*\*\*

Using my modification is easy. First, enter the Editor4/SRC program (see the Program Listing), using EDTASM in the Model III mode. Assemble the source file to produce Editor4/CMD. (Don't forget to save a copy of the source file.)

Next, boot up your Model 4 with a TRSDOS 6.X system disk. Insert your Model III disk with EDTASM/CMD and Editor4/CMD on it into drive 1. Use the TRSDOS 6.X Convert command (CONV) to copy these files to your Model 4 disk.

My method doesn't permanently patch EDTASM. Editor4 is an interface program that inserts the patches into EDTASM in memory and then runs the EDTASM program.

When you run Editor4/SRC, you should see the familiar EDTASM message on your screen. If you get the message "Incorrect version of EDTASM," you made a mistake entering Editor4/SRC or you have a different version of EDTASM. If the latter is the case, you'll have to disassemble EDTASM and look for the Model III dependencies. Chances are that the locations of the subroutine calls are similar.

Continued



## Modifying EDTASM

The method I used to modify EDTASM works well with most software packages. Here's how I did it:

First, I disassembled EDTASM. I used a powerful disassembler package on an IBM mainframe, but any reasonable disassembler will do. You must, however, be able to separate and assign symbolic labels to instructions and data areas.

Then I found all calls or other references to Model III Level II ROM subroutines or data areas, as well as those in TRSDOS. Model III ROM references are in the address range from 0000 hexadecimal (hex) to 37FF hex. DOS calls and data areas are from 4000-51FF hex.

Radio Shack usually documents references in a program such as EDTASM, but there are exceptions. You should get a book that annotates the Model III ROM. If you're completely stuck or have a spirit for adventure, you can disassemble the ROM and TRSDOS code yourself.

Now came the task of making the patches. Most of them involved changing the address in a Call or Jump instruction. I wrote Editor4 to load the EDTASM module, insert the patches, and start the main program. This method is much less prone to error than actually patching EDTASM.

I had to simulate the Level II ROM and DOS routines listed in the Table. I also had to modify several other parts of the program.

In several places, EDTASM references the memory locations containing the screen cursor location. Since the Model 4 requires a supervisor call (SVC) to get the cursor address, I had to change the Load instruction op code and the address to a Call command. My interface could then issue the SVC to get the cursor address. I inserted patches to use the larger 24-line by 80-character screen.

EDTASM uses the up-arrow key, which generates a different code on the Model 4 (0B hex) than on the Model III



(5B hex). I had to change this character in two places, and also add it to a table of valid control characters. This made the table 1 byte longer; I therefore had to provide my own table and change all references to the original table so they would point to mine.

Since I figured out how EDTASM handled command input, I decided to add a System command. You can enter DOS commands while editing or assembling a program by typing S and the DOS command. For instance, if you want to see a directory of the disk in drive 1, you type S DIR:1 (S,I,A). To erase a file called MYPROG/SRC, type S REMOVE MYPROG/SRC.

EDTASM's commands are table-driven; that is, each has a corresponding letter in a table, followed by the address of the routine that processes the command. To implement my System command, I just copied the EDTASM command table to my own table, added the System command to the end, and

patched the EDTASM references to the table's address and length.

The only other change I had to make involved a reference to an undocumented Level II data area. When you initialize EDTASM, it compares a byte in low memory to the letter I. It turns out that this byte is part of the "TRSDOS Model III" message, and checks to see whether you're using a Model I or III. I changed the instruction to reference a location in my interface program containing the letter I.

## The Conversion to TRSDOS 6.X

Writing the code to simulate the Model III's DOS and Level II ROM calls was simple—the parameters required for most of the calls are identical. Only the manner in which the calls are made differs.

In the Model III, you use a Call instruction to invoke a subroutine, which is at a fixed location in memory. The Model 4 invokes all system interfaces via SVCs. The computer does this by loading the A register with the number of the SVC you want to invoke, loading any other registers that SVC requires, and issuing an RST 28 (hex) instruction.

For most of the system calls, all I had to do was issue the appropriate SVC. In cases where the Model III would pass an argument in the A register, the Model 4 SVC usually requires the argument in the C register.

The routine to print a character on the printer required a little extra work. EDTASM performs a primitive form of pagination. It uses the values in the Model III printer device control block (DCB) that contain the maximum number of lines per page, and the number of

### The Key Box



**Model 4**  
**64K RAM**  
**TRSDOS 1.3**  
**TRSDOS 6.X**  
**Assembly Language**  
**EDTASM 1.0**

Program Listing, Editor4/SRC, the Model 4 EDTASM interface.

```
00100 ; EDTASM Model 4 Interface
00110
00120 ; Requires EDTASM/CMD on Model 4 disk.
00130 ; (Use TRSDOS 6.x CONV Command.)
00140
00150 ; TRSDOS Supervisor Calls
00160
0002 00170 SVC DSP EQU 2 ; @DSP
0003 00180 SVC GET EQU 3 ; @GET
0004 00190 SVC PUT EQU 4 ; @PUT
0006 00200 SVC PRT EQU 6 ; @PRT
0008 00210 SVC KBD EQU 8 ; @KBD
0009 00220 SVC KEY EQU 9 ; @KEYIN
000A 00230 SVC DPL EQU 10 ; @DSPLY
000F 00240 SVC VDC EQU 15 ; @VDCTL
0019 00250 SVC MDR EQU 25 ; @CMNDR
001A 00260 SVC ERR EQU 26 ; @ERROR
003A 00270 SVC INI EQU 58 ; @INIT
003B 00280 SVC OPN EQU 59 ; @OPEN
003C 00290 SVC LOS EQU 60 ; @CLOSE
004C 00300 SVC PLD EQU 76 ; @LOAD
005B 00310 SVC M16 EQU 91 ; @MUL16
005E 00320 SVC D16 EQU 94 ; @DIV16
0064 00330 SVC CHI EQU 100 ; @HIGHS
0065 00340 SVC FLG EQU 101 ; @FLAGS
```

Listing continued

lines already printed to eject paper over the perforation in fanfold paper.

Since the Model 4 does not maintain these values, I had to add the code to my printer routine. This required that the count of the number of lines printed be incremented by one for each carriage-return character printed, and reset to one for each form-feed character printed.

## Other Conversions

If you're competent at disassembling machine-language programs, you should have little trouble converting other Model III programs to run on your Model 4. The only programs that might prove difficult or impossible to convert are those that directly address the video RAM to do screen I/O (Scriptit and SuperScriptit, for example). The Model 4's video RAM is not easily accessible, and all screen I/O is generally done through SVCs.

Modifying Model III programs is a good way to learn how the Model 4 works. And in the process, you'll quickly develop a substantial Model 4 library. ■

*You can contact Douglas Payne at 58 Brendawood Crescent, Waterloo, Ontario N2J 4J5, Canada.*

<b>\$GET</b>	Read 1 byte from file or device. Undocumented by Radio Shack, but well known to Assembly-language programmers.
<b>\$PUT</b>	Write 1 byte to file or device. Same format as \$GET.
<b>\$KBCHAR</b>	Get one character from the keyboard if available.
<b>\$VDCHAR</b>	Display a character on the screen at the current cursor location.
<b>\$PRCHAR</b>	Print one character on the printer.
<b>\$KBLINE</b>	Read one full line from the keyboard.
<b>\$KBWAIT</b>	Wait for one keyboard character, read it.
<b>\$VDCLS</b>	Clear the screen.
<b>\$JP2DOS</b>	Transfer control to TRSDOS Ready.
<b>\$ERRDSP</b>	Display TRSDOS error message.
<b>\$MEMEND</b>	The storage location containing the highest memory address available.
<b>\$INIT</b>	Open an existing file, or create a new one if it doesn't exist.
<b>\$OPEN</b>	Open an existing file.
<b>\$CLOSE</b>	Close a file.

Table. Level II ROM and DOS routines requiring simulation.

Listing continued

```

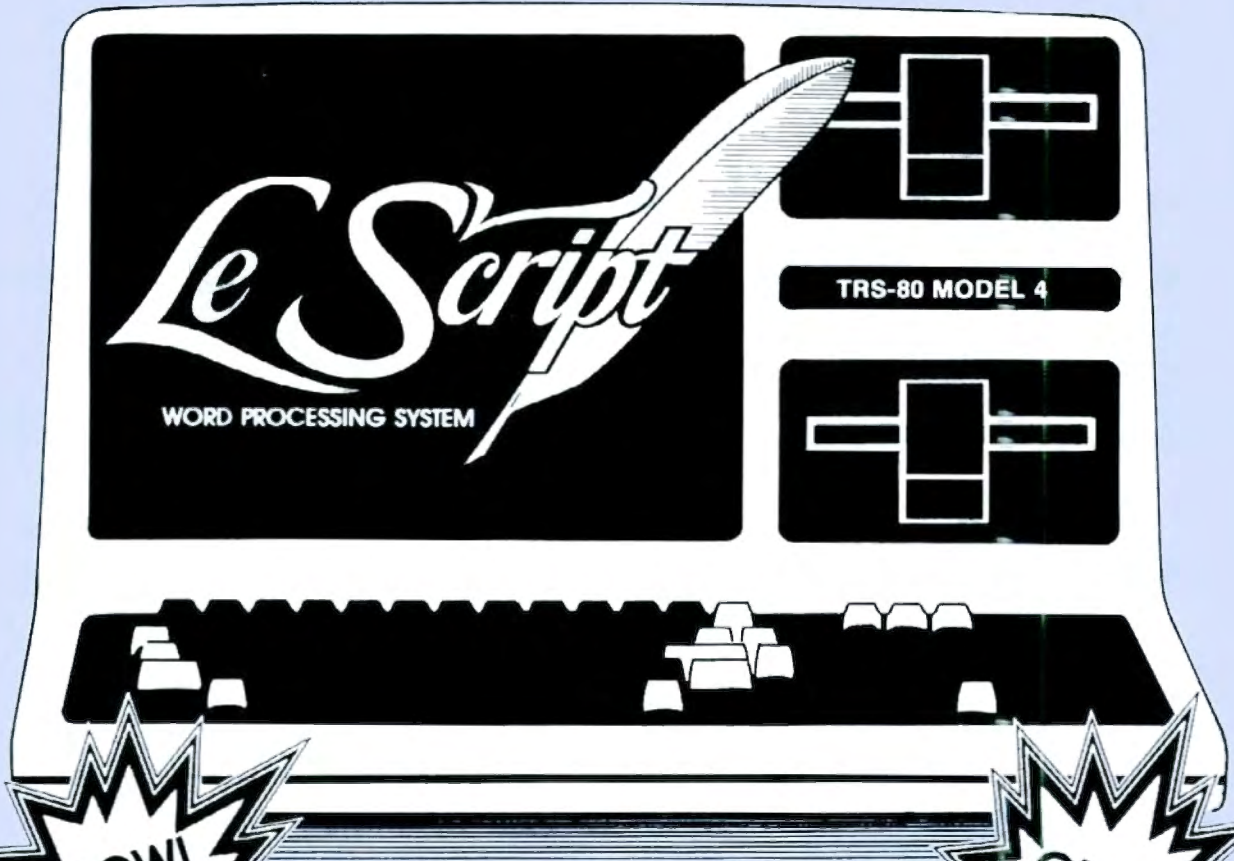
0002      00350 CFLAG EQU 2           ; - CFLAGS
000A      00360 KFLAG EQU 10          ; - KFLAGS
          00370
          00380 ; ASCII Character Codes
          00390
0001      00400 SOH EQU 01H           ; MODEL 3 BREAK
0008      00410 BS EQU 08H            ; LEFT-ARROW
0009      00420 TAB EQU 09H           ; RIGHT-ARROW
000A      00430 LF EQU 0AH            ; DOWN-ARROW
000B      00440 VT EQU 0BH            ; UP-ARROW
000C      00450 FF EQU 0CH            ; PRINTER FORM-FEED
000D      00460 CR EQU 0DH            ; ENTER
0018      00470 CAM EQU 18H           ; SHIFT-LEFT-ARROW
001B      00480 ESC EQU 1BH           ; SHIFT-UP-ARROW
0080      00490 BREAK EQU 80H         ; MODEL 4 BREAK
          00500
          00510 ; Screen Control Codes
          00520
001C      00530 HOME EQU 1CH           ; CURSOR HOME
001F      00540 CLR EOS EQU 1FH        ; CLEAR TO END OF SCREEN
          00550
3000      00560 ORG 3000H
          00570
          00580 ; Program Termination Routines
          00590
3000      00600 ERROR EQU 5            ;
3000 F6C0 00610 OR 0C0H                ; DISPLAY ERROR MESSAGE
3002 4F    00620 LD C,A
3003 3E1A 00630 LD A,SVCERR            ; @ERROR SVC
3005 EF    00640 RST 28H
          00650
3006      00660 EXIT EQU 5             ;
3006 310000 00670 LD SP,$-$            ; RESTORE STACK POINTER
3007      00680 SPSAVE EQU $-2
          00690
3009 FD210000 00700 LD IY,$-$          ; RESTORE KFLAGS
3008      00710 FLAGS EQU $-2
300D 3E00 00720 LD A,$-$
300F      00730 KFLSAV EQU $-1
300F FD770A 00740 LD (IY+KFLAG),A
          00750
3012 210000 00760 LD HL,0             ; SET RETURN CODE
3015 C9    00770 RET                    ; RETURN TO DOS
          00780
          00790 ; Program Data Areas
          00800
3016 49    00810 BVMSG: DEFM 'Incorrect version of EDTASH'
3017 6E
3018 63
3019 6F
301A 72
301B 72
301C 65
301D 63
301E 74
301F 20
3020 76
3021 65
3022 72
3023 73
3024 69
3025 6F
3026 6E
3027 20
3028 6F
3029 66
302A 20
302B 45
302C 44
302D 54
302E 41
302F 53
3030 4D
3031 0D
          00820 DEF B CR
          00830
3032 49    00840 MODIII: DEF B 'I'       ; MODEL 3 INDICATOR FLAG
          00850
          00860 EADCB: DEF B 'EDTASH/CMD' ; EDTASH/CMD FILE DCB
3033 45
3034 44
3035 54
3036 41
3037 53
3038 4D
3039 2F
303A 43
303B 4D
303C 44
303D 0D
          00870 DEF B CR
          00880 DCBFNL EQU 5-EADCB
          00890 DEFS 32-DCBFNL
          00900
3053 0000 00910 MEMEND: DEF W $-$       ; HIGH MEMORY SAVED HERE
          00920
          00930 OKCTL EQU 5             ; VALID CONTROL CHARS
3055 08    00940 DEF B BS                ; LEFT-ARROW
3056 09    00950 DEF B TAB              ; RIGHT-ARROW
3057 0A    00960 DEF B LF               ; DOWN-ARROW
3058 08    00970 DEF B VT               ; UP-ARROW
3059 08    00980 DEF B CR               ; CARRIAGE-RETURN
305A 18    00990 DEF B CAN              ; SHIFT-LEFT-ARROW
305B 01    01000 DEF B SOH              ; BREAK

```

Listing continued

305C 1B	01010	DEFB	ESC	;	SHIFT-UP-ARROW	01730	HL,CLOSE	;	\$CLOSE - 4428H
0008	01020	EQU	\$-ORCTL	;	TABLE LENGTH	01740	(5704H),HL	;	
	01030			;		01750	(5716H),HL	;	
0033	01040	CMDTBL:	17+34	;	COMMAND TABLE	01770	HL,ERRDSP	;	\$ERRDSP - 4409H
0033	01050	CMDLEN	\$-CMDTBL	;	TABLE LENGTH	01780	(5710H),HL	;	
3090 53	01060	DEFB	'S,	;	SYSTEM COMMAND	01800	HL,GET	;	\$GET - 0013H
3091 A432	01070	DEFW	SYSCMD	;		01810	(5803H),HL	;	
	01080			;		01820	HL,INIT	;	\$INIT - 4420H
0050	01090	SYSBUF:	80	;	BUFFER FOR SYS COMMAND	01830	(56F2H),HL	;	
0050	01100	SYSBFL	\$-SYSBUF	;	BUFFER LENGTH	01840	HL,EXIT	;	\$JP2DOS - 402DH
	01110			;		01850	(5CD2H),HL	;	
	01120		;	;	Execution Begins Here	01860	HL,KBCHAR	;	\$KBCCHAR - 002BH
30E3	01130	EQU	\$	;		01880	(583EH),HL	;	
	01140	MOD4EA		;		01900	HL,KBLINE	;	\$KBLINE - 0040H
30E3 ED730730	01160	LD	(SPSAVE),SP	;	SAVE STACK POINTER	01920	(5781H),HL	;	
	01170			;		01930	HL,KBWAIT	;	\$KWAIT - 0049H
30E7 3E65	01180	LD	A,SVCFLG	;	@FLAGS SVC	01980	HL,MEMEND	;	\$MEMEND - 4411H
30E9 EF	01190	RST	28H	;		01990	(5880H),HL	;	
30EA FD220B30	01200	LD	(FLAGS),IY	;	SAVE TABLE ADDRESS	02000	HL,MOD111	;	\$MODEL 3 ID - 0125H
30EE FD7E0A	01210	LD	A,(IY+KFLAG)	;	SAVE KFLAG\$	02010	(5883H),HL	;	
30F1 320E30	01220	LD	(KFLSAV),A	;		02020	HL,OPEN	;	\$OPEN - 4424H
30F4 FDC0AEE	01230	SET	5,(IY+KFLAG)	;	SET 'CAPS' IN KFLAG\$	02050	HL,PRCHAR	;	\$PRCHAR - 003BH
30F8 FDC02EE	01240	SET	4,(IY+CFLAG)	;	ALLOW ONLY LIB COMMANDS	02060	(59C6H),HL	;	
	01250			;		02070	HL,PUT	;	\$PUT - 001B
30FC 3E64	01260	LD	A,SVCHI	;	@HIGHS SVC	02110	HL,VDCLS	;	\$VDCLS - 01C9H
30FE 0600	01270	LD	B,0	;	SELECT HIGHS	02120	(58D4H),HL	;	
3100 210000	01280	LD	HL,0	;	GET HIGHS	02130	HL,GETCUR	;	\$GET CURSOR ADDRESS
3103 EF	01290	RST	28H	;		02140	(576DH),A	;	\$LD -> CALL
3104 225330	01300	LD	(MEMEND),HL	;	SAVE IT	02150	(576EH),HL	;	
3107 113330	01320	LD	DE,EADCB	;	LOAD EDTASM/CMD	02160	(58EBH),HL	;	
310A 3E4C	01330	LD	A,SVCPLD	;	@LOAD SVC	02170	(58F4H),HL	;	
310C EF	01340	RST	28H	;		02180	(58FDH),HL	;	
310D C20030	01350	JP	NZ,ERROR	;	EXIT IF ERROR	02190	(59AEH),HL	;	
3110 E5	01360	PUSH	HL	;	SAVE TRANSFER ADDRESS	02200	HL,VDCLS	;	\$VDCLS - 01C9H
	01370			;		02210	(58D4H),HL	;	
	01380			;	Verify Correct Version of EDTASM	02220	HL,GETCUR	;	\$GET CURSOR ADDRESS
3111 116758	01400	XOR	DE,5867H	;	CORRECT XFER ADDRESS ?	02230	(576DH),A	;	\$LD -> CALL
3114 AF	01410	LD	A	;		02240	(576EH),HL	;	
3115 ED52	01420	SBC	HL,DE	;		02250	(58EBH),HL	;	
3117 2020	01430	JR	NZ,BADVRS	;		02260	(58EDH),A	;	
	01440			;		02270	(58F7H),A	;	
3119 21725B	01450	LD	HL,5B72H	;	CORRECT VERS # (1.0) ?	02280	(58F8H),HL	;	
311C 3E31	01460	LD	A,'I'	;		02290	HL,PUTCUR	;	\$STORE CURSOR ADDRESS
311E EDA1	01470	CPI	A,'I'	;		02300	(5778H),A	;	\$LD -> CALL
3120 2017	01480	LD	NZ,BADVRS	;		02310	(5779H),HL	;	
3122 3E2E	01490	LD	A,''	;		02320	(58F7H),A	;	
3124 ED41	01500	CPI	A,''	;		02330	(58EEH),HL	;	
3126 2011	01510	JR	NZ,BADVRS	;		02340	HL,PUTCUR	;	\$STORE CURSOR ADDRESS
3128 3E30	01520	LD	A,'0'	;		02350	(5778H),A	;	\$LD -> CALL
312A EDA1	01530	CPI	A,'0'	;		02360	HL,0	;	\$NO CURSOR OFF BEFORE
312C 200B	01540	JR	NZ,BADVRS	;		02370	(5764H),HL	;	\$Chain files ? MSG
	01550			;		02380	(5764H),HL	;	
312E 2AD66E	01560	LD	HL,(6ED6H)	;	ONE LAST CHECK	02390	A,60	;	\$EXTRA SCREEN WIDTH
3131 11B76C	01570	LD	DE,6CB7H	;		02400	(59A1H),A	;	
3134 AF	01580	XOR	A	;		02410	HL,-80	;	
3135 ED52	01590	SBC	HL,DE	;		02420	(5771H),HL	;	
3137 2E03	01600	JR	Z,PATCH	;		02430		;	
	01610			;		02440		;	
3139	01620	BADVRS	\$	;				;	
3139 211630	01630	LD	HL,BVMSG	;	DISPLAY ERROR MSG			;	
313C 3E0A	01640	LD	A,SVCPLD	;	@DSPLY SVC			;	
313E EF	01650	RST	28H	;				;	
313F C30630	01660	JP	EXIT	;				;	
	01670			;				;	
	01680			;	Patch EDTASM for Model 4 Operation			;	
3142	01690	EQU	\$	;				;	
	01700	PATCH		;				;	
	01710			;				;	
3142 3ECD	01720	LD	A,0CDH	;	CALL OPCODE			;	

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305C IB	01010	DEFB	ESC	; SHIFT-UP-ARROW	01730	LD	HL,CLOSE	; \$CLOSE - 4428H
0008	01020	EQU	\$-OKCTL	; TABLE LENGTH	01740	LD	(5704H),HL	
	01030				01750	LD	(5716H),HL	
0033	01040	CMDTBL:	17+34	; COMMAND TABLE	01760	LD	HL,ERRDSP	; \$ERRDSP - 4409H
0033	01050	EQU	\$-CMDTBL	; TABLE LENGTH	01780	LD	(5710H),HL	
3090 53	01060	DEFB	'S'	; SYSTEM COMMAND	01790	LD	HL,GET	; \$GET - 0013H
3091 A432	01070	DEFW	SYSCMD		01800	LD	(5803H),HL	
	01080				01810	LD	HL,INIT	; \$INIT - 4420H
0050	01090	DEFB	80	; BUFFER FOR SYS COMMAND	01820	LD	(56F2H),HL	
0050	01100	EQU	\$-SYSBUF	; BUFFER LENGTH	01830	LD	HL,EXIT	; \$JPDOS - 402DH
	01110				01860	LD	(5CD2H),HL	
	01120			Execution Begins Here	01880	LD	HL,KBCHAR	; \$KBCHAR - 002BH
30E3	01130	EQU	\$		01890	LD	(583EH),HL	
	01140	MOD4EA	(SPSAVE),SP	; SAVE STACK POINTER	01900	LD	HL,KBLINE	; \$KBLINE - 0040H
30E3 ED730730	01160	LD	A,SVCFLG	; @FLAGS SVC	01910	LD	(5781H),HL	
	01170				01920	LD	HL,KBWAIT	; \$KBWAIT - 0049H
30E9 3E65	01180	RST	(FLAGS),IY	; SAVE TABLE ADDRESS	01950	LD	(5820H),HL	
30EA FD220B30	01200	LD	A,(IY+KFLAG)	; SAVE KFLAG\$	01960	LD	HL,MEMEND	; \$MEMEND - 4411H
30EE FD7E0A	01210	LD	(KFLSAV),A		02000	LD	(5880H),HL	
30F1 320E30	01220	LD	5,(IY+KFLAG)	; SET 'CAPS' IN KFLAG\$	02010	LD	HL,MODIII	; MODEL 3 ID - 0125H
30F4 FDC80AEE	01230	SET	4,(IY+CFLAG)	; ALLOW ONLY LIB COMMANDS	02020	LD	(5883H),HL	
30F8 FDC802E6	01240	SET	4,(IY+CFLAG)		02030	LD	HL,OPEN	; \$OPEN - 4424H
	01250				02040	LD	(56F8H),HL	
30FC 3E64	01260	LD	A,SVCHI	; @HIGHS SVC	02070	LD	HL,PRCHAR	; \$PRCHAR - 003BH
30FE 0600	01270	LD	B,0	; SELECT HIGHS	02080	LD	(59B2H),HL	
3100 210000	01280	LD	HL,0	; GET HIGHS	02090	LD	(59C6H),HL	
3103 EF	01290	RST	28H		02110	LD	HL,PUT	; \$PUT - 001B
3104 225330	01300	LD	(MEMEND),HL	; SAVE IT	02120	LD	(57F2H),HL	
	01310				02130	LD	HL,VDCHAR	; \$VDCHAR - 0033H
3107 113330	01320	LD	DE,EADCB	; LOAD EDTASM/CMD	02140	LD	(581BH),HL	
310A 3E4C	01330	LD	A,SVCPLD	; @LOAD SVC	02160	LD	(58EBH),HL	
310C EF	01340	RST	28H		02170	LD	(58F4H),HL	
310D C20030	01350	JP	NZ,ERROR	; EXIT IF ERROR	02180	LD	(58FDH),HL	
3110 E5	01360	PUSH	HL	; SAVE TRANSFER ADDRESS	02190	LD	(59AEH),HL	
	01370			Verify Correct Version of EDTASM	02200	LD	HL,VDCLS	; \$VDCLS - 01C9H
	01380				02210	LD	(58D4H),HL	
3111 116758	01390	LD	DE,5867H	; CORRECT XFER ADDRESS ?	02220	LD	HL,GETCUR	; GET CURSOR ADDRESS
3114 AF	01400	XOR	A		02230	LD	(576DH),A	; LD -> CALL
3115 ED52	01420	SBC	HL,DE		02240	LD	(576EH),HL	
3117 2020	01430	JR	NZ,BADVRS		02250	LD	(58EDH),A	
	01440				02260	LD	(58EEH),HL	
3119 21725B	01450	LD	HL,5B72H	; CORRECT VERS # (1.0) ?	02280	LD	HL,PUTCUR	; STORE CURSOR ADDRESS
311E ED41	01460	LD	A,'1'		02300	LD	(5778H),A	; LD -> CALL
3120 2017	01470	CPI	A,'1'		02310	LD	(5779H),HL	
3122 3E2E	01480	JR	NZ,BADVRS		02320	LD	(58F7H),A	
3124 ED41	01490	LD	A,'0'		02330	LD	(58F8H),HL	
3126 2011	01500	CPI	NZ,BADVRS		02340	LD	HL,0	
3128 3E30	01520	LD	A,'0'		02350	LD	(5764H),HL	
312A ED41	01530	CPI	NZ,BADVRS		02360	LD	A,60	
312C 200B	01540	JR	NZ,BADVRS		02400	LD	(59A1H),A	
312E 2AD66E	01550	LD	HL,(6ED6H)	; ONE LAST CHECK	02410	LD	HL,-80	
3131 11B76C	01560	LD	DE,6CB7H		02420	LD	(5771H),HL	
3134 AF	01570	XOR	A		02430	LD	A,60	
3135 ED52	01580	SBC	HL,DE		02440	LD	HL,-80	
3137 2809	01590	JR	Z,PATCH		02450	LD	EXTRA SCREEN WIDTH	
	01600							
3139	01610	EQU	\$					
3139 211630	01620	BADVRS	HL,BVMSG	; DISPLAY ERROR MSG				
313C 3E0A	01630	LD	A,SVCPLD	; @DSPLY SVC				
313E EF	01640	RST	28H					
313F C30630	01650	JP	EXIT					
	01660							
	01670							
3142	01680			Patch EDTASM for Model 4 Operation				
	01690							
	01700	PATCH	EQU \$					
	01710							
3142 3ECD	01720	LD	A,0CDH	; CALL OPCODE				





AYS TO ME, 'YOU GOTTA CUT OUT



HAVEN'T SPOKEN TO MY WIFE IN 3 WEEKS... I DIDN'T



WON'T WANT TO INTERRUPT ~ WHAT IS

WE LIVED IN CHICAGO - MY DOC



# ONE-LINERS

by Harold B. Fink

**S**implify, simplify. At some point, you've probably tried to increase the speed and reduce the memory overhead of a Basic program. I've found that the result of removing all unnecessary code is oftentimes a one-line Basic program. The games and graphics one-liners published in *80 Micro* demonstrate the power you can pack into a single 255-byte line of Basic.

But one-liners are more than an effective programming technique for games and graphics. You can use them as building blocks, much like Fortran subroutines, to create fast and efficient applications programs.

My Program Listing contains 40 one-line Basic programs and subroutines you can insert anywhere in your Basic programs. If you have a programmable keyboard program, you can write any of them with a few keystrokes. All will run on the Models I, III, and 4 (in Model III mode), and some will also run on the Models II and 100. The Models I, III, and 4 do not require Then after an If statement, but the Models II, 12, 16, and 100 do. I've included Thens where line length permits.

MY UNCLE WAS THE TOWN DRUNK...AND

THIS, AN AUDIENCE OR A WAKE? ~

Illustration by Roger Leyonmark

Lines 5995-6850 contain terminal and numerical conversion subroutines; lines 6995-7910 contain keyboard input and screen routines; lines 8195-8800 contain calendar and miscellaneous subroutines; and lines 9095-9600 contain disk input/output (I/O) routines.

I preceded each program in the Listing by three lines that include a brief description of the program, a list of variables, and a list indicating on which models the subroutine will run. I'll cover all the routines in this article, but give only a cursory description of those that are adequately described in the Listing.

In the variables list, IN: refers to the variables the program searches for, while OUT: contains the routine's results, and LOCAL: represents any additional variables. The one-liners use U-Z and V\$-X\$ for variables; make sure you don't use these variables in your main program.

TRS-80 Disk Basic (Microsoft Basic 4.5X) does not lend itself to structured programming, but I used the following line format to approximate a structure similar to Microsoft Basic 5.XX's WHILE...WEND statements:

```
FOR X = 0 TO 1 STEP 0:... (STATEMENT:)
IF... THEN NEXT ELSE...
FOR X = 0 TO 1: X=0:... (STATEMENT:)
IF... THEN NEXT ELSE...
```

The above lines let the programs repeat a series of commands each time they encounter a Next instruction. This eliminates the need for GOTO commands, but adds some byte overhead.

## Communications Line

The first program in the Listing is a one-line terminal program that works at 300 baud on TRS-80s running as slowly as 2 megahertz (MHz) (see line 6000). It initializes the Radio Shack universal asynchronous receiver/transmitter (UART, TR1602) for 300 baud, 7 bits, 1 stop bit, and no parity (300/7/1/N). The Table contains the port values necessary to change the UART configuration, using the OUT,port,n command. But remember, Basic can't handle baud

rates higher than 300; if you need anything faster, you should use a machine-language program.

The above routine is for TRS-80s, but the terminal program in line 6050 works with Micro Connection's 8561 UART.

To simply send a disk file over your modem to another computer, use the subroutine in line 6100. It's set for the same UART configuration as the terminal program. Use F\$ for the file name.

To receive a disk file over your modem, use the program in line 6150. It loads files into memory starting at M and continues until it receives a CHR\$(Z); assign Z the ASCII value required by the sender's protocol. You can write the file to disk using TRS-DOS's Dump command.

The one-liner in line 6200 automatically dials any telephone number you need for your Hayes Smart modem—even MCI. You can modify the program to work with any modem if you know the values it requires and change V\$ accordingly. Let U\$ equal the telephone number and insert a comma for each pause as required by the Hayes modem.

The one-liner in line 6300 lets you log onto a telecommunications system automatically, send a few control codes, pause, send your name or ID, and wait for a particular byte before sending a password.

You should enter your log-on message in X\$. To send an ASCII character (nn), include '#nn/' in your message. To wait for byte CHR\$(nn), you should include '?nn/', and to pause, enter '#nn/' (nn is the delay in number of seconds).

If you'd rather not search for a telephone number, use the program in line 6500 to do the job for you and send it to

your modem. For example, you can enter a person's name, address, profession, and telephone number in U\$; the program will search for any key word and return with the telephone number in U\$ ready for an automatic dialing routine.

## Conversion Play

The next four programs convert decimal, hexadecimal (hex), and binary number systems. You can use them with data statements to PEEK or POKE memory or perform hex or binary mathematics.

The program in line 6605 converts decimal to hex, line 6615 converts hex to decimal, line 6621 converts decimal to binary, and line 6627 converts binary to decimal.

Line 6633 is a stand-alone program that lets you enter decimal data to get a hexadecimal printout of memory, 16 lines at a time, starting at the address you assign M. The routine in line 6637 lets you make the same memory PEEK, but since it accepts only hex input, you should run it with the decimal-to-hex conversion program in line 6605.

The program in line 6641 performs a function similar to the previous two programs, but it prints out in ASCII.

The routine in line 6647 POKES hex data statements into memory beginning at address M. Make sure you put spaces between your data statements and groups of bytes, and close the statement with END.

The routine in line 6700 converts to and from numerical bases from 2 to 24, and lets you enter numbers up to 1,000,000 decimal. If you use double-precision variables, you can enter much larger numbers. Enter your numbers in U\$ and the first base in B1. Enter the

## The Key Box

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**Models II and 100**  
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**32K RAM Disk Basic**

### Baud Rates:

Baud Rate	Value to Port 233 (OUT233,n)
110	34
300	85
1,200	119
2,400	170
4,800	204
9,600	238
19,200	255

### Bits and Parity:

Bits and Parity	Value to Port 234 (OUT234,n)
7/2/E	53
8/1/N	109
7/1/E	165

Table. Changes necessary to reconfigure UART with terminal program.

# CLONE I



# CLONE III

Dear Customer!

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Program Listing. 40 one-line Basic programs and subroutines.

```

10 *****
11 '          SELECTION OF ONELINE PROGRAMS AND
          ROUTINES WRITTEN FOR TRS-80 MODELS I/III/IV/II/100
          BY: HAROLD B. FINK
12 *****
14 '
16 '
18 '
5995 '***** TERMINAL PROGRAM *****
5996 ' 300 BAUD 7 BITS 1 STOP BIT EVEN PARITY
          CNTRL C (SH/DOWN ARR) TO RETURN
          BAUD RATE 110 300 1200 4800 9600
          OUT233,   34  85 119 204 238
                   E/7/1/  E/7/2/  N/8/1/
          OUT234,  165          109          53
5997 'VAR - IN:          OUT:          LOCAL:U,X,U$  MODELS:1,3,4
5999 '-----
6000 OUT232,0:OUT233,85:OUT234,165:FORX=0TOLSTEP0:IFINP(234)AND128
THENU=INP(235):IFU>1THENPRINTCHR$(U);U=0:NEXTELSENEXTELSEU$=INKEY
$:IFU$>"THENU=ASC(U$):IFU=3THENRETURNELSEIFINP(234)AND64THENOUT(2
35),ASC(U$):NEXTELSENEXTELSENEXT

6050 '***** TERMINAL 8561 UART *****
6051 OUT209,0:OUT209,0:OUT209,0:OUT209,64:OUT209,78:OUT209,7:OUT20
9,7:FORX=0TOLSTEP0:IFINP(209)AND2THENU=INP(208):IFU>1PRINTCHR$(U);
:U=0:NEXTELSENEXTELSEU$=INKEY$:IFU$>"THENU=ASC(U$):IFU=3RETURNELS
EIFINP(209)AND1OUT(208),ASC(U$):NEXTELSENEXTELSENEXT

6095 '***** SEND DISK FILE TO RS232 *****
6096 'WILL TRANSFER A DISK FILE TO SERIAL PORT AT 300 BAUD
          7 BITS, 1 STOP, EVEN PARITY. WILL CONTINUE TO END OF FILE.
6097 'VAR - IN:F$  OUT:          LOCAL:U,V,X,U$,V$  MODELS:1,3,4
6098 LINEINPUT"FILE NAME ";F$:IFF$>"THENGOSUB6100:GOTO6098ELSE609
8
6099 '-----
6100 OUT233,85:OUT234,165:OPEN"I",1,F$:FORX=0TOLSTEP0:IFEOF(1)THEN
RETURNELSELINEINPUT#1,V$:FORU=1TOLEN(V$):IFINP(234)AND64THENU$=MID
$(V$,U,1):OUT(235),ASC(U$):PRINTU$;:FORV=1TO10:NEXTV,U:OUT(235),13
:PRINT:NEXTX:CLOSE:RETURNELSENEXTU,X:CLOSE1:RETURN

6145 '***** LOAD FILE INTO MEMORY *****
6146 'MODELS:1,3,4
6150 FORX=0TOLSTEP0:IFINP(234)AND128THENU=INP(235):POKEM,U:M=M+1:P
RINTCHR$(U);:NEXTELSEU$=INKEY$:IFU$>"THENU=ASC(U$):IFU=7THENRETUR
NELSEIFINP(234)AND64THENOUT(235),U:NEXTELSENEXTELSENEXT

6195 '***** AUTO-DIAL MODEM *****
6196 'FOR USE WITH HAYES SMARTMODEM. TELEPHONE NUMBER IN U$
          MODEM WILL DIAL NUMBER AND HANG UP WHEN ENTER IS
          PRESSED.
6197 'VARIABLES - IN:U$  OUT:          LOCAL:X,Z,V$  MODELS:1,3,4
6198 LINEINPUT"ENTER TEL NO (111/111-1111) ";U$:IFU$>"THENGOSUB62
00:GOTO6198
6199 '-----
6200 OUT233,85:OUT234,165:V$="AT DT"+U$+CHR$(13)+CHR$(13):FORZ=1TO
LEN(V$):FORX=0TOLSTEP0:IFINP(234)AND64THENOUT235,ASC(MID$(V$,Z,1))
:NEXTZ:FORX=0TOLSTEP0:IFINKEY$=CHR$(13)THENOUT235,13:RETURNELSENEX
TELSENEXT

6295 '***** AUTO LOG ON *****
6296 'ROUTINE TO SEND A LOG ON MESSAGE IN X$ TO SERIAL PORT
          300/7/1/E. #XX/ = SEND ASCII CODE XX. ?XX/ WILL
          PAUSE UNTIL XX IS RECEIVED. I.E. X$="NAME#13/?15/
          PASSWORD=SEND 'NAME', WAIT FOR CHR$(XX), SEND PW.
          #-XX/ = PAUSE. -50 = 1SEC
6297 'VAR - IN:X$  OUT:          LOCAL:U-X,Z  MODELS:1,3,4
6298 OUT232,0:OUT233,85:OUT234,165:X$="#-200/#13/#13/#13/?61/D1#1
3/?64/A 123 45#13/ " :GOSUB6300:STOP
6299 '-----
6300 W=0:FORV=1TOLEN(X$):U=ASC(MID$(X$,V,1)):IFU=47W=0:NEXTELSEIFW
NEXTELSEZ=VAL(MID$(X$,V+1)):FORX=0TOL:X=0:IFZ<0Z=Z+1:NEXTELSEIFU=
63W=1:IFINP(234)AND128ANDINP(235)=ZNEXTVELSENEXTELSEIFINP(234)AND6
4IFU=35W=1:OUT235,Z:NEXTELSEOUT235,U:NEXTV:RETURNELSE1SEC
6350 U$="292-0320":GOSUB6200:X$="#-200/#13/#13/#13/?61/D1#13/?64/C
301 38#13/ " :GOSUB6300:STOP

6395 '***** AUTO DIAL & LOG ON *****
6396 'ROUTINE TO AUTODIAL HAYES AUTOMODEM AND UPON RECEIPT
          OF CARRIER CODE SEND A STRING OF CHARS. IF NO CARRIER
          IS DETECTED THEN PROGRAM HANGS UP PHONE AND RETURNS.
          DO NOT USE W/ HI SPEED MOD
6397 'VAR - IN:U$,W$  OUT:          LOCAL:U-Z,V$,X$  MODELS:1,3,4
6398 LINEINPUT"TELEPHONE NO ";U$:IFU$>"THENLINEINPUT"ENTER LOG ON
MESSAGE ";W$:GOSUB6400:GOTO6398ELSE6398

```

Listing continued

new base in B2 and the program returns the result in W\$.

## Input Routines

The subroutine in line 7000 places a specified number of light blocks on the screen without disturbing the existing display. It returns input in U\$ when you enter a carriage return or the specified number of characters. (The program does not print carriage returns or include them in U\$.) You can backspace to replace light blocks. The subroutine returns the length of input in Z.

To input a string anywhere on the screen using the light block program, add the following line to it:

```
PRINT@XX,;L=(length of input):GOSUB7000
```

If you need a numerical value, add:

```
U=VAL(U$)
```

The light block routine's structured loop (FOR X = 0 TO 1 STEP 0...) repeats each time the routine encounters a Next instruction. CHR\$(138) represents a light block and CHR\$(24) backs up the cursor one space. You can alter the light block character by changing its CHR\$ value.

The program in line 6750 converts hex strings (V\$) into machine-language strings (Z\$). To create the routine, fill V\$ with your hex code, followed by GOSUB 6750. The program ignores spaces between the bytes and returns the memory address of your machine-language string in M. Enter DEFUSR = M : X = USR(0) to run the program.

The program in line 6800 converts fractions to decimal equivalents, and the program in line 6850 converts decimal numbers (with up to three decimal places) to fractions with the lowest common denominator. Enter your numbers in U\$, and the program returns the decimal number in U and the fraction in W\$.

I've also written two input routines that use the light block routine. (You can make them stand alone by substituting LINEINPUT U\$ for GOSUB 7000.)

The first lets you enter and edit input by placing it into array T\$( ) (see line 7015). It returns the screen prompts for each input and the total length of the array in N. To edit, return to the routine without changing the value of N. If you press the enter key for any prompt, the routine displays the previous value. To edit new material, change N to zero.

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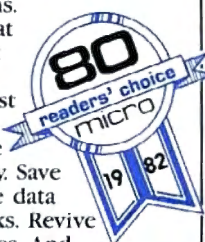
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```

6399 '-----
6400 OUT232,0:OUT233,85:OUT234,165:X$=CHR$(13):V$="ATV0S7=15DT"+U$
+X$:FOR Y=0T01:FOR Z=1T0LEN(V$):FOR X=0T01:X=0:IFINP(234)AND64=0NEXTX
ELSEU=ASC(MID$(V$,Z)):OUT235,U:NEXTZ:FORW=0T01:W=0:V=INP(235):IFV=
49V$=W$+X$:NEXTY:RETURNELSEIFV=51OUT235,13:RETURNELSENEXT

6495 '***** SEARCH TELEPHONE NO *****
6496 'PROGRAM TO SEARCH IN MEMORY STRING ARRAY FOR KEYWORDS.
      WHEN LOCATED CHECKS FOR TELEPHONE NUMBER. IF FOUND
      RETURNS WITH NUMBER IN U$ (READY FOR AUTO DIAL)
6497 'VAR - IN:V$,U$( ) OUT:V,U$,U$(V) LOCAL:U-X,Z MODEL:1,3,4
6498 CLEAR1000:DIMU$(21):U$(5)="JOHN SMITH 212/482-9876 DENTIST":U
$(6)="HAROLD KAYE 212/123-4567 PLUMBER":N=20:LINEINPUT"ENTER KEYWO
RDS ";V$:V$=V$+" ":GOSUB6500:PRINTU$:GOTO6498
6499 '-----
6500 Z=0:W=1:FORX=0T01:X=0:U=INSTR(W,V$, " ");IFU>0W$(Z)=MID$(V$,W,
U-W):W=U+1:Z=Z+1:NEXTELSEFORV=0T01:IFU$(V)=" " NEXT:RETURNELSEFOR Y=
0T0Z-1:IFINSTR(U$(V),W$(Y)) NEXT:PRINTU$(V):U=INSTR(U$(V),"-"):IFU
>0 U$=MID$(U$(V),U-7,12):RETURNELSENEXTV:RETURNELSENEXTV

6600 '***** DECIMAL TO HEXADECIMAL *****
6601 'PROGRAM TO CONVERT DECIMAL TO HEX. INPUT ANY NUMBER FROM
      1 TO 65535 OR INTEGER (-32768 TO +32767)
6602 'VAR - IN:U! OUT:U$ LOCAL:X,V$ MODEL:1,3,4,2,100
6603 INPUT"ENTER DECIMAL ";U!:GOSUB6605:PRINTU$:GOTO6603
6604 '-----
6605 V$="0123456789ABCDEF":U!=U!+((U!>0)AND(U!>32767))*65536:U$=MI
DS(V$, (U!AND-4096)/4096+1-(U!<0)*16,1)+MID$(V$, (U!AND3840)/255+1,1
)+MID$(V$, (U!AND240)/16+1,1)+MID$(V$, (U!AND15)+1,1):RETURN

6610 '***** HEX TO DEC *****
6611 'PROGRAM TO CONVERT HEX TO DECIMAL. INPUT ANY HEXIDECIMAL
      NUMBER FROM 1 TO FFFF
6612 'VAR - IN:U$ OUT:U! LOCAL:V$ MODELS:1,3,4,2,100
6613 INPUT"ENTER HEX ";U$:GOSUB6615:PRINTU!:GOTO6613
6614 '-----
6615 U$=RIGHT$( "0000"+U$,4):V$="0123456789ABCDEF":U!=(INSTR(V$,MID
$(U$,1,1))-1)*4096+(INSTR(V$,MID$(U$,2,1))-1)*256+(INSTR(V$,MID$(U
$,3,1))-1)*16+(INSTR(V$,MID$(U$,4,1))-1):RETURN

6616 '***** DEC TO BINARY *****
6617 'PROGRAM TO CONVERT DECIMAL TO BINARY. INPUT ANY DECIMAL
      NUMBER FROM 1 TO 65535 OR INTEGER (-32768 TO +32767)
6618 'VAR - IN:U! OUT:U$ LOCAL:V-Z MODELS:1,3,4
6619 INPUT"ENTER DEC ";U!:GOSUB6621:PRINTU$:GOTO6619
6620 '-----
6621 Y=0:U$=STRING$(16," "):U!=U!+((U!>0)AND(U!>32767))*65536:FORX
=1T016:V!=INT(2*((16-X)+.5)):V!=V!+(V!>32767)*65536:IFUANDV!MID$(U
$,X,1)="1":Y=2:NEXT:RETURNELSEIFV>0MID$(U$,X,1)="0":NEXT:RETURNELSE
NEXT

6622 '***** BINARY TO DECIMAL *****
6623 'PROGRAM TO CONVERT BINARY TO DECIMAL. INPUT ANY BINARY #
      UP TO 16 BITS (DEC 65535) USING 0'S AND 1'S
6624 'VAR - IN:U$ OUT:U! LOCAL:X MODELS:1,3,4
6625 INPUT"ENTER BINARY (USE 1 OR 0 UP TO 16 BITS) ";U$:GOSUB6627:
PRINTU!:GOTO6625
6626 '-----
6627 U!=0:U$=RIGHT$(STRING$(16,"0")+U$,16):FORX=1T016:IFMID$(U$,X,
1)="0"THENNEXT:RETURNELSEU!=U!+2*((16-X)):NEXT:RETURN

6628 '***** PEEK MEMORY *****
6629 'ROUTINE TO PRINT OUT MEMORY 16 BYTES PER DISPLAY LINE
      IN HEXADECIMAL, STARTING AT ADDRESS M. PRESS '@' TO END
6630 'VAR - IN:M,N OUT: LOCAL:U,W-Z,V$ MODELS:1,3,4
6631 INPUT"MEMORY STARTING ADDRESS (DEC) ";M:CLS:GOSUB6633:GOTO663
1
6632 '-----
6633 V$="0123456789ABCDEF":FORW1=MTO65536STEP16:IFINKEY$="@" RETUR
NELSEPRINTW!:TAB(10);:FORX=0T015STEP2:FOR Y=0T01:V1=W1+X+Y:V1=V1+(V
1>32767)*65536:U=PEEK(V1):PRINTMID$(V$, (UAND240)/16+1,1);MID$(V$, (
UAND15)+1,1);:NEXT:PRINT" ";:NEXT:PRINT:NEXT:RETURN

6634 '***** PEEK MEMORY 2 *****
6635 INPUT"MEMORY STARTING ADDRESS (HEX) ";U$:GOSUB6605:M=U1:CLS:G
OSUB6637:STOP 'MODELS: 1,3,4
6636 '-----
6637 V$="0123456789ABCDEF":FORW1=MTO65536STEP16:U!=W1:GOSUB6605:PR
INTU$;TAB(10);:FORX=0T015STEP2:FOR Y=0T01:V1=W1+X+Y:V1=V1+(V1>32767
)*65536:U=PEEK(V1):PRINTMID$(V$, (UAND240)/16+1,1);MID$(V$, (UAND15)
+1,1);:NEXT:PRINT" ";:NEXT:PRINT:NEXT:RETURN

```

Enter your prompts in V\$, separating each description with a slash (/) and ending with a prompt message. If you need numerical input, make the changes in line 7024.

The second program that uses the light block routine lets you enter a matrix of data (see line 7035). This is helpful for listing inventories and invoices. Enter the matrix headings in V\$ using the same format as the previous example. You can edit the headings by reentering the routine without changing the values in N or N1. The routine returns input values in the subscripted array U\$(X,Y).

The program in line 7045 lets you create labels and headings for your matrix. Y equals the average size of the columns across the page. Enter the number of columns in N and the number of rows in N1. Line 7054 displays the labels and headings you created.

The next subroutine produces a simple menu consisting of up to nine numbered lines and accompanying command or option descriptions (see line 7500). For example, the following entry would create the menu in the Figure:

```

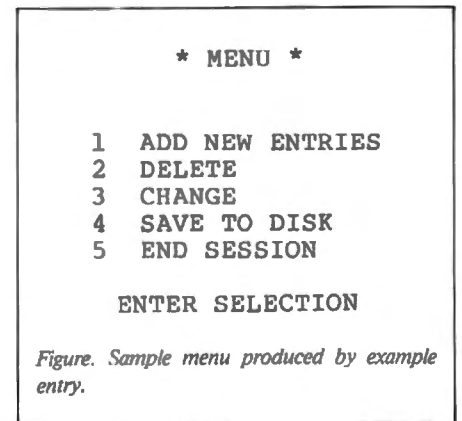
U$="ADD NEW ENTRIES/DELETE/
CHANGE/SAVE TO DISK/END SESSION/
ENTER SELECTION":GOSUB7500

```

The menu subroutine responds only to the number keys displayed on the screen and returns that number in U. To branch your program from there, add a GOSUB routine such as ON U GOSUB X X X X,X X X X,X X X X,X X X X,XXXX.

The program in line 7600 lets you assign control to specific keys. Pressing a control key sends the program to a designated line number. Enter the ASCII code for the control key in V\$(see line 7598) and the corresponding line number in the GOSUB routine.

Line 7700 contains a simple screen print routine. Enter the line you want the





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```

6638 '***** PEEK MEMORY - ASCII *****
6639 INPUT"MEMORY STARTING ADDRESS (HEX) ";U$:GOSUB6605:M=U!:CLS:G
OSUB6641:GOTO6639
6640 '-----
6641 FORW1=MT065536STEP32:U1=W1:IFINKEY$="@":THENRETURNELSEGOSUB660
5:PRINTU$:TAB(10);:FORX=0TO31:V1=W1+X:V1=V1+(V1>32767)*65536:U=PEE
K(V1):FORZ=0TO1:IFU<33ORU>90THENU=46:NEXTZELSEPRINTCHR$(U);:NEXTX:
PRINT:NEXTW1:RETURN
6642 '***** POKE HEX *****
6643 'ROUTINE TO POKE HEX TO MEMORY FROM DATA STATEMENTS
STARTING AT ADDRESS M
6644 'VAR - IN:M OUT: LOCAL:U-X,U$,V$ MODELS:1,3,4
6645 CLEAR 3000:INPUT"ENTER MEMORY ";M:GOSUB6647:GOTO6645
6646 '-----
6647 M=M+(M>32767)*65536:V$="0123456789ABCDEF":FORV=0TO1STEP0:READ
U$:IFU$="END" RETURNELSEFORW=1TOLEN(U$):IFMID$(U$,W,1)="*" NEXTWEL
SEU=0:FORX=0TO1:V=INSTR(V$,MID$(U$,W+X,1))-1:U=U+V+V*(1-X)*15:NEXT
X:POKEM,U:M=M+1:W=W+1:NEXTW,V:RETURN
6648 'DATA AE15 D673 EE03 F1A9,END
6695 '***** TRANSFER TO/FROM ANY BASE *****
6696 'ROUTINE TO TRANSFER TO AND FROM ANY NUMERICAL BASE (2-24).
MAXIMUM VALUES ARE FFFF HEX AND 999999 DEC
I.E. ENTER 111001,2,8 TO CONVERT FROM BINARY TO OCTAL
OR FED0,16,10 TO CONVERT FROM HEX TO DECIMAL
6697 'VAR - IN:U$,B1,B2 OUT:W$ LOCAL:U-Z,V$
MODELS:1,3,4,2,100
6698 INPUT"NUMBER,BASE,NEW BASE ";U$,B1,B2:GOSUB6700:PRINTW$:GOTO6
698
6699 '-----
6700 V$="0123456789ABCDEFGHIJKLMN":U1=0:FORX=1TOLEN(U$):V=INSTR(V$,
MID$(U$,X,1))-1:U1=U1+V*B1[(LEN(U$)-X):NEXT:W$="":X=0:Z1=U1+.2:FO
RW=0TO1STEP0:X=X+1:IFZ1>B2[XTHENNEXTELSEFORY=X-1TO0STEP-1:V=INT(Z1
/B2[Y]:W$=W$+MID$(V$,V+1,1):Z1=Z1-V*B2[Y:NEXTY:RETURN
6745 '***** HEX TO STRING *****
6746 'ROUTINE TO LOAD STRING Z$ WITH MACHINE LANGUAGE PROGRAM.
V$ CONTAINS HEX CODE Z$ WILL CONTAIN M/L ROUTINE. IF
V$ = "" PROGRAM WILL RETURN WITH STARTING ADDRESS OF
M/L PROGRAM (MUST BE RELOCATABLE) IN M.
6747 'VAR - IN:V$ OUT:M,Z$ LOCAL:U,V,X,Y,Z MODELS:1,3,4
6748 V$="3E2A 21003C 0600 77 23 05 20FB C9":Z$="":GOSUB6750:INPUT"
PRESS ENTER TO RUN ";U:V$="":GOSUB6750:DEFUSR=M:X=USR(0):END
6749 '-----
6750 Z=LEN(V$):Z$=Z$+STRING$(Z/2,32):M=PEEK(VARPTR(Z$)+2)*256+PEEK
(VARPTR(Z$)+1):M=M+(M>32767)*65536:IFZFORX=1TOZ:U=0:FORY=0TO1:V=IN
STR("0123456789ABCDEF",MID$(V$,X+Y,1))-1:IFV<0NEXTXELSEU=U+V+(1-Y)
*15:V:NEXT:X=X+1:POKEM,U:M=M+1:NEXTX:RETURNELSERETURN
6795 '***** FRACTION TO DEC *****
6796 'CONVERT FRACTIONS TO DECIMAL. INPUT FRACTIONS WITH SPACE
BETWEEN WHOLE NUMBER AND FRACTION I.E. 23 3/17
6797 'VAR - IN:U$ OUT:U! MODELS:1,3,4,2,100 LOCAL:V-W,Y,Z
6798 LINEINPUT"ENTER FRACTION (XXX YY/Z) ";U$:GOSUB6800:PRINTU!:G
OTO6798
6799 '-----
6800 V=INSTR(U$, " "):Y=VAL(MID$(U$,V+1)):W=INSTR(U$, "/"):IFW=0THEN
RETURNELSEZ=VAL(MID$(U$,W+1)):U!=Y/Z:IFV>0THENU!=VAL(LEFT$(U$,V-1
))+U!:RETURNELSERETURN
6845 '***** DEC TO FRACTION *****
6846 'CONVERT DECIMAL TO FRACTION UP TO 3 DECIMAL PLACES
RESULT WILL BE IN THE LOWEST COMMON DENOMINATOR
6847 'VAR - IN:U$ OUT:W$ LOCAL:U-Z MODELS:1,3,4,2,100
6848 LINEINPUT"ENTER DECIMAL (XX.XXX) ";U$:GOSUB6850:PRINTW$:GOTO6
848
6849 '-----
6850 U=INT(VAL(U$)):V=INSTR(U$, "."):IFV=0THENRETURNELSEY1=VAL(MID$(
U$,V)):Y1=INT(Y1*1000):FORX=1TOY1:FORZ=0TO1:IFW<XANDY1/X=INT(Y1/
X)AND1000/X=INT(1000/X) THENW=X:NEXTZELSENEXTX:W$=STR$(U)+STR$(Y1/
X)+"/"+MID$(STR$(1000/W),2):RETURN
6995 '***** INPUT ROUTINE *****
6996 'INPUT ROUTINE - PLACES L LIGHT BLOCKS ON SCREEN
PERMITS A MAX OF L CHARACTERS INPUT
WILL ACCEPT ALL CONTROL CHAR (EXCL CNTRL A)
6997 'VARIABLES - IN:L OUT:U$ LOCAL:U,X,Z,W$ MODELS:1,3,4
6998 L=10:GOSUB7000:PRINTCHR$(30):PRINTU$:GOTO6998
6999 '-----
7000 U$="":Z=0:PRINTSTRING$(L,130)STRING$(L,24);:FORX=0TO1STEP0:W$
=INKEY$:IFW$="*" NEXTELSEU=ASC(W$):IFU=8ANDZ:Z=Z-1:U$=LEFT$(U$,Z):P
RINTCHR$(24)CHR$(138)CHR$(24);:NEXTELSEIFU=8NEXTELSEZ=Z+1:IFU=13RE
TURNELSEPRINTW$;:U$=U$+W$:IFL=LORZ=LRETURNELSENEXT

```

Listing continued

program to begin printing at in U. Press the control key (@) to stop printing.

The next routine lets you move the cursor around the screen using the arrow keys, without disturbing the existing display (see line 7800). If you press a key other than an arrow key, the routine returns with the screen location in Z.

Since the previous program can't stand alone, I've included two example applications. The first lets you create a screen display and save it in an array. You can recall the screen at any time or save it to disk:

```

1000 CLS:V=0:FORI=0TO1STEP0:GOSUB
7800:X=X+2:V=V+1:U(V)=Z:
W$=U$:FORJ=0TO1STEP0:U$=INKEY$:
IFU$=""NEXTELSEU=ASC(U$):
IFU=13U$(V)=W$:GOTO2000:ELSEIF
U<32ORU>90U$(V)=W$:NEXTIELSE
IFU=8PRINTCHR$(24);:W$=LEFT$(W$,
LEN(W$)-1):NEXTELSEPRINTU$;:W$=W$
+U$:X=X+1:NEXT

```

The second application prints a directory (under most DOSes) and lets you run a Basic program by placing the cursor to the left of, or on the first character of, the program name, and pressing the R key (this is similar to the program in line 7820):

```

2000 CLS:PRINT@525,"PRESS ENTER TO
RECALL DISPLAY ";:INPUTU:CLS:FORI=
1TOV:PRINT@U(I)+1,U$(I);:NEXT:FORJ=
0TO1STEP0:NEXT

```

The following one-liner lets you display a library of your programs on a disk a page at a time and run them by simply pressing a key (see line 7900). The routine displays nine lines per page for an unlimited number of pages. To enter a new program, add the description and program name in a data statement and place two commas after the last entry. The routine responds only when you press the enter key or enter a line number appearing on the screen.

## Pick a Date

The program in line 8200 is a perpetual calendar you can insert into your Basic programs to give you the day of the week and date for plus or minus 100 years. The program in line 8350 displays and prints a calendar for any month and year from 1900 to 2100.

The program in line 8400 is a pulse-dialer. It lets you dial a telephone number (not for a modem) from your computer. Just hook up the telephone to your cassette port.

Line 8800 performs a high-low binary search of ordered arrays.

The next three one-liners determine

Continued on p. 62

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record size, open random disk files, set up individual subrecords, and field records automatically. With a little work, these simple programs could serve as the cornerstone of a data-base system.

You should enter the length and name of each field in U\$, such as:

```
"IONAME/20ADDRESS/15CITY/02STATE/
05ZIP/12TELEPHONE/"
```

and put the file name in F\$. Make sure you press 3V when you enter Basic. If you need more than 10 fields, remember to dimension the U( ) and US( ) arrays. Once you run this routine, you can get or put any record number and read or write any field from within the US( ) array.

The routine in line 9098 configures a random disk file, the routine in line 9100 sets individual field sizes, and the input routine in line 7000 prompts for input in each field and saves and recalls entries by record number. You can add a few additional one-liners, such as the binary search routine in line 8800, to create a full indexed sequential access method (ISAM) data-base manager.

The next two routines let you separate a string (U\$) into individual key words and search a disk file for an input line or sector containing all the key words. The routine in line 9200 searches random files, and the routine in line 9300 searches sequential files. Enter the key words, separated by a space, in U\$, end with a space, and enter the file name in F\$.

I fielded each sector into two 128-byte subrecords in the random file routine because strings in a Disk Basic file can be no longer than 255 bytes, one less than a disk sector.

The program in line 9400 indicates the number of words (W), the number of bytes (U), and the average word size ((U - W)/W) in an ASCII text file. Just enter the file name in F\$.

To format a printout for an ASCII or Scripsit file, use the program in line 9450. It lets you assign the left margin (T), and minimum line width (L) without splitting words.

To print a program listing, use the one-liner in line 9500. Set the line width in W and the program provides hanging indents for line numbers.

The last one-liner of the bunch lets you create an ASCII file from scratch (see line 9600). I use this program to build do-files. ■

Contact Harold B. Fink at 8 N. Drive, Great Neck, NY 11021.

```
7010 ***** INPUT LIST *****
7011 'ROUTINE TO PROMPT FOR AND ACCEPT A SERIES OF INPUTS
      INTO AN ARRAY T$( ). SIZE OF ARRAY WILL BE RETURNED
      IN N. WILL ALSO PERMIT EDITING OF AN EXISTING
      T$( ) ARRAY (IF N>0). ROUTINE USES LINE 7000 ROUTINE
7012 'VAR -IN:V$,KBD OUT:T$(N),N LOCAL:U-Z,U1,W$,X$ MODEL:1,3,4
7013 V$="NAME/ADDRESS/CITY/STATE/ZIP/TELEPHONE/":GOSUB7015:INPUTU:
GOTO7013
7014 '-----
7015 CLS:PRINT@271,,:X$=CHR$(30):L=15:Y=0:W=1:FORU=0TOLSTEP0:V=IN
STR(W,V$,"/"):IFV=0N=Y:RETURNELSEPRINTTAB(15)MID$(V$,W,V-W);TAB(28
);:Y=Y+1:W=V+1:GOSUB7000:IFU$>" PRINTX$:T$(Y)=U$:NEXT:N=Y:RETURNE
LSEIFY<=NPRINTT$(Y)X$:NEXTELSEIFN<Y N=Y:RETURN

7020 ***** INPUT LIST - NUMERICAL *****
7021 'SAME ROUTINE AS 7400 EXCEPT FOR NUMERIC INPUT ONLY.
      T( ) ARRAY IS USED
7022 'VAR -IN:V$,KBD OUT:T$(N),N LOCAL:U-Z,U1,W$,X$ MODEL:1,3,4
7023 '-----
7024 CLS:PRINT@271,,:X$=CHR$(30):L=15:Y=0:W=1:FORU=0TOLSTEP0:V=IN
STR(W,V$,"/"):IFV=0N=Y:RETURNELSEPRINTTAB(15)MID$(V$,W,V-W);TAB(27
);:Y=Y+1:W=V+1:GOSUB7000:IFU$>" PRINTX$:T(Y)=VAL(U$):NEXT:N=Y:RET
URNELSEIFY<=NPRINTT(Y)X$:NEXTELSEIFN<Y N=Y:RETURN

7030 ***** MATRIX INPUT *****
7031 'ROUTINE TO INPUT AND EDIT A MATRIX U$(X,Y). THE HEADINGS
      ACROSS TOP ARE INPUT IN U$ STRING WITH EACH COLUMN
      LABEL SEPARATED BY AN '/'. TO END ENTER 'E' IN ANY
      COLUMN. ROWS 0 TO N-1 COLUMNS 1 TO N1
7032 'VAR - IN:V$ OUT:U$(X,Y),N,N1 LOCAL:V,W,Y,U$
      ODELS:1,3,4,2
7033 V$="NAME/ADDRESS/CITY/STATE/ZIP/":GOSUB7035:GOSUB7054:INPUTU:
GOTO7033
7034 '-----
7035 CLS:W=1:FORN=0TO99:V=INSTR(W,V$,"/"):IFVTHENPRINTTAB(12*N)MID
$(V$,W,V-W);:W=V+1:NEXTELSEL=10:W=0:FORV=0TOLSTEP0:W=W+1:PRINT:FOR
V=0TON-1:PRINTTAB(12*V);:GOSUB7000:IFU$>"E"ORN1=WTHENN1=W:RETURNEL
SEIFU$>" U$(W,V)=U$:NEXTV,YELSEPRINTU$(W,V);:NEXTV,Y

7040 ***** MATRIX INPUT LABELS & HEADINGS *****
7041 'WILL INPUT A MATRIX U$(X,Y) OF UP TO 64/Y ACROSS AND ANY
      NO DOWN UNTIL 'E' IS ENTERED.: 0-N ACROSS & 0-N1 DOWN.
      WILL PRINT OUT EXISTING MATRIX (IF N>0)
7042 'VAR - IN: OUT:N,N1,U$(N,N1) LOCAL:V-Y,U$
      MODELS:1,3,4,2
7043 CLEAR3000:N=0:GOSUB7045:GOSUB7045:PRINT:INPUTU:GOTO7043
7044 '-----
7045 CLS:Y=10:IFNTHENFORX=0TON1:FORV=0TON:PRINTTAB(Y*V)U$(X,V);:NE
XTV:PRINT:NEXTX:RETURNELSEL=7:FORV=0TO64/Y-1:PRINTTAB(Y*V);:GOSUB7
000:U$(0,V)=U$:NEXT:N=N+1:PRINT:W=1:FORX=0TOLSTEP0:GOSUB7000:IFU$=
"E"ORN1=WTHENN1=W:RETURNELSEU$(W,0)=U$:W=W+1:PRINT:NEXT

7050 ***** PRINT MATRIX OUTPUT *****
7051 'ROUTINE TO DISPLAY (FOR PRINTER CHANGE ALL PRINTS TO
      LPRINTS) A MATRIX U$(X,Y). HEADINGS ACROSS TOP ARE INPUT
      IN V$ N1 = NO OF ROWS
7052 'VAR - IN:V$ OUT: LOCAL:U-X,Z MODELS:1,3,4,2
7053 '-----
7054 CLS:W=1:FORX=0TO99:V=INSTR(W,V$,"/"):IFVTHENPRINTTAB(12*X)MID
$(V$,W,V-W);:W=V+1:NEXTELSEPRINT:FORU=1TON1:FORZ=0TOX-1:PRINTTAB(1
2*Z)U$(U,Z);:NEXTZ:PRINT:NXTU:RETURN

7495 ***** MENU *****
7496 'ROUTINE TO DISPLAY MENU ON SCREEN AUTOMATICALLY
      CENTERED. CAN BE USED FOR UP TO 9 LINES.
      SELECTION NUMBER WILL BE RETURNED IN U
7497 'VAR - IN:U$ OUT:U LOCAL:V-Z MODELS:1,3,4
7498 Y=8:U$="LINE1/LINE2/LINE3/LINE4/LINE5/LINE6/LINE7/LINE8/ENTER
      LINE NO":GOSUB7500:PRINT:PRINTU:STOP
7499 '-----
7500 CLS:PRINT@92,"* MENU *":PRINT@INT((17-Y)/2)*64+9,,:W=1:Z=1:F
ORX=0TOL:X=0:V=INSTR(Z,U$,"/"):IFVTHENPRINTTAB(10)W "HID$(U$,Z,V-
Z):W=W+1:Z=V+1:NEXTELSEPRINT:PRINTTAB(20)MID$(U$,Z);:FORX=0TOLSTEP
0:U=VAL(INKEY$):IFU<LORU>W-1THENNEXTELSEPRINTU:;RETURN

7595 ***** KEYBOARD CONTROL *****
7596 'KEYBOARD ROUTINE SEEKS REPOSE ONLY FROM SELECTED KEYS
      AND DIRECTS EACH TO ITS OWN SUBROUTINE. V$ CONTAINS
      VALUES OF SELECTED KEYS (ASCII OR ALPHA) EACH SEPARATED
      WITH A '/'. FOR PROG TO RESPOND TO BKSPCE,CLR,'A' THEN
      V$="8/31/A/"
7597 'VAR - IN:V$ OUT: LOCAL:U-Y,U$,W$ MODELS:1,3,4
7598 V$="8/10/9/91/25/0/32/E/":GOSUB7600:INPUTZ:GOTO7598
7599 '-----
7600 W$="":W=1:FORX=0TOLSTEP0:V=INSTR(W,V$,"/"):IFV:U$=MID$(V$,W,V
```

Listing continued

Listing continued

```
-W):W=V+1:U=VAL(U$):IFU:W$=W$+CHR$(U):NEXTELSEW$=W$+U$:NEXTELSEFOR
Y=0TOLSTEP0:U$=INKEY$:IFU$="" NEXTELSEU=INSTR(W$,U$):ONUGOSUB7650,
7650,7650,7650,7650,7650,7650,7650:NEXTELSEGOSUB7650:NEXT
7650 PRINT"SUBROUTINE LINE NO"U+7649:RETURN
```

```
7695 '***** SCREEN PRINT *****
7696 'ROUTINE TO PRINT SCREEN STARTING AT LINE U.
PRESS '@' TO STOP.
7697 'VAR - IN: OUT: LOCAL:W-Z MODELS:1,3,4
7698 PRINT@960,"PRINT FROM LINE ";:L=2:GOSUB7000:U=VAL(U$):GOSUB77
00:GOTO7698
7699 '-----
7700 FORX=(U-1)*64*(U>1)TO960STEP64:IFINKEY$=""THENRETURNELSEFOR
Y=0TOLSTEP0:Z=PEEK(15360+X+Y):Z=Z-(Z<32)*64:LPRINTCHR$(Z);:NEXTY:LPRIN
T" ":NEXTX:RETURN
```

```
7795 '***** SCREEN CONTROL *****
7796 'ROUTINE FOR MOVING CURSOR ABOUT SCREEN USING ARROW KEYS
WILL RETURN WITH SCREEN LOCATION Z WHEN ANY OTHER KEY
IS DEPRESSED. USE CLR KEY TO DELETE CHARS
7797 'VAR - IN: OUT:Z LOCAL:U,W-Y,U$ MODELS:1,3,4
7798 CLS:FORN=1TO200:GOSUB7800:PRINT@Y*64+X,U$;:U(N)=Z-15360:W$=U$
:FORW=0TOLSTEP0:U$=INKEY$:IFU$="" NEXTELSEU=ASC(U$):IFU=31PRINTCHR
$(0);:W$=LEFT$(W$,LEN(W$)-1):NEXTELSEIFU=13U$(N)=W$:GOTO7820ELSEIF
U<32ORU>90U$(N)=W$:NEXTELSEPRINTU$;:W$=W$+U$:X=X+1:NEXTW
7799 '-----
7800 FORW=0TOLSTEP0:Z=Y*64+X+15360:V=PEEK(Z):POKEZ,62:FORQ=0TOLSTE
P0:U$=INKEY$:IFU$="" NEXTELSEU=ASC(U$):V=V-(V<32)*64:POKEZ,V:IFU=
10ANDY<15Y=Y+1:NEXTELSEIFU=9LANDY>0Y=Y-1:NEXTELSEIFU=8ANDX>0X=X-
1:NEXTELSEIFU=9ANDX<62X=X+1:NEXTELSERETURN
7801 '
7820 CLS:PRINT@525,"PRESS ENTER TO DISPLAY SCREEN ";:INPUTU:CLS:FO
RI=1TON:PRINT@U(I)+1,U$(I);:NEXT:FORJ=0TOLSTEP0:NEXT
```

```
7845 '***** SCREEN CONTROL 2 *****
7846 'EXAMPLE APPLICATION FOR SCREEN CONTROL ROUTINE ( 7800)
FOR USE WITH ANY DOS WHICH SUPPORTS 'CMD"DIR" OR EQUIV
PLACE POINTER NEXT TO OR ON 1ST CHAR. PRESS 'R' TO RUN
7849 '-----
7850 W$="" :CMD"DIR":W=0:FORI=0TOLSTEP0:GOSUB7800:POKEZ,V:IFU<82NE
XTIELSEFORJ=0TOL3:V=PEEK(Z+J):V=V-(V<32)*64:IFV<>32W$=W$+CHR$(V):W
=2:NEXT:RUN W$ELSEIFW=0NEXTELSERUN W$
```

```
7895 '***** PROGRAM DIRECTORY *****
7896 'ROUTINE TO MAINTAIN & DISPLAY CATALOG OF PROGRAMS.
NINE NUMBERED LINES PER SCREEN PAGE. UNLIMITED
NO OF PAGES. ENTER LINE NO TO RUN A PROGRAM.
DESCRIPTIONS & PROGRAM NAMES IN DATA STATEMENTS
7897 'VAR - IN: OUT: LOCAL:U-W,Y,Z,U$,V$,V$() MODEL:1,3,4
7898 CLEAR1000:GOSUB7900:GOTO7898
7899 '-----
7900 CLS:FORY=1TO20:IFY<10READV$,V$(Y):IFV$="" Y=10:NEXTELSEPRINT@
Y*64+212,Y,V$:W=Y:NEXTELSEPRINT@W*64+286,"SELECT NO ";:FORZ=0TOL:Z
=0:U$=INKEY$:IFU$="" NEXTELSEU=VAL(U$):IFU>0ANDU<=VRUNV$(U)ELSEIFA
SC(U$)<>13NEXTELSECLS:Y=0:IFV$="" RESTORE:NEXTYELSENEXTY
7901 '
7910 DATA DESCRIPTION 1,PROGRAH 1,DESCRIPTION 2,PROGRAM 2,AAA,AAA,
BBB,BBB,CCC,CCC,DDD,DDD,EEE,EEE,FFF,FFF,GGG,GGG,HHH,HHH,III,III,JJ
J,JJJ,,
```

```
8195 '***** CALCULATE DAY OF WEEK & DATE *****
8196 'ROUTINE THAT WILL RETURN DAY OF THE WEEK, DATE
8197 'VAR - IN:H,D,Y OUT:D1,W!,U$ LOCAL:U,V,X
MODELS:1,3,4,2,100
8198 CLS:PRINT:PRINT:INPUT"MM,DD,YYYY ";M,D,Y:GOSUB8200:PRINTU$;Y
:INPUTU:GOTO8198
8199 '-----
8200 U=(M<3)*-1:V=1-(M<3)*12:W1=INT(365.25*(Y-U))+INT(30.6*(M+V))+
D-621049:D1=INT((W1/7-INT(W1/7))*7+.5):U$=MID$("SUNMONTUEWEDTHUFRI
SAT",D1*3+1,3)+" "+MID$(" JANFEBMARAPRMAJUNJULAUGSEPOCTNOVDEC"
,M*3+1,3)+STR$(D)+"":RETURN
```

```
8295 '***** PRINT CALENDAR *****
8296 'ROUTINE TO PRINT OUT A CALENDAR FOR ANY MONTH AND YEAR
FROM 1900 TO 2100 AND USED IN CONJUNCTION WITH LINE
8200 ROUTINE
8297 'VAR - IN:Z,N3 OUT: LOCAL:W,V$,W$ MODELS:1,3,4,2
8298 INPUT"MM,YYYY ";M,Y:D=1:GOSUB8200:W$=MID$(U$,6,3)+STR$(Y):D4=
D1:D3=W!:M=M+1:FORX=0TOL:IFH>12THENM=1:Y=Y+1:NEXTELSEGOSUB8200:N3
=W1-D3I:Z=D4:GOSUB8300:PRINT:GOTO8298
8299 '-----
8300 CLS:PRINT@26,W$:PRINT:Z=Z+1:V$="##":PRINTTAB(7)"SUN MON
TUE WED THU FRI SAT":PRINT:PRINTTAB(3+7*(Z-1));:FORW=
1TON3:PRINT" ";:PRINTUSINGV$,W;:IFZ/7=INT(Z/7)THENPRINT:PRINT:
PRINT" ";:Z=Z+1:NEXT:RETURNELSEZ=Z+1:NEXT:RETURN
```

Listing continued

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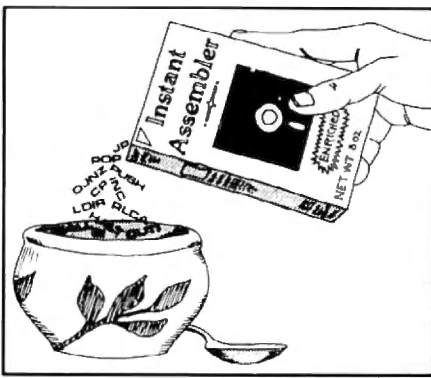
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Listing continued

```
8345 '***** PRINT CALENDAR *****
8346 'STAND ALONE ROUTINE TO PRINT OUT CALENDAR FOR ANY MONTH
      AND YEAR FROM 1900 TO 2100.
8347 'VAR - IN:M,Y      OUT:      LOCAL:U-Z      MODELS:1,3,4
8348 PRINT:PRINT"INPUT"ENTER MM,YYYY ";M,Y:CLS:PRINTTAB(10)M"/"Y:G
OSUB8350:GOTO8348
8349 '-----
8350 W=INT(15.25*(Y+(M<3)))+INT(2.6*(M+1-(M<3)*12))-1:Z=INT((W/7-I
NT(W/7))*7+.5):V=VAL(MID$("303232332323",M,1))+(M=2)*(Y=INT(Y/4)*4
)+28:PRINT" SUN MON TUE WED THU FRI SAT":PRINTTAB(4*Z);FORX=1TOV
:PRINTUSING"###";X;:U=Z+X:LFU/7=INT(U/7)PRINT:NEXTELSNEXT
8351 GOTO8348
```

```
8395 '***** TELEPHONE DIALER *****
8396 'PULSE TELEPHONE DIALER USING PORT 255 (CASSETTE).
      REQUIRES INTERFACING PORT WITH PHONE DIALER
8397 'VAR - IN:U$      OUT:      LOCAL:U-Z,V$      MODELS:1,3,4
8398 PRINT"ENTER TELEPHONE NO (000/000-0000) ";:W=12:GOSUB7000:PRI
NT:GOSUB8400:PRINT:GOTO8398
8399 '-----
8400 V$="1234567890/- ";FORU=1TOLEN(U$):FORV=1TO50:NEXTV:W$=MID$(U
$,U,1):PRINTW$;X=INSTR(V$,W$):IFX>10:FORW=1TO100:NEXTW:U=RETURNE
LSEFORW=1TOX:Z=4:FORY=1TO2:OUT255,Z:FORV=1TO5:NEXTV:Z=0:NEXTY,W,U:R
ETURN
```

```
8795 '***** BINARY SEARCH *****
8796 'BINARY SEARCH OF AN ARRAY N$( ) FOR A MATCHING
      KEYWORD U$. IF FOUND Z=ARRAY NO. IF NOT Z=-1
      N=LENGTH OF ARRAY
8797 'VAR = IN:N,U$,N$(N)      OUT:Z      LOCAL:U,X,V$
      MODELS:1,3,4,2,100
8798 CLEAR3000:DEFINTA-Z:DIMN$(30):N=20:FORI=1TON:N$(I)=CHR$(I+64)
+"AAAA":NEXT:PRINT"ENTER KEY ";:W=5:GOSUB7000:PRINT:GOSUB8800:IFZ>
0THENPRINT"ARRAY #"Z:PRINTN$(Z):GOTO8798ELSEPRINT"CANNOT BE FOUND
":GOTO8798
8799 '-----
8800 U=1:W=N:FORX=0TOLSTEP0:IFW<UTHENZ=-1:RETURNELSEZ=INT((U+W)/2)
:V$=LEFT$(N$(Z),LEN(U$)):IFU$<V$THENW=Z-1:NEXTELSEIFU$>V$THENU=Z+1
:NEXTELSEFORX=0TOLSTEP0:IFZANDU$=LEFT$(N$(Z-1),LEN(U$))THENZ=Z-1:N
EXT:RETURNELSERETURN
```

```
9095 '***** OPEN & FIELD RANDOM FILE *****
9096 'PROGRAM TO OPEN DISK FILE F$, CALCULATE RECORD SIZE
      AND SET UP FIELD NAMES AND SIZES FROM STRING X$
9097 'VAR - IN:F$,X$      OUT:Z,U(X),U$(X)      LOCAL:U,W,X,V$(?)
      MODELS:1,3,4
9098 CLEAR3000:CLS:X$="15NAME/20ADDRESS/02STATE/":LINEINPUT"FILE N
AME ";F$:IFF$>"GOSUB9100:FORJ=0TOLSTEP0:INPUT"REC # ";F:IFF>0GET1
,F:FORI=0TOV-1:PRINTV$(I)";:IFF<=LOP(1)PRINTU$(I):NEXTI,JEJSEL=J
(I):GOSUB7000:LSETU$(I)=U$:PRINT:NEXTI:PUT1,F:NEXTELSNEXTJ
9099 '-----
9100 Z=0:W=1:FORX=0TOLSTEP0:U=INSTR(W,X$,"/"):IFUTHENU(V)=VAL(MID$(
X$,W)):V$(V)=MID$(X$,W+2,U-W-2):Y=Y+U(V):W=U+1:V=V+1:NEXTELSEOPEN
"R",1,F$,Y:W=0:FORX=0TOV-1:FIELD1,W*1AS U$,U(X)ASU$(X):W=W+U(X):NE
XTX:RETURN
```

```
9195 '***** SCAN RANDOM FILE FOR KEYWORDS *****
9196 'PROGRAM WILL SEPARATE ONE OR MORE KEYWORDS IN STRING U$
      AND LOCATE ALL SECTORS IN RANDOM FILE F$ THAT CONTAIN
      ALL THE KEYWORDS
9197 'VAR - IN:F$,U$      OUT:U$      LOCAL:U-X,Z,W$( )
      MODELS:1,3,4,2
9198 CLEAR3000:LINEINPUT"FILE NAME ";F$:IFF$>"THENLINEINPUT"ENTER
KEYWORDS (XXXX YYYY ZZZZ) ";U$:U$=U$+" ";:GOSUB9200:GOTO9198ELSE91
98
9199 '-----
9200 Z=0:W=1:FORX=0TOLSTEP0:V=INSTR(W,U$," ");IFVTHENW$(Z)=MID$(U$
,W,V-W):W=V+1:Z=Z+1:NEXTELSEOPEN"R",1,F$:FORX=1TOLOP(1):GET1,X:FOR
U=0TOL:FIELD1,U*128ASW$,128ASU$:FORW=0TOZ-1:IFINSTR(U$,W$(W))THENH
EXTW:PRINTU$:NEXTU,X:CLOSE:RETURNELSENEXTU,X:CLOSE:RETURN
```

```
9295 '***** SCAN SEQUENTIAL FILE FOR KEYWORDS *****
9296 'PROGRAM WILL SEPARATE ONE OR MORE KEYWORDS IN STRING U$
      AND LOCATE ALL LINES IN A SEQUENTIAL FILE F$ THAT
      CONTAIN ALL THE KEYWORDS
9297 'VAR - IN:F$,U$      OUT:U$      LOCAL:U-X,Z,W$( )
      MODELS:1,3,4,2
9298 CLEAR3000:LINEINPUT"FILE NAME ";F$:IFF$>"THENLINEINPUT"ENTER
KEYWORDS (XXXX YYYY ZZZZ) ";U$:U$=U$+" ";:GOSUB9300:GOTO9298ELSE92
98
9299 '-----
9300 Z=0:W=1:FORX=0TOLSTEP0:U=INSTR(W,U$," ");IFUTHENW$(Z)=MID$(U$
```

Listing continued



# NICE<sup>(tn)</sup>

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Visicalc menu

Main Menu

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2.	10. Utilities
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=> \_\_\_\_\_

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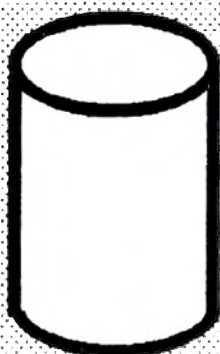
### Visicalc<sup>(tn)</sup> interface

	A	B	C
1	Description	Date	Amount
2			
3	Supplies	08/15/83	\$27.86
4	Parking	08/20/83	\$15.00
5	Shopping	08/20/83	\$73.20
6		Total:	\$116.06
7			
8			
9			

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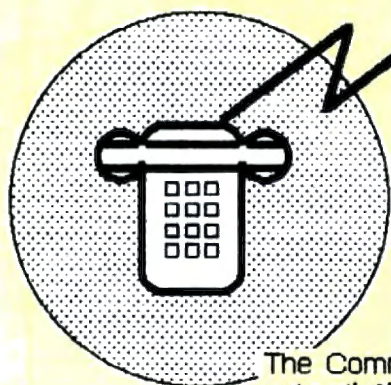


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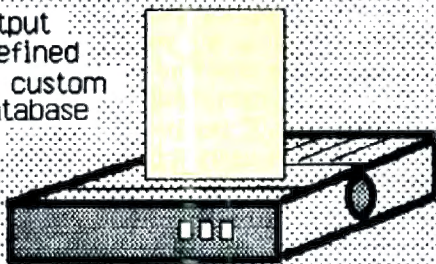
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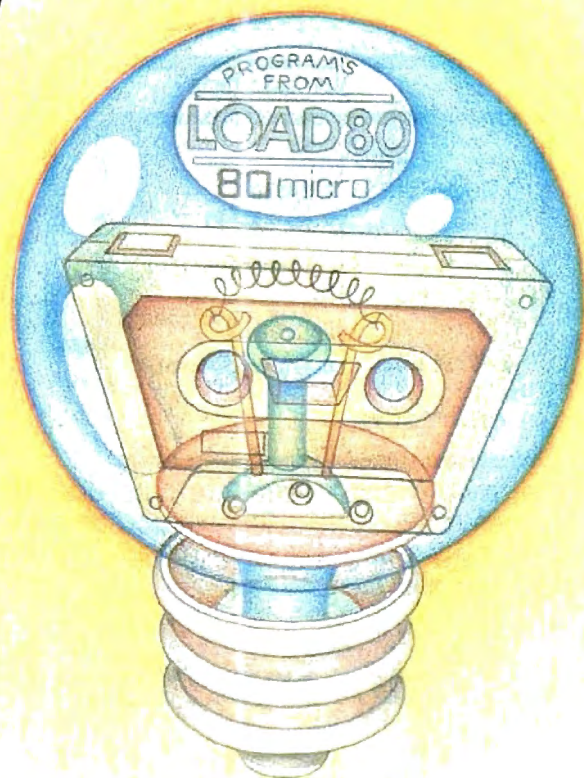
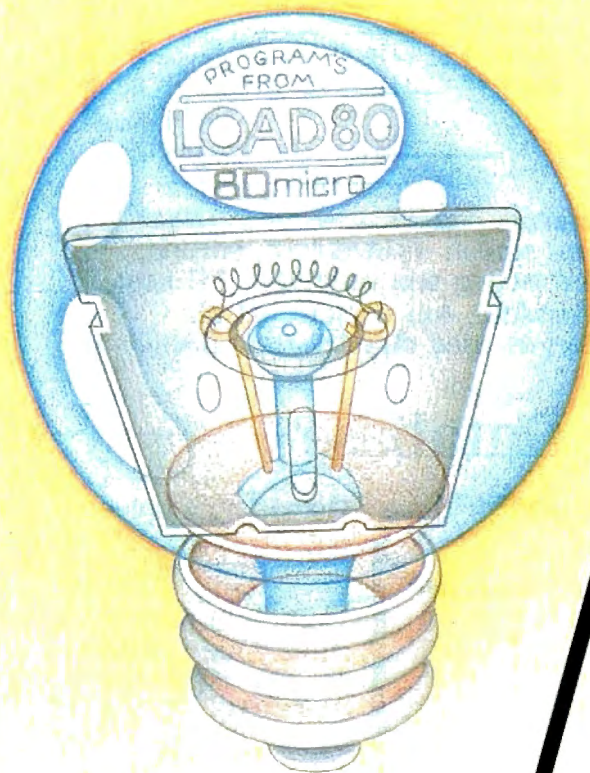


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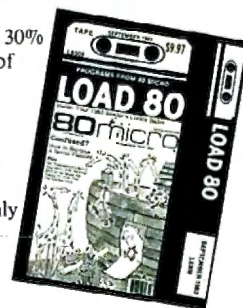
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**LOAD 80**



L8408

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Listing continued

```
,W,U-W):W=U+1:Z=Z+1:NEXTELSEOPEN" I",1,F$:FORX=0TOLSTEP0:IFNOTEOF(1)
)THENINPUT#1,U$:FORW=0TOZ-1:IFINSTR(U$,W$(W))THENNEXTW:PRINTU$:NEX
TX:CLOSE:RETURNELSENEXTX:CLOSE1:RETURN:ELSECLOSE1:RETURN
```

```
9395 '***** WORD COUNT *****
9396 'ROUTINE TO COUNT NUMBER OF WORDS & CHARACTERS IN AN
      ASCII FILE. PLACE FILE NAME IN F$. NO OF WORDS
      RETURNED IN W AND NO OF CHARACTERS IN U
9397 'VAR - IN:F$      OUT:U,W      LOCAL:V,X,Y,Z,U$
      MODELS:1,3,4,2
9398 LINEINPUT"FILE NAME ";F$:IFF$>"THENGOSUB9400:PRINT"HERE ARE
      "W"WORDS,"U"CHARACTERS. AVERAGE WORD SIZE IS"INT((U-W)/W):GOTO9398
      ELSE9398
9399 '-----
9400 OPEN" I",1,F$:U=0:W=0:FORX=0TOLSTEP0:IFEOF(1)THENCLOSE:RETURNE
      LSELLINEINPUT#1,U$:Z=1:FORY=0TOLSTEP0:V=INSTR(Z,U$,")":IFV=0ORV=LE
      N(U$)THENW=W+1:U=U+LEN(U$):NEXTXELSEZ=V+1:IFMID$(U$,Z,1)<>" THENW
      =W+1:NEXTYELSENEXTY
```

```
9445 '***** FORMATTED PRINTOUT *****
9446 'WILL PRINT AN ASCII OR SCRIPTSIT FILE WITH SELECTED LEFT
      MARGINS (T) & MINIMUM LINE WIDTH (L) WITHOUT SPLITTING
      WORDS AT END OF LINE. CAN BE ADAPTED TO ANY WORD
      PROCESSOR. FOR ASCII FILES W$=CHR$(13) FOR SCRIPTSIT W$=""
9447 ' VAR - IN:L,T,F$,W$      OUT:      LOCAL:U-Z,V$      MODELS:1,3,4
9448 CLEAR3000:DEFINTA-Z:W$="":INPUT"ENTER FILE NAME ";F$:INPUT"(S
)CRIPSIT OR (A)SCII ";U$:INPUT"LEFT MARGIN ";T:INPUT"LINE WIDTH ";
L:IFF$>"ANDL>20IFU$="A" W$=CHR$(13):GOSUB9450ELSEGOSUB9450ELSE944
8
9449 '-----
9450 Y=0:OPEN" I",1,F$:FORX=0TOL:X=0:IFEOF(1)ORINKEY$="@ " CLOSE:RET
URNSELSELLINEINPUT#1,V$:V=L+Y:W=1:FORZ=1TOLLEN(V$):U=ASC(MID$(V$,Z,1)
):IFU>127ORZ>VANDU=32LPRINTTAB(T)MID$(V$,W,Z-W):W=Z+1:V=L+W:Y=0:NE
XTZ,XELSENEXT:LPRINTTAB(T)MID$(V$,W)W$;:Y=W-Z:NEXTX
```

```
9495 '***** FORMATTED LISTING OF BASIC *****
9496 'ROUTINE TO PRINT A BASIC PROGRAM SAVED IN ASCII AT
      VARIOUS WIDTHS USING HANGING INDENT (PROGRAM IS
      INDENTED FROM LINE NUMBERS). FILE IN F$ AND LINE
      WIDTH IN LN WILL PRINT FROM LINE S TO LINE T
      PRESS @ KEY TO ABORT
9497 'VAR - IN:L,S,T,F$      OUT:      LOCAL:U-Z,U$      MODELS:1,3,4
9498 LINEINPUT"FILE NAME ";F$:INPUT"LINE WIDTH ";L:INPUT STARTING
      LINE NO ";S:INPUT"ENDING LINE NO ";T:IFF$>"ANDL>20ANDL<80THENGOSO
      B9500:GOTO9498ELSE9498
9499 '-----
9500 OPEN" I",1,F$:FORX=0TOLSTEP0:IFEOF(1)ORINKEY$="@ "ORT<=WANDT<0C
LOSE:RETURNELSELLINEINPUT#1,U$:W=VAL(U$):IFW<SNEXTXELSEU=0:Z=INSTR(
U$,")":V=Z:FORY=0TOLSTEP0:IFLEN(U$)>L+VLPRINTTAB(U)LEFT$(U$,L+V):
U$=MID$(U$,L+V+1):U=Z:V=0:NEXTYELSELPRINTTAB(U)U$:NEXTX
```

```
9595 '***** BUILD ASCII FILE *****
9596 'ROUTINE TO CREATE AN ASCII FILE ON DISK. CAN BE USED TO
      BUILD CHAIN OR 'DO' FILE
9597 'VAR - IN:F$      OUT:      LOCAL:U-X,U$      MODELS:1,3,4
9598 CLS:PRINT@530,,:LINEINPUT"FILE NAME (W/EXT) ";F$:IFF$>"THENGO
      SUB9600:GOTO9598ELSE9598
9599 '-----
9600 FORU=0TOLSTEP0:CLS:PRINT@84,"ENTER COMMANDS FOR 'DO' FILE";P
      RINT@266,,:W=1:FORX=1TO99:PRINTTAB(10);"LINE"X,,:LINEINPUT"> ";U$:I
      FU$="E"THENNEXTXELSEIFU$>" THENU$(X)=U$:NEXTXELSEOPEN"O",1,F$:FORV
      =1TOX-1:PRINT#1,U$(V):NEXTV:CLOSE1:RETURN
```

End

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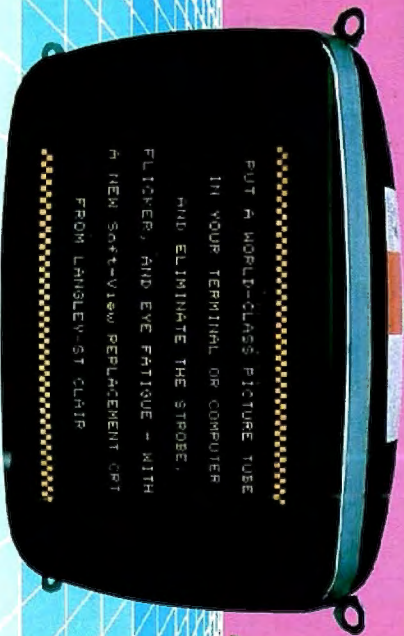
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---

# SCRIPSIT EXTRAS

*Spend a few minutes patching Scripsit and call 11 special characters from the keyboard.*

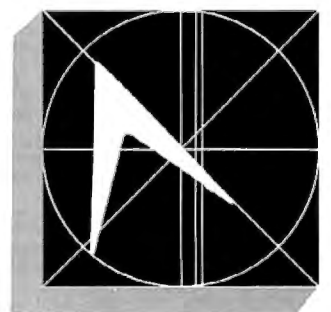
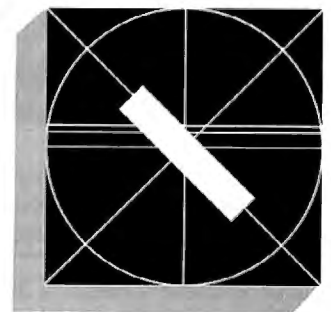
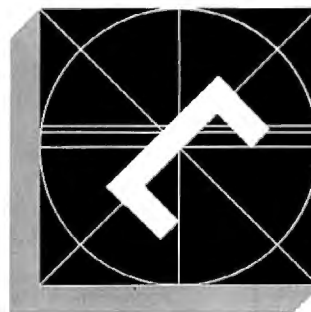
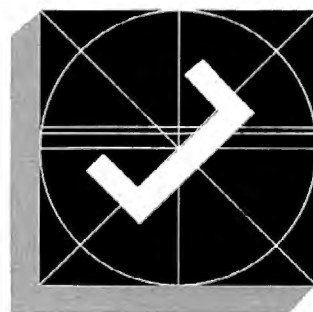
by Richard W. Harrison  
and Louis S. VanSlyck



our printer has the capability to produce special characters like brackets, braces, and underscores, but your keyboard can't handle them. Filling in those empty spaces in your document with hand-drawn characters works poorly; the final product never looks professional.

To help you solve this problem, we've implemented 11 special characters in Scripsit (see the Table). Scripsit uses the @ key as a convenient control switch to flag special commands. By using this control key with other keys on the keyboard, you can generate the special-character ASCII codes.

We use the top row of keys (1-9, zero, and the colon) for our modification. We chose these keys because you can conveniently attach labels above them that depict special characters as they'll appear on both the screen and the printer (see the Table). By changing the values listed in the Table, you can modify a different set of keys, or you can customize the



11 new keys for any other special characters you want.

The Table shows the 11 new keys and their corresponding keyboard control codes. For example, holding down the control key (@) and the 5 key generates an underscore character. If you don't release these keys, the underscore character will repeat.

You place the code in this table at the end of the Scripsit program file. Notice that it is arranged in 2-byte pairs: The first byte (9B) is the Scripsit code for the depressed key and the next byte (1B) is the new associated key code.

Newcode1, which contains the logic to process the translation table, replaces Scripsit's existing program code, Oldcode1 (see the Figure). The third byte (0E) contains the number (14) of table translations to be made.

The fifth and sixth bytes (D8 and 7A), in least significant byte/most significant byte (LSB/MSB) format contain the table address 7AD8 hexadecimal (hex). The old code per-

formed three translations now accomplished by the first three entry pairs in Newcode2.

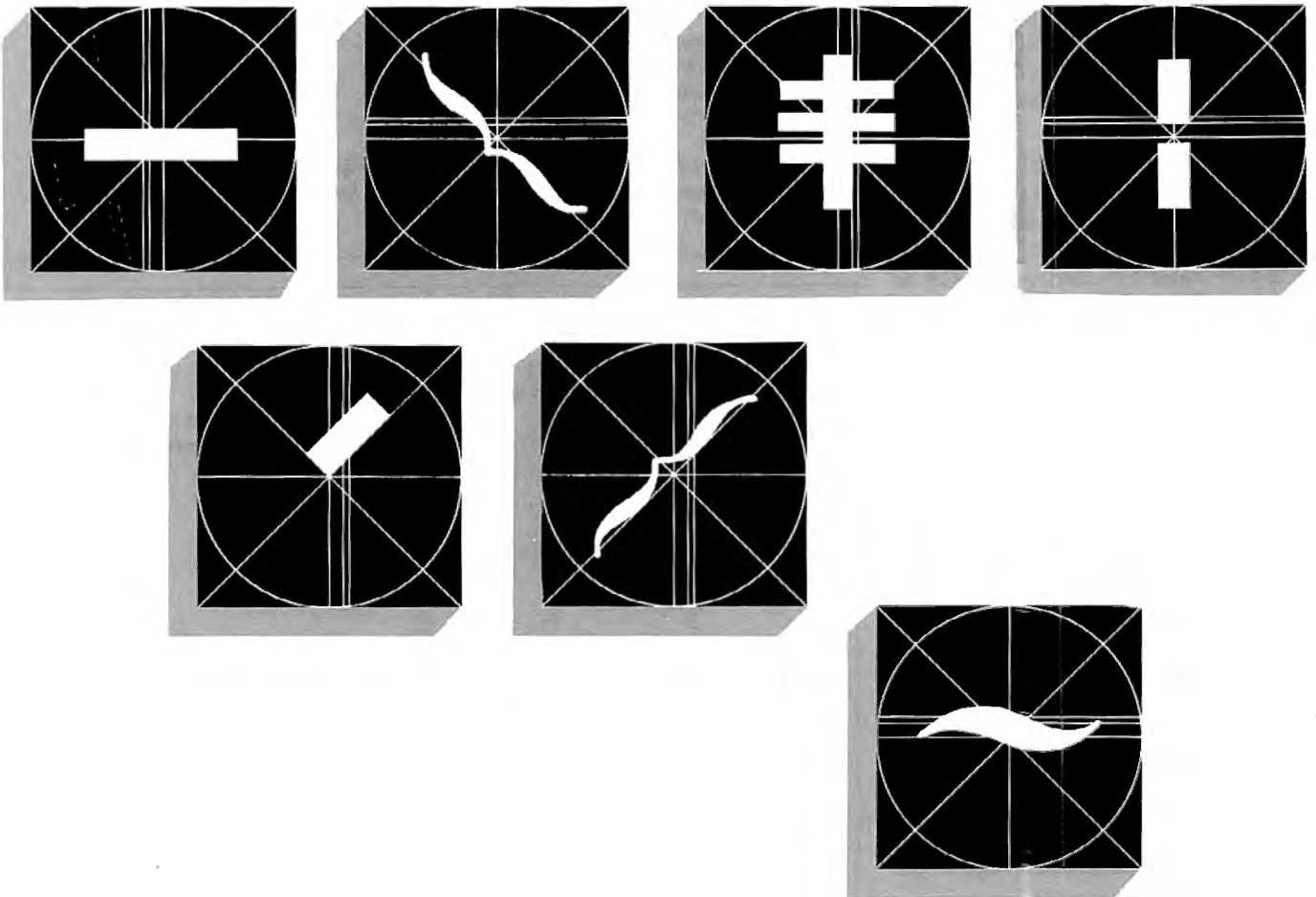
The Program Listing shows the Assembly-language patch that makes the character substitution.

Bytes to be replaced and the new code details are in the Figure. You can advance pages by pressing the semicolon key, and move back with the hyphen key. Move the cursor to the correct byte using the arrow keys. Press the break key to erase changes.

Remember that you're counting in hex: The first byte in a line is zero and the last byte is 0F. Replace asterisks with \*\*code in the byte tables.

### TRSDOS 1.3

At TRSDOS Ready, type in DEBUG and press the F key. Answer the "Filespec?" prompt with SCRIPSIT/CMD (or the name of your Scripsit file).



Advance to the page containing line numbers 1000-10F0. Press the M key. Then move the cursor to the indicated byte, insert Newcode1, and press the enter key.

Advance to the page containing line numbers 2900-29F0 (for version 1.0, 2A00-2AF0). Press the M key. Move the cursor to the indicated byte, insert Newcode2, and press the enter key. Press the break key twice to return to DOS.

### DOSPLUS 3.4

At DOSPLUS, type in DISKDUMP SCRIPSIT/CMD (or the name of your Scripsit file). Then enter GF and press the M key. Move the cursor to the correct byte and insert Newcode1. At the end of each line, use the down-arrow key to advance to the next line. Press the enter key when you've entered all of Newcode1.

Then enter G28 and press the M key. Move the cursor to the correct bytes and enter Newcode2. Press the enter key, then press the break key twice to return to DOS.

### NEWDOS80

At NEWDOS Ready, type in SUPERZAP. Next, enter DFS. Answer "Filespec?" with SCRIPSIT/CMD (or the name of your Scripsit file). Answer Relative-Sector-Within-File # with 15. Type MODBYTE#.

Now, enter Newcode1, press the enter key, and advance to the page with FRS 40 (for version 1.0, FRS41). Type MODBYTE#. Type in Newcode2, press the enter key, and type EXIT to return to DOS. ■

Write to Richard W. Harrison and Louis S. VanSlyck at 2107 Middlesex Road, Upper Arlington, OH 43220.

### The Key Box



Model III  
TRSDOS 1.3, DOSPLUS 3.4,  
or NEWDOS80  
Scripsit 1.0, 3.1, or 3.2\*

\*Frank DeSimone and Beve Woodbury wrote the adaptations for TRSDOS 1.3, DOSPLUS 3.4, and Scripsit 3.1 and 3.2.

```

A6179 EQU 6179H ;Return with new key
A615D EQU 615DH ;Return with no change
6145 E5 PUSH HL ;Save HL
6146 860E LD B,14 ;Number of table pairs
6148 21D87A LD HL,7AD8H ;Table address
614B BE LOOP CP (HL) ;? Match with table ?
614C 23 INC HL ;Point at next entry
614D 2806 JR Z,FOUND ;Match found
614F 23 INC HL ;Point at next entry
6150 10F9 DJNZ LOOP ;Continue search
6152 E1 POP HL ;Restore HL
6153 1808 JR A615D ;No translation needed
6155 7E FOUND LD A,(HL) ;Get new command
6156 E1 POP HL ;Restore HL
6157 1828 JR A6179 ;Exit with new command
6159 00 NOP ;Spare
615A 00 NOP ;Spare
615B 00 NOP ;Spare
615C 00 NOP ;Spare

```

Program Listing. Assembly-language mnemonic patch for Newcode1.

```

Oldcode1: FE 9B 20 04 3E 1B 18 2C FE 9C 20 04 3E 1C 18
           24 FE 9D 20 04 3E 1F 18 1C
Newcode1: E5 06 0E 21 D8 7A BE 23 28 06 23 10 F9 E1 18
           08 7E E1 18 20 00 00 00 00

Oldcode2: 02 02 00 .....
Newcode2: 01 1E D8 7A 9B 1B 9C 1C 9D 1F 31 5B 32 5C 33 5D
           34 5E 35 5F 36 60 37 7B 38 7C 39 7D 30 7E 3A 7F
           02 02 00 **

```

Byte Table 1: TRSDOS 1.3 and DOSPLUS 3.4

		Scripsit version		
		1.0	3.1	3.2
Newcode1:	Byte#	85	6F	8A
Newcode2:	Byte#	49	69	84
	**code	52	53	53

Byte Table 2: NEWDOS80

		Scripsit version		
		1.0	3.1	3.2
Newcode1:	Byte#	85	6F	8A
Newcode2:	FRS	41	40	40
	Byte#	79	69	84
	**code	52	53	53

Figure. New code information and byte tables. The ellipses in Oldcode 2 represent whatever bytes your computer memory has set. Newcode 1 is the hex code for the Program Listing. Newcode 2 is the hex code of the Table.

	Control Input Key	Input Control Code	Translated Code	Screen Characters*		
				ASCII Characters	Model: I III	Printer Characters†
Old Code Keys	↑	9B	1B	Same translations as original Scripsit code		
	↓	9C	1C			
	←	9D	1F			
New Keys	1	31	5B	[	↑ [	[ [
	2	32	5C	\	↓ \	\ ⊙
	3	33	5D	]	← ]	] ]
	4	34	5E	^	→ ^	↑ ⊙
	5	35	5F	—	— —	← —
	6	36	60	,	,	↓ ⊙
	7	37	7B	{	{ {	{ §
	8	38	7C		: :	¶
	9	39	7D	}	} }	} †
	0	30	7E	~	~ ~	→ TM
	:	3A	7F	DEL	‡ ±	‡ =

\*Screen character depends on your video driver. Our Model I/III characters are shown.  
†Printer character depends on your printer or printwheel. Two of ours are shown.

Table. The 11 new keys and corresponding keyboard control codes.

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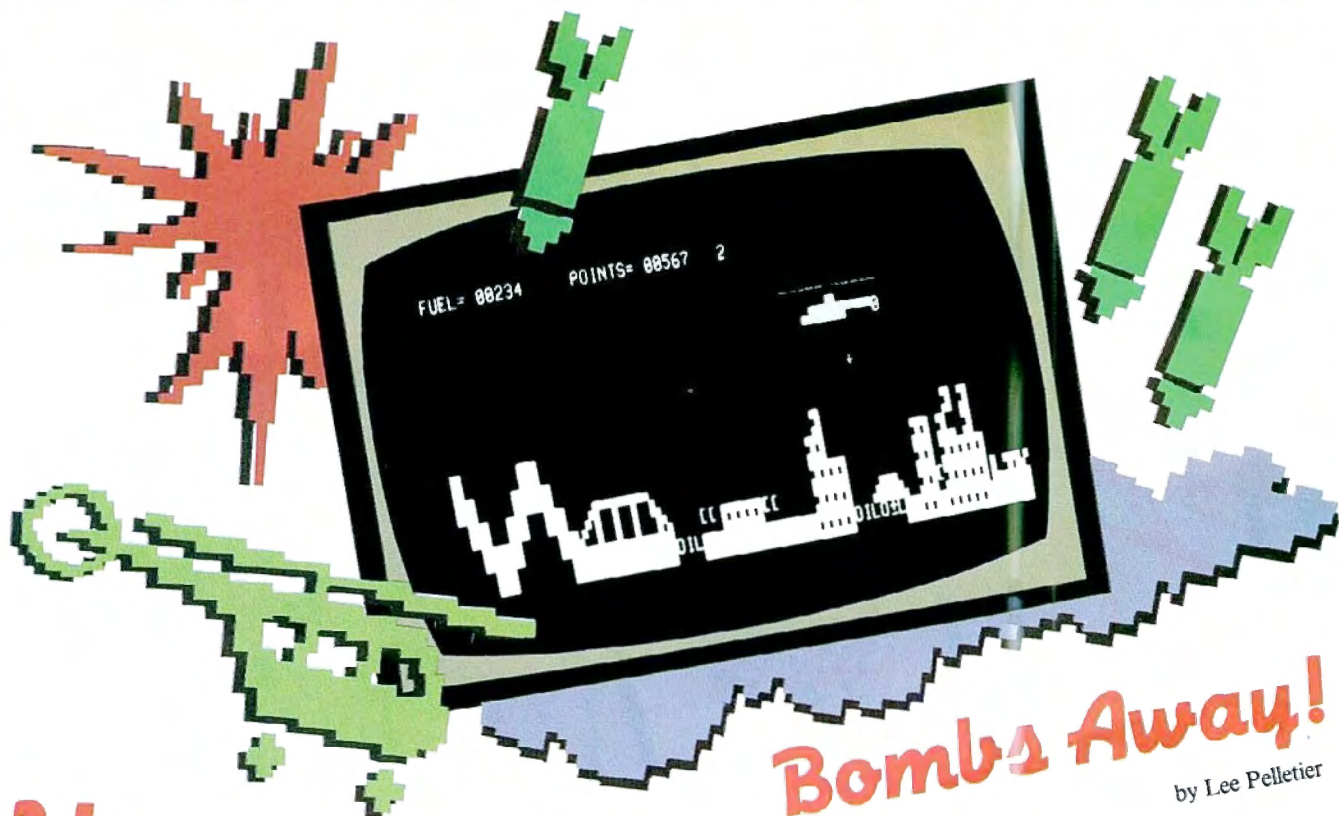
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# Playing Around



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Your orders have just come in from Strategic Air Command: Fly over enemy territory and destroy as many installations as possible. Your mission is fraught with danger. As you pillage enemy landscape, be on the lookout for vicious death missiles aimed straight for your craft, and watch out for jutting bridges and skyscrapers—you might fly into them and blow yourself to Kingdom Come. It's you against them.

Bomber is a Model I/III arcade-style game with features galore. It includes sophisticated graphics, a built-in sound generator, and a scoreboard. You pilot either a jet or a helicopter over the landscape, accumulating different points according to your target. The oil wells are particularly important since you need to hit them to refuel.

### Program Operation

Program Listing 1 (Bomber/SRC) is the source code for the game (p. 106). You need a 48K Model I or III to assemble the code. If you don't have a 48K computer, you might be able to assemble Bomber with an editor/assembler that chains files.

Bomber runs on a 16K Model I, and will run on a Model III if you de-

lete lines 9690-9710. Due to memory considerations, I included the comments for Listing 1 in Program Listing 2 (p. 116). (Note that Listing 2 omits most lines not containing author's comments.) A variables list with explanations appears in lines 11060-11410 of Listing 2.

The main program contains several exciting features. First, it creates a self-loading disk with high score updating. (This works for the Model I only; Model III users must rewrite this section of the program.) To do this, press the W key when you see the title page. The computer prompts you to insert a formatted disk into drive zero. Be sure to use an expendable disk as formatting erases all files.

Use TRSDOS's Format command to format the disk. Once you insert the disk into drive zero, press the enter key. The computer outputs the program to disk along with a boot sector and a high score sector. To use this disk, put it into drive zero and press the reset button. The disk boots up automatically and displays the title page.

### Game Variations

The game also has a Create Game mode. To select this option, press the

C key when you see the title page. The computer lets you select several game options: bomber speed, progressive increase in speed with time, missile activity, and number and type of aircraft. The standard game mode starts at medium speed, becoming faster as you progress, missiles are active, and you pilot one airplane bomber.

You can experiment with the different variations to see what they all do, but I suggest that less experienced gamers start at the slow speed with no missiles and progress from there.

### High Score Routine

Bomber includes a high score update routine. This update works only on the self-loading disks described above. When the computer determines that you have a high score, it displays a page of five high scores, and lets you enter your initials. The

### The Key Box



Models I and III  
 16K RAM (for system program)  
 48K RAM (to assemble)  
 Editor/Assembler  
 Optional Sound

backspace key erases characters if you enter the wrong initial.

Once you enter your initials, press the enter key and the computer sends out the new high scores to your self-loading disk (be sure the disk is in the drive). Out of fairness, only the standard game mode has a high-score update since you can create other game variations that are easier than the standard game variation. To see the high scores, press the enter key when you see the title page. High scores appear until you press the enter key again.

Finally, you can put the game into a demonstration mode by pressing the D key at the title page. The computer displays the title pages and the high scores, plays an unintelligent game, and finally returns to the title

page. This cycle continues indefinitely until someone presses a key.

### Program Routines

The main program has a few interesting routines. RND (at line 16110) is a random number generator that juggles some bits around and uses the R register to provide some degree of randomness. To use it, load the L register with the upper limit for the random number that you want to generate. RND returns a number in the A register that is between 1 and the number you put in the L register.

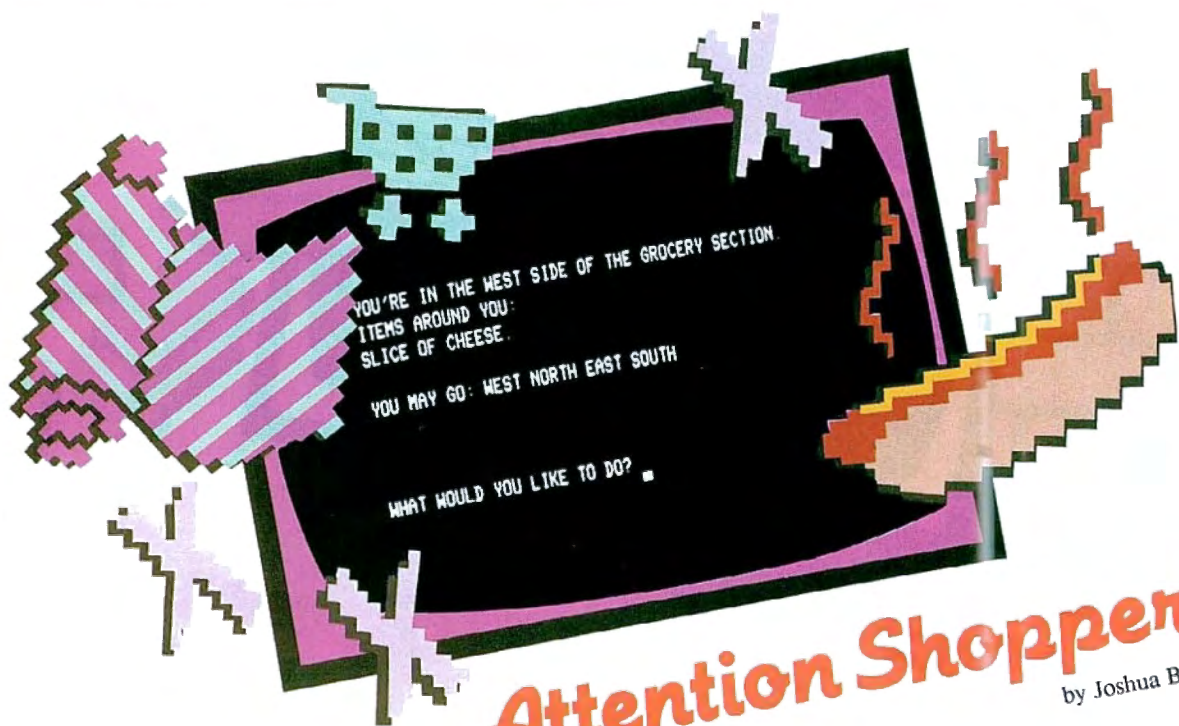
Bomber also has several sound routines that are fun to work with. Program Listing 3 (p. 127) outputs a series of pulses to the cassette output jack. However, as it progresses, the delay between pulses becomes longer and

longer. This creates a sound like a photon gun. By changing the INC D to DEC D you can make the same routine sound like an alarm.

Program Listing 4 (p. 127) also generates sound, but more of a static-like noise. Shift generates pulses in an irregular sequence. This creates a random static sound. Listing 4 sounds something like an anti-aircraft cannon booming. You might be able to use Listings 3 and 4 in other programs, as well. ■

*The listings for this article begin on p. 106 with Listing 1. Listing 2 starts on p. 116, and Listings 3 and 4 are on p. 127.*

*Lee Pelletier lives at 5 Burley St., Wenham, MA 01984.*



**C**onsider, if you will, a department store. An innocent place of commerce. A potpourri of goods. A model of the good life.

Consider also what happens when this aspect of the American dream turns into a nightmare. When a tranquil shopping trip becomes a bizarre journey into a world of screaming television sets, eye-blinding chintz, and oversteamed hot dogs.

Here's your chance to see if you can survive X-Mart, the ultimate 1980s department store.

X-Mart is a Model I/III Basic adventure game that pits you, the shopper, against the perils of the department store. You must find the 12 items on your shopping list, pay for them, and exit the store to win.

Successfully obtaining the items, however, requires ingenuity as well as a good sense of direction.

### Playing X-Mart

To run X-Mart, type in the Program Listing (p. 130) and get into Basic. Then type RUN"XMART

### The Key Box



Models I and III  
16K Cassette Basic  
32K Disk Basic

and press the enter key. X-Mart displays an introduction and gives you some commands (see the Table for a complete list of commands). Press the enter key when you're ready to start.

As the adventure starts, you're in the west parking lot; you must find your way into and around the department store. To move, type N for north, S for south, and so on. To see your shopping list, type in READ LIST.

Use verb/noun format when entering commands. X-Mart recognizes 38 verbs and 53 nouns. You can abbreviate words to three letters.

X-Mart's 77 locations include the department store and its surrounding

alleys, sidewalks, and avenues. Each move (N, S, E, W) puts you in a new area.

Once you collect your 12 items, go to the check-out counter. Be careful—you'll need more than your purchases to get out of X-Mart.

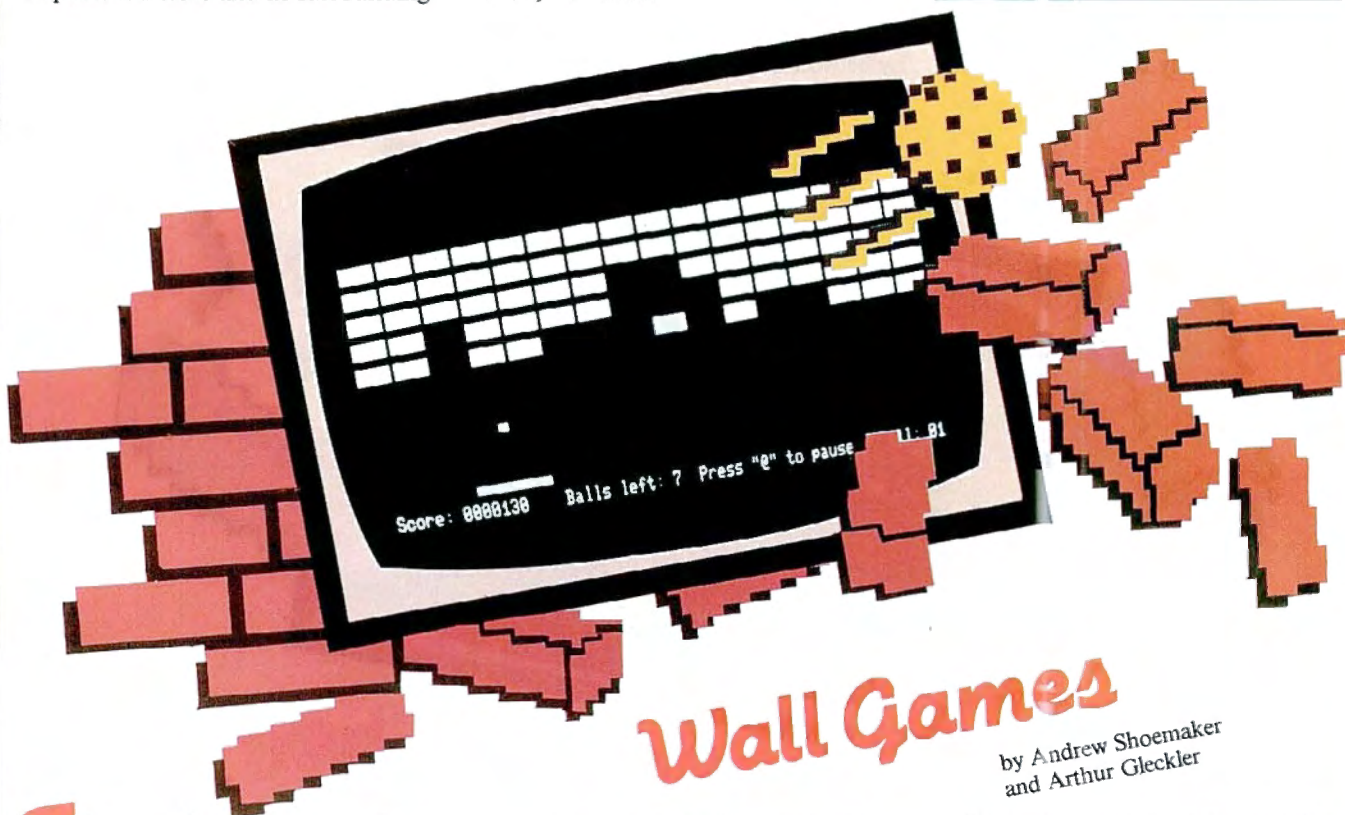
Although some of X-Mart's situations might seem impossible, you can get your shopping done if you use your imagination. Finally, no matter how tempted you are, don't shoplift! ■

*The listing for X-Mart begins on p. 130.*

*You can reach Joshua Barinsein at 12647 Victory Blvd., N. Hollywood, CA 91606.*

Bend	Go	Put
Break	Hit	Read
Call	Insert	Run
Climb	Listen	Show
Close	Lock	Sleep
Cut	Look	Smash
Decode	Open	Swallow
Drop	Pay	Take
Examine	Play	Tap
Feed	Poke	Unlock
Fix	Pop	Walk
Get	Press	Wear
Give	Pump	

*Table. List of verb commands for X-Mart.*



If you're tired of zapping aliens and navigating endless mazes and you're looking for something new, Noc Out is your ticket. We wrote Noc Out, based on the arcade game Breakout, in Z80 Assembly language to run on the Models I, III, and 4 (see the Program Listing [p. 134]).

### Playing Noc Out

Noc Out's screen is made up of a wall five bricks high by 16 bricks wide. A movable set of paddles ap-

pears on either side of the wall. The object of the game is to keep a bouncing ball in play using the paddles while you knock out as many bricks as possible.

To start the game, type in NOC-OUT and press the enter key. The game begins as soon as you choose a difficulty level of from zero (fast) to 9 (slow).

Noc Out serves the ball from the screen bottom. You control both paddles simultaneously with the left- and right-arrow keys.

The ball bounces off the paddles, bricks, and screen sides. It goes out of play when it passes by your paddles at the top or bottom of the screen. The game ends after you lose nine balls.

### The Key Box

Models I and III  
32K RAM  
Assembly Language  
Editor/Assembler





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Each brick is worth 10 points. After you knock out all 80 bricks, a new wall appears. You can pause the game by pressing the @ key; hit the enter key to continue.

Press the break and clear keys to quit. The display line at the screen bottom shows your score, the number of balls you have left, and the number of the current wall. To play again, enter a new difficulty level.

### The Way the Ball Bounces

To make the ball's motion realistic, Noc Out stores the ball's position and velocity in fixed precision. That is, the program keeps an extra bit of

precision to let the ball move in more than eight directions.

Noc Out obtains the ball's screen coordinates by shifting the fixed position coordinates right one bit position.

When the ball hits the left or right side of the screen, its X velocity reverses. When the ball bounces off a paddle, Noc Out determines its new velocity and direction based on which part of the paddle it hits.

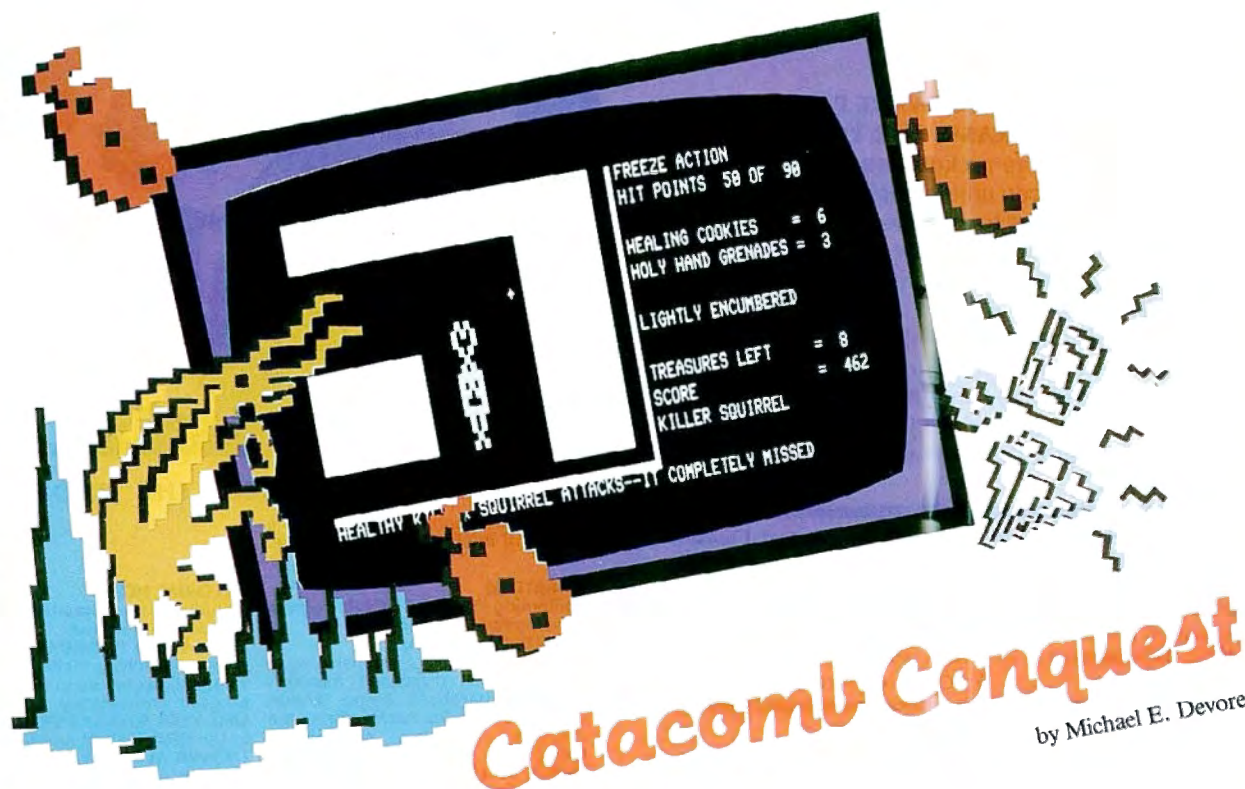
When the ball strikes a brick, the lower 2 bits of the ball's character position (determined by the program's Point routine) clear to find the brick's starting character posi-

tion. Noc Out erases the four characters starting at this position to erase the brick.

The program stores the score, ball count, and wall number as ASCII characters in screen memory, rather than as binary numbers in program memory. This is more efficient because the program doesn't have to update the score in memory and convert it to ASCII before displaying it. ■

*The listing for Wall Games begins on p. 134.*

*Contact Andrew Shoemaker and Arthur Gleckler at 612 Hollen Road, Baltimore, MD 21212.*



**T**he catacombs of Medcres are not for the timid, but your life as a mercenary in an age of sorcery and swordplay has prepared you for the worst. You begin your Model I/III graphics adventure when a rich merchant hires you to recover rare treasures stolen by the evil wizard Medcres.

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The catacombs have their own

built-in defenses. A monster guards each treasure, while more monsters wander the passages. Traps are also common.

Worst of all, Medcres has enchanted the catacombs: If you kill any monster (except a treasure guardian), it is instantly resurrected somewhere else in the maze. If you succeed in defeating the monsters and recovering the treasures, you still have to find your way out of the myriad passages.

Unfortunately, you must work alone on this mission. Medcres

would instantly recognize a force of warriors as a threat, and deal with them appropriately. He tolerates single adventurers because they keep the monsters in fighting trim and reduce his bills for feeding them.

To increase your chances of survi-

### The Key Box

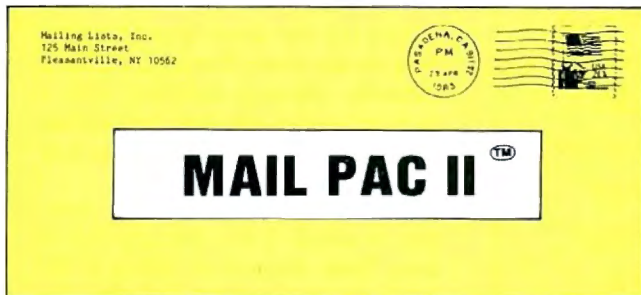


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val, your employer has provided healing cookies for your wounds. Also, the local priest has presented you with several holy hand grenades—they are specially blessed to destroy evil creatures. In the catacombs, previous unsuccessful adventurers have left behind several items that might help you in your task.

After you enter, the entrance is sealed shut. At the exit, the merchant awaits you and his treasures.

## The Program

The Catacombs of Medcres runs on the Models I and III with 32K and one disk drive. The game is actually two programs, Maze and Catacomb (see Program Listings 1 [p. 84] and 2 [p. 85], and one data file, Scores. Catacomb creates Scores; your disk must have two free granules before the first run.

You must set memory size to 43263 and you should have one file buffer available (at DOS Ready, type in BASIC MAZE/BAS -F:1 -M:43263). When you first enter Basic, run Maze to POKE in the USR machine-language routines the program uses. This takes about a minute, but you need to do it only once when you first turn on the computer.

Three of the USR routines perform time-consuming program functions so events within the game can occur quickly. Program Listing 3 (p. 102) gives you the source code for these routines.

I based the fourth USR routine (Program Listing 4 [p. 103]) on "Kwikmaze" (80 Micro, November 1982, p. 318). Listing 4 builds a different maze for the catacombs after each game, preventing the player from memorizing a single maze. I've also included an option that lets you replay a previous maze.

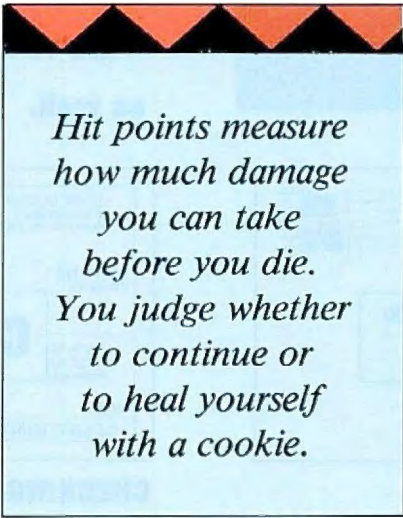
You can add custom modifications to the program in the remaining 3-4K of free memory space. You can make Catacombs harder by raising the monsters' hit points in line 300, or by lowering the hit points, healing cookies, or holy hand grenades you start out with in line 530.

## Under Way

To play the game, first choose a skill level from one to nine. The level influences many factors, including

the number and power of the monsters you encounter, the number of treasures you must recover, the number and severity of traps, and the number of hit points, healing cookies, and holy hand grenades with which you start.

Next, you have a short wait while the program sets up the location of traps, treasures, monsters, and special items. Then the screen clears and displays the game.



*Hit points measure  
how much damage  
you can take  
before you die.  
You judge whether  
to continue or  
to heal yourself  
with a cookie.*

The screen is vertically split. The left side of the screen is a graphics display of the catacombs for five spaces in each direction. The right half provides information about your character. Temporary messages appear at the bottom of the screen. See Table 1 for a profile of the figures you see as you move about the catacombs.

The character information indicates your status. For example, hit points are a measure of how much damage you can take before you die. You have to judge whether to continue at your current level of hit points or to heal yourself with a cookie. The first number is your current level; the second is your base—the amount you have when completely healthy.

Other character information includes the number of healing cookies and holy hand grenades you have, the number of treasures remaining in the catacombs, and your current score. The number of treasures remaining includes those you are carrying.

One of the most valuable indica-

tors is encumbrance level (how full your hands are). The five stages of encumbrance are unencumbered, lightly encumbered, moderately encumbered, heavily encumbered, and fully encumbered.

You cannot carry more than six items and treasures at a time. In fact, you might have to leave the maze to deliver some treasures to the merchant, then return for those that remain.

The more encumbered you are, the less dexterous you become. Your dexterity affects how well you hit the monsters you attack and how successful they are in striking back.

## Your Options

You use the arrow keys to move. You cannot move through a wall or a monster, although colliding with a monster makes you lose one to four hit points in addition to damage you might suffer from attack.

You must be adjacent to a monster to attack it (by pressing the A key). Your chances of hitting it depend on your current dexterity, the monster's dexterity, and, to a lesser extent, your current strength. Damage to the monster depends on your strength.

If two or more monsters are adjacent to you when you wish to attack, you must indicate the number of the one you're attacking. Monsters are numbered in order from left to right and top to bottom.

An attack can have three possible outcomes. A direct hit delivers the greatest possible damage, while a glancing blow hurts less. A clean miss does no harm at all. Attack outcomes appear at the bottom of the screen.

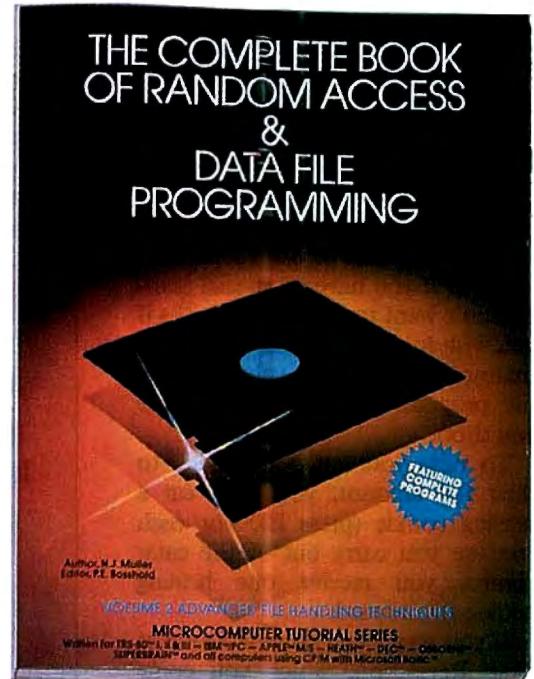
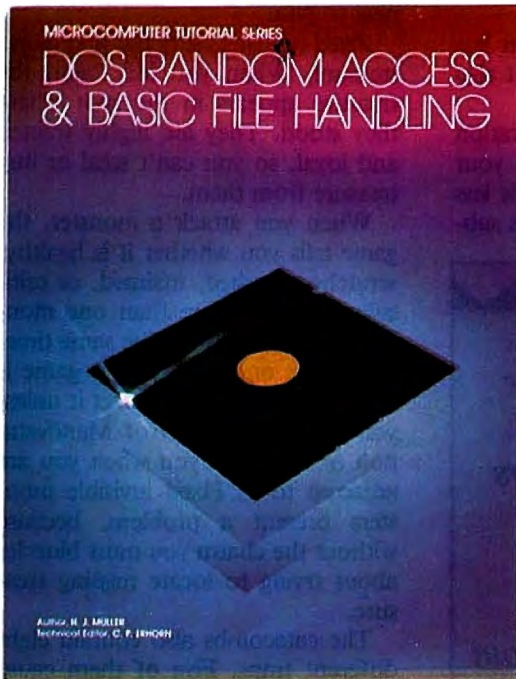
Press T to thrust at a monster. This is similar to attacking, but a thrust has a 20 percent greater chance of a successful hit. Also, any damage that occurs is four hit points greater than a simple attack. A monster returning an attack after a thrust also gets a 20 percent better chance of striking and a four hit point bonus on damage.

To make a parrying attack on a monster, press P. This is the same as a normal attack, with a 20 percent less chance of striking and four hit points less damage per hit. Pressing



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Although random access file handling is a matter of some complexity, the subject has been treated in a simple and down-to-earth fashion, so that anyone with some small familiarity with programming in Microsoft BASIC will be able to cope with the material. Each stage of learning uses a sample program as a starting point. The programs grow in capability and complexity as the books progress into all of the various aspects of file handling and record manipulation. An extensive effort has been made to keep the material coherent and every program line is explained in detail.

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- The writing of a Menu to summarize program functions
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the B key blows up a holy hand grenade and destroys all monsters adjacent to you.

When you find a treasure or special item, position yourself over it. Press G to grab the item. If more than one article is in the same spot, you'll grab treasure first. You can grab only one article per turn.

If you find that you're too encumbered, you can press D to drop an item or treasure. The program asks whether you wish to drop a particular item. If you have no special items or don't want to drop any, it asks if you wish to drop a treasure. Since all treasure has the same value to you, the program selects which treasure you drop.

To raise your hit points back to their full amount, you must eat a healing cookie (press E). For each treasure you carry out of the catacombs, you receive one healing cookie as a reward.

If you aren't carrying the Stone of Trap Revelation, which you come upon by chance, you must press the S key to search for traps. You have a 25 percent chance of success per search.

Pressing I gives you an inventory of everything you carry. This serves only as a reminder, and doesn't take up a turn.

To wait for one turn, press the W key. You usually use this to let the Talisman of Regeneration build up your hit points, or to wait for your smell to return to normal after you encounter a noxious-fumes trap.

The shift key calls a time-out. All action stops and the message "Freeze Action" flashes at the top of the screen. Pressing an arrow key or the enter key resumes action.

Pressing the space bar gives you the list of commands and their functions. The game doesn't penalize you for checking the list, and you press enter to resume play.

## Items and Treasures

The maze contains five special items. Although you don't have to recover them, they can be useful in your mission. Unfortunately, one of the items is cursed; the only way to determine which one is to study its effects on your character.

The Stone of Trap Revelation lets you see traps at all times without searching. The stone takes one turn to activate itself after you pick it up, and it's never cursed.

The Charm of Manifestation lets you see all invisible monsters. It also is never cursed.

The Talisman of Regeneration adds one hit point per turn to your current hit points if the total is less than your base. The talisman is sub-

*Monsters are either wandering or fixed. Wandering monsters track you as soon as you enter the catacombs. Fixed monsters stay put and guard treasure.*

ject to burnout. If cursed, it rapidly erases your hit points.

The Bracers of Dexterity normally increase your dexterity. But if they're cursed, your dexterity decreases. Similarly, the Chain of Strength increases your strength. If you find yourself weakening, it is cursed.

Unlike the special items, treasures are always guarded by a monster. You can distinguish monsters that carry treasure from the others because they don't move. Wandering monsters always pursue you unless you block them.

Each treasure has a name; otherwise, they don't differ from each other in any manner significant to you.

## Hazards of the Maze

In the catacombs are 25 different monsters of varying strength and dexterity (see Table 2). The tougher the monster is, the higher its hit points. The type of monsters you encounter depends on the skill level you choose.

Monsters are either wandering or

fixed. Wandering monsters track you as soon as you enter the catacombs. When you kill them, they can reappear anywhere, including right next to you.

Fixed monsters stay put and guard treasure. When you kill them, the treasure appears in the spot where they stood. They are highly trained and loyal, so you can't steal or buy treasure from them.

When you attack a monster, the game tells you whether it is healthy, scratched, gashed, maimed, or critically injured. More than one monster can attack you at the same time.

At least one monster per game is invisible. You cannot detect it unless you have the Charm of Manifestation or it attacks you when you are adjacent to it. Fixed invisible monsters present a problem, because without the charm you must blunder about trying to locate missing treasure.

The catacombs also contain eight different traps. Five of them cause you injury and subtract from your hit points.

The sixth trap paralyzes you for a short time, leaving you defenseless against nearby monsters. The next trap sprays you with noxious fumes that leave you weak until they wear off. The last trap is a teleportation square that randomly relocates you in the catacombs. This is the only trap that you can set off more than once.

## Exit

A nice feature of the Catacombs of Medces is its meaningful score. Your score decreases one point per turn, increases 1,000 points for each treasure you exit with, increases 66-330 points for each monster you kill, and increases 1,000 points per treasure if you succeed in recovering all treasures.

The program also saves high scores for each skill level to disk with a message of up to 250 characters.

This game requires some strategy, so don't act thoughtlessly. Use holy hand grenades sparingly because you can't replace them. They are most useful when you're fighting more than one monster or when your strength is low.

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### BUSINESS 100 PROGRAM LIST

NAME	DESCRIPTION
1 RULE78	Interest Apportionment by Rule of the 78's
2 ANNU1	Annuity computation program
3 DATE	Time between dates
4 DAYYEAR	Day of year a particular date falls on
5 LEASEINT	Interest rate on lease
6 BREAKEVN	Breakeven analysis
7 DEPRSL	Straightline depreciation
8 DEPRSY	Sum of the digits depreciation
9 DEPRDB	Declining balance depreciation
10 DEPRDDB	Double declining balance depreciation
11 TAXDEP	Cash flow vs. depreciation tables
12 CHECK2	Prints NEBS checks along with daily register
13 CHECKBK1	Checkbook maintenance program
14 MORTGAGE/A	Mortgage amortization table
15 MULTMON	Computes time needed for money to double, triple, etc.
16 SALVAGE	Determines salvage value of an investment
17 RRVARIN	Rate of return on investment with variable inflows
18 RRCONST	Rate of return on investment with constant inflows
19 EFFECT	Effective interest rate of a loan
20 FVAL	Future value of an investment (compound interest)
21 PVAL	Present value of a future amount
22 LOANPAY	Amount of payment on a loan
23 REGWITH	Equal withdrawals from investment to leave 0 over
24 SIMPDISK	Simple discount analysis
25 DATEVAL	Equivalent & nonequivalent dated values for oblig.
26 ANNUDEF	Present value of deferred annuities
27 MARKUP	% Markup analysis for items
28 SINKFUND	Sinking fund amortization program
29 BONDVAL	Value of a bond
30 DEplete	Depletion analysis
31 BLACKSH	Black Scholes options analysis
32 STOCVAL1	Expected return on stock via discounts dividends
33 WARVAL	Value of a warrant
34 BONDVAL2	Value of a bond
35 EPSEST	Estimate of future earnings per share for company
36 BETAALPH	Computes alpha and beta variables for stock
37 SHARPE1	Portfolio selection model-i.e. what stocks to hold
38 OPTWRITE	Option writing computations
39 RTVAL	Value of a right
40 EXPVAL	Expected value analysis
41 BAYES	Bayesian decisions
42 VALPRINF	Value of perfect information
43 VALADINF	Value of additional information
44 UTILITY	Derives utility function
45 SIMPLEX	Linear programming solution by simplex method
46 TRANS	Transportation method for linear programming
47 EOQ	Economic order quantity inventory model
48 QUEUE1	Single server queueing (waiting line) model
49 CVP	Cost-volume-profit analysis
50 CONDPF0F	Conditional profit tables
51 OPTLOSS	Opportunity loss tables
52 FQUOQ	Fixed quantity economic order quantity model
53 FQEOVSH	As above but with shortages permitted
54 FQEOQPB	As above but with quantity price breaks
55 QJUEICB	Cost-benefit waiting line analysis
56 NCFANAL	Net cash-flow analysis for simple investment
57 PROFIND	Profitability index of a project
58 CAP1	Cap. Asset Pr. Model analysis of project

59 WACC	Weighted average cost of capital
60 COMPBAL	True rate on loan with compensating bal. required
61 DISCBAL	True rate on discounted loan
62 MERGAMAL	Merger analysis computations
63 FINRAT	Financial ratios for a firm
64 NPV	Net present value of project
65 PRINDLAS	Laspeyres price index
66 PRINDPA	Paasche price index
67 SEASIND	Constructs seasonal quantity indices for company
68 TIMETR	Time series analysis linear trend
69 TIMEMOV	Time series analysis moving average trend
70 FUPRINF	Future price estimation with inflation
71 MAILPAC	Mailing list system
72 LETWRT	Letter writing system-links with MAILPAC
73 SORT3	Sorts list of names
74 LABEL1	Shipping label maker
75 LABEL2	Name label maker
76 BUSBUD	DOVE business bookkeeping system
77 TIMECLCK	Computes weeks total hours from timeclock info.
78 ACCTPAY	In memory accounts payable system-storage permitted
79 INVOICE	Generate invoice on screen and print on printer
80 INVENT2	In memory inventory control system
81 TELDIR	Computerized telephone directory
82 TIMUSAN	Time use analysis
83 ASSIGN	Use of assignment algorithm for optimal job assign.
84 ACCTREC	In memory accounts receivable system-storage ok
85 TERMSPAY	Compares 3 methods of repayment of loans
86 PAYNET	Computes gross pay required for given net
87 SELLPR	Computes selling price for given after tax amount
88 ARBCOMP	Arbitrage computations
89 DEPRSF	Sinking fund depreciation
90 UPSZONE	Finds UPS zones from zip code
91 ENVELOPE	Types envelope including return address
92 AUTOEXP	Automobile expense analysis
93 INSFILE	Insurance policy file
94 PAYROLL2	In memory payroll system
95 DILANAL	Dilution analysis
96 LOANAFD	Loan amount a borrower can afford
97 RENTPRCH	Purchase price for rental property
98 SALELEAS	Sale-leaseback analysis
99 RRCONVBD	Investor's rate of return on convertible bond
100 PORTVAL9	Stock market portfolio storage-valuation program

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1000	179.6	3.5
2000	713.2	7.8

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Bear in mind that monsters don't cross treasures or special items, and won't move into a trap. You can use this knowledge to block attacks or seal hallways, and to greatly improve your chances of leaving the catacombs alive. ■

Listing 1 begins on this page, Listing 2 starts on p. 85, Listing 3 begins on p. 102, and Listing 4 is on p. 103.

You can contact Michael E. Devore at 1209B E. Florida Ave. #23, Urbana, IL 61801.

Display	Description
☺	Your character, always in the middle of the screen
*	Unguarded treasure
.	Special item
☼	Lightweight monster
☼☼	Mediumweight monster
☼☼☼	Medium-heavyweight monster
☼☼☼☼	Heavyweight monster
☼☼☼☼☼	Super-heavyweight monster
☼☼☼☼☼☼	Invisible monster, only seen with the charm of manifestation
☼☼☼☼☼☼☼	Traps, only seen when successfully searching or with the stone of trap revelation

Table 1. Interpretations of the game's graphics characters.

Monster Name	Strength	Dexterity
Giant tick	Very low (Lightweight)	Very low
Giant termite	Very low	Low
Killer squirrel	Very low	Moderate
Toy dragon	Very low	High
Vampire bat	Very low	Very high
Land crab	Low (Mediumweight)	Very low
Giant toad	Low	Low
Skeleton	Low	Moderate
Giant bee	Low	High
Giant cockroach	Low	Very high
Fanged tumbleweed	Moderate (Medium-heavyweight)	Very low
Zombie	Moderate	Low
Mercenary fighter	Moderate	Moderate
War dog	Moderate	High
Giant lizard	Moderate	Very high
Sentient boulder	High (Heavyweight)	Very low
Dwarf rhino	High	Low
Lion	High	Moderate
Minotaur	High	High
Werewolf	High	Very high
Giant amoeba	Very high (Super-heavyweight)	Very low
Mummy	Very high	Low
Swamp thing	Very high	Moderate
Dragon	Very high	High
Nether demon	Very high	Very high

Table 2. The strength and dexterity of the 25 maze monsters.

### Catacomb Conquest: Program Listing 1. Maze/BAS.

```

H100 REM ***** HAZE/BAS
110 REM ***** BY MICHAEL E. DEVORE
120 CLEAR2000:DEFINT A-M:RANDOM:DEFUSR0=&HAE02
130 CLS:PRINT:PRINT
140 PRINT:PRINT"CATACOMBS UNDER CONSTRUCTION--STAND BY"
150 FORA=&HAE02TO&HAF4D
160 READA$:B$=LEFT$(A$,1):MZ=16*(VAL(B$)-(B$>"9")*(ASC(B$)-55))
170 B$=RIGHT$(A$,1):MZ=MZ+VAL(B$)-(B$>"9")*(ASC(B$)-55):POKEA,MZ
:NEXT
180 FORA=&HAC02TO&HADDA
190 READA$:B$=LEFT$(A$,1):MZ=16*(VAL(B$)-(B$>"9")*(ASC(B$)-55))
200 B$=RIGHT$(A$,1):MZ=MZ+VAL(B$)-(B$>"9")*(ASC(B$)-55):POKEA,MZ
:NEXT
210 FORA=&HAB00TO&HABD7
220 READA$:B$=LEFT$(A$,1):MZ=16*(VAL(B$)-(B$>"9")*(ASC(B$)-55))
230 B$=RIGHT$(A$,1):MZ=MZ+VAL(B$)-(B$>"9")*(ASC(B$)-55):POKEA,MZ
:NEXT
    
```

Listing 1 continued

Listing 1 continued

```

240 A=USR0(A)
250 RUN"CATACOMB/BAS"
260 REM ***** THIS IS MAZE DATA
270 DATA21,00,B0,36,BF,11,01,B0,01,FF,0F,ED,B0,3E,80,06,04,11,3C
,00,21,00,B1,CD,42,AF,21,37,00,22,00,AE,21,00,B1,0E,00,5D,54,7C,
FE,BC,30,09,24,24,CB,46,62,28,02,CB,C1,7C,FE,B3,38,09,25,25,CB,4
6,62
280 DATA28,02,CB,D1,7D,E6,3B,28,0B,7D,D6,08,6F,CB,46,6B,28,02,CB
,D9,7D,E6,3F,FE,34,30,0B,7D,C6,08,6F,CB,46,6B,28,02,CB,C9,79,B7,
28,5D,CD,F4,AE,11,40,00,06,04,CB,4F,20,30,CB,57,20,18,CB,5F,20,1
E,19
290 DATA19,19,CD,08,AF,CD,13,AF,10,F8,B7,ED,52,ED,52,ED,52,18,25
,CD,38,AF,CD,3D,AF,10,F8,18,1B,CD,1E,AF,CD,29,AF,10,F8,18,11,7D,
C6,03,6F,2C,CD,1F,AF,2C,CD,2A,AF,10,F6,2D,2D,2D,EB,2A,00,AE,2B,2
2,00
300 DATAAE,7C,B5,28,22,EB,C3,25,AE,24,24,7C,FE,BE,38,10,26,B1,7D
,C6,08,6F,E6,3F,28,04,FE,3C,38,02,2E,00,CB,46,20,E5,C3,25,AE,3E,
80,11,3C,00,06,08,21,38,BE,CD,42,AF,C9,E5,C5,21,04,00,CD,CC,14,C
1,E1
310 DATA47,AF,37,17,10,FD,A1,28,ED,C9,19,3E,80,77,2C,77,2C,77,2C
,77,C9,19,3E,80,77,2D,77,2D,77,2D,77,C9,2D,3E,80,77,19,77,19,77,
19,77,C9,2D,3E,80,B7,77,ED,52,77,ED,52,77,ED,52,77,C9,B7,ED,52,1
8,CC
320 DATAB7,ED,52,18,D2,C5,06,04,77,23,10,FC,C1,19,10,F5,C9
330 REM ***** THIS IS DISPLAY DATA
340 DATADD,21,00,3C,2A,00,AC,2B,2B,2B,2B,11,40,01,B7,ED,52,06
,0B,C5,E5,06,0B,7C,FE,B0,3E,BF,30,0B,DD,77,00,DD,77,01,DD,77,02,
18,39,3A,00,AC,F6,C0,C6,07,38,09,4F,7D,F6,C0,91,3E,BF,30,E3,3A,0
0,AC
350 DATAE6,3F,D6,06,38,09,4F,7D,E6,3F,B9,3E,BF,38,D1,7C,FE,C0,3E
,80,30,CA,7E,FE,80,38,30,DD,77,00,DD,77,01,DD,77,02,23,DD,23,DD,
23,DD,23,10,AC,F1,C1,11,40,00,19,11,1F,00,DD,19,10,9B,21,4F,3D,3
6,A8
360 DATA23,36,89,23,36,A9,2A,00,AC,C3,9A,0A,FE,1B,D2,05,AD,FE,06
,30,0E,DD,36,00,80,DD,36,01,99,DD,36,02,91,18,C2,FE,0B,30,0E,DD,
36,00,A0,DD,36,01,A7,DD,36,02,A5,18,B0,FE,10,30,0E,DD,36,00,9E,D
D,36
370 DATA01,83,DD,36,02,AD,18,9E,FE,15,30,0F,DD,36,00,8A,DD,36,01
,9C,DD,36,02,9E,C3,65,AC,FE,1A,28,0F,DD,36,00,AA,DD,36,01,9B,DD,
36,02,BB,C3,65,AC,3A,FC,AF,B7,3E,80,CA,5C,AC,DD,36,00,B3,DD,36,0
1,BF
380 DATADD,36,02,B3,C3,65,AC,FE,51,30,0F,DD,36,00,20,DD,36,01,2A
,DD,36,02,20,C3,65,AC,FE,5B,30,0A,DD,36,00,20,DD,36,01,2B,18,EB,
3A,FD,AF,B7,3E,20,CA,5C,AC,3E,54,C3,AC,CD,7F,0A,3A,FB,AF,47,7
D,2A
390 DATA00,AC,11,40,00,17,17,38,3C,17,38,3C,17,38,33,17,30,03,B7
,ED,52,7E,FE,80,28,17,FE,1B,30,04,06,01,18,1B,FE,65,30,17,FE,5B,
38,04,06,02,18,05,47,18,02,06,00,22,00,AC,78,32,FB,AF,C3,02,AC,2
A,00
400 DATAAC,18,F1,19,18,D0,23,18,CD,2B,18,CA,CD,7F,0A,06,03,DD,21
,F0,AD,11,41,00,B7,ED,52,C5,06,03,7E,FE,1B,30,25,FD,21,00,A9,FD,
5E,00,FD,56,01,E5,B7,ED,52,E1,28,07,11,08,00,FD,19,18,EC,FD,E5,D
1,DD
410 DATA73,00,DD,23,DD,72,00,DD,23,23,10,D3,C1,11,3D,00,19,10,C9
,AF,DD,77,00,DD,77,01,2A,F0,AD,C3,9A,0A
420 REM ***** THIS IS MONSTER MOVEMENT DATA
430 DATACD,7F,0A,E5,AF,32,FB,AF,DD,21,C0,AA,ED,5B,00,AC,CD,AB,AB
,DD,21,00,AA,CD,AB,AB,DD,E1,DD,6E,00,DD,66,01,36,80,7D,E6,3F,5F,
3A,00,AC,E6,3F,BB,28,06,38,03,2C,18,01,2D,7E,FE,80,20,0E,E5,ED,5
B,00
440 DATAAC,B7,ED,52,E1,28,03,DD,75,00,DD,6E,00,DD,66,01,7D,E6,C0
,07,07,5F,7C,CB,27,CB,27,E6,3F,83,5F,3A,00,AC,E6,C0,07,07,57,3A,
01,AC,CB,27,CB,27,E6,3F,82,BB,11,40,00,28,1E,38,03,19,18,03,B7,E
D,52
450 DATA7E,FE,80,20,11,E5,ED,5B,00,AC,B7,ED,52,E1,28,06,DD,75,00
,DD,74,01,DD,6E,00,DD,66,01,DD,7E,02,77,11,08,00,DD,19,DD,7E,01,
B7,C2,1C,AB,C9,DD,7E,01,FE,B0,38,22,DD,6E,00,DD,66,01,E5,B7,ED,5
2,E1
460 DATADD,7E,02,20,03,32,FB,AF,47,7E,FE,1B,38,01,78,77,01,04,00
,DD,09,18,D7,B7,C8,18,F5

```

End

Catacomb Conquest: Program Listing 2. Catacomb/BAS.

```

100 REM ***** CATACOMB/BAS
110 REM ***** YOU MUST RUN MAZE/BAS BEFORE USING THIS PROGRAM
120 REM ***** MEMORY SIZE = 43263, FILES = 1
130 REM ***** WRITTEN BY MICHAEL E. DEVORE
140 CLS: CLEAR1000: DEFINT A-X: RANDOM: DIMMS(26), MD(26): TW=0: LC=0: A=
0

```

Listing 2 continued

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Listing 2 continued

```

150 PRINT:PRINT:INPUT"WHAT DIFFICULTY LEVEL (1 - 9, 1 IS THE EAS
IEST)";DF:IFDF<1ORDF>9THENPRINT"DIFFICULTY MUST BE IN THE RANGE
1 TO 9":GOTO150
160 POKE&HAFFA,DF
170 CLS:PRINT:PRINT"NOW STOCKING THE CATACOMBS"
180 FORA=1TO26:READA$,MS(A),MD(A):NEXT
190 B$="":FORA=1TO18:READTV:B$=B$+CHR$(TV):NEXT
200 DEFUSR0=PEEK(VARPTR(B$)+1)+256*PEEK(VARPTR(B$)+2)-65536:TV=U
SR0(TV)
210 B$="":FORA=1TO14:READTV:B$=B$+CHR$(TV):NEXT
220 DEFUSR0=PEEK(VARPTR(B$)+1)+256*PEEK(VARPTR(B$)+2)-65536:TV=U
SR0(TV)
230 DF=PEEK(&HAFFA):MN=DF*2:HW=DF+4:ML=&HA900:TL=&HAA00:SL=&HAAC
0
240 TV=DF*2+2:FORA=1TOMN+MW
250 TW=RND(25):IFMS(TW)+MD(TW)<TV-2ORMS(TW)+MD(TW)>TV+2THEN250
260 LC=RND(3775)+&HB100:IFPEEK(LC)<>128THEN260
270 POKELC,TW:TX=LC/256+256
280 IFA<=MNTHENPOKETL,LC-TX*256+65536:POKETL+1,TX:POKETL+2,A+50:
TL=TL+4
290 POKEML,LC-TX*256+65536:POKEML+1,TX:POKEML+2,TW:POKEML+3,MS(T
W):POKEML+4,MD(TW)
300 TX=10*MS(TW)+RND(25)+5:POKEML+5,TX:POKEML+6,TX:ML=ML+6
310 NEXT:POKETL+1,0:POKE&HAC00,0:POKE&HAC01,&HB1:POKE&HAFPD,0:PO
KE&HAFFC,0
320 FORA=01TO85
330 LC=RND(3007)+&HB400:IFPEEK(LC)<>128THEN330
340 POKELC,A:TW=LC/256+256
350 POKESL,LC-TW*256+65536:POKESL+1,TW:POKESL+2,A:SL=SL+4:NEXT
360 POKE&HAA00+4*(RND(3)+2)-1,1
370 FORA=1TODF*8
380 LC=RND(3775)+&HB100:IFPEEK(LC)<>128THEN380
390 POKELC,RND(10)+90:NEXT
400 FORA=&HA900TO&HA900+DF*8-8STEP8:LC=PEEK(A)+256*PEEK(A+1)-655
36:POKELC,26:POKEA+2,26:NEXT
410 IFDF>5THENTV=ML-8:FORA=TVTOTOV-8*(DF-6)STEP-8:LC=PEEK(A)+256*
PEEK(A+1)-65536:POKELC,26:POKEA+2,26:NEXT
420 DATA"GIANT TICK",2,2,"GIANT TERMITE",2,4,"KILLER SQUIRREL",2
,6,"TOY DRAGON",2,8,"VAMPIRE BAT",2,10
430 DATA"LAND CRAB",4,2,"GIANT TOAD",4,4,"SKELETON",4,6,"GIANT B
EE",4,8,"GIANT COCKROACH",4,10
440 DATA"FANGED TUMBLEWEED",6,2,"ZOMBIE",6,4,"MERCENARY FIGHTER"
,6,6,"WAR DOG",6,8,"GIANT LIZARD",6,10
450 DATA"SENTIENT BOULDER",8,2,"DWARF RHINO",8,4,"LION",8,6,"HIN
OTAUR",8,8,"WEREWOLF",8,10
460 DATA"GIANT AMOEBA",10,2,"HUMMY",10,4,"SWAMP THING",10,6,"DRA
GON",10,8,"NETHER DEMON",10,10,"INVISIBLE",6,6
470 DATA33,0,176,126,254,128,48,2,62,128,119,35,124,254,192,56,2
42,201
480 DATA33,0,169,17,1,169,1,255,1,54,0,237,176,201
490 CLEAR:DEFINTA-S:DEFSTRZ:DEFUSR0=&HAD34:DEFUSR1=&HAD00:DEFUSR
2=&HAE02:DEFUSR3=&HAB00
500 CT=0:KB=0:PR=0:PL=&H3840:PM=&HAFFB:LC=0:PN=&H3801:EX=&HBFBB:
SH=&H3880:PP=&H3804:AM=0:PS=&H3802
510 L2=&HA900:L3=&HAA00:L4=&HAA00:L5=&HADF0
520 A=0:DF=PEEK(&HAFFA):KV=0:Z3=CHR$(31):Z2=CHR$(30):CU=0:MW=DF+
4:KW=0:TH=0
530 HT=DF*15+30:HP=HT:YV=0:RR=DF*2:VL=0:HC=DF+2:HH=DF:CR=0
540 DIMZN(26),ZT(18),MD(26),MS(26),ZE(4),ZR(10),ZH(5),EC(5),ZC(4
)
550 CS=8:CD=6:C2=8:C3=6:SH=0:MN=RR
560 FORA=1TO26:READZN(A),MS(A),MD(A):NEXT
570 FORA=1TO32:READKV:NEXT
580 FORA=1TO18:READZT(A):NEXT
590 FORA=0TO4:READZE(A):NEXT
600 FORA=1TO8:READZR(A):NEXT:ZR(9)=ZR(8):ZR(10)=ZR(8)
610 FORA=1TO5:READZH(A):NEXT
620 FORA=0TO4:READZC(A):NEXT
630 FORA=0TO704STEP64:PRINT@A+35,CHR$(149);:NEXT:LC=USR0(0):A=US
R1(LC)
640 PRINT@100,"HIT POINTS "HT"OF "HP;:PRINT@228,"HEALING COOKIES
="HC;:PRINT@292,"HOLY HAND GRENADES ="HH;:PRINT@420,2;ZE(
(CR+1)*5/8)"ENCUMBERED";
650 PRINT@548,"TREASURES LEFT ="RR;:CU=612:GOSUB1790:POKE&H
AFPD,EC(1):POKE&HAFFC,EC(2):IFSM=0PRINT@704,STRINGS(35,176);:GOT
O700
660 SM=SM-1:IFSM<4THENPRINT@64*11,"AHH--THE SMELL FINALLY WORE O
FF";:GOTO700
670 IFSM<10THENPRINT@64*11,"THE AIR IS CLEARING";STRINGS(16,176)
;:GOTO700
680 IFSM<50THENPRINT@64*11,"YOU REEK";STRINGS(27,176);:GOTO700

```

Listing 2 continued on p. 99

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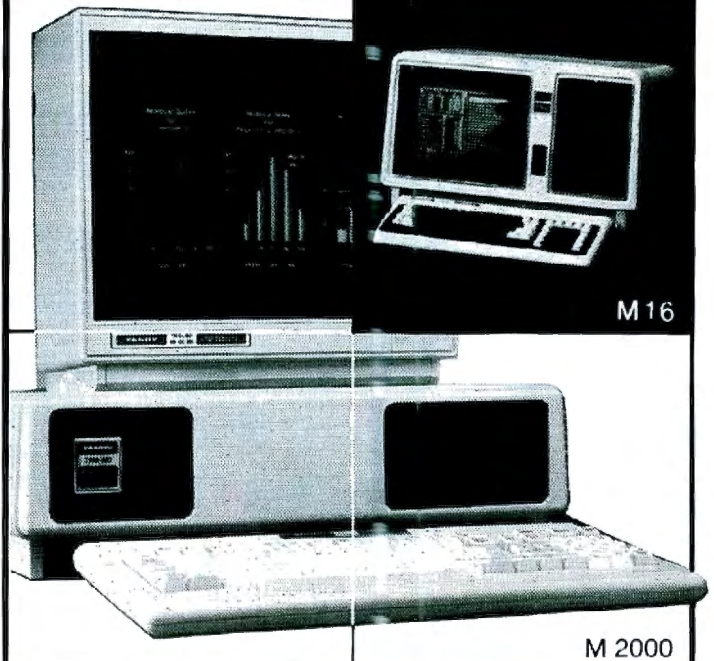
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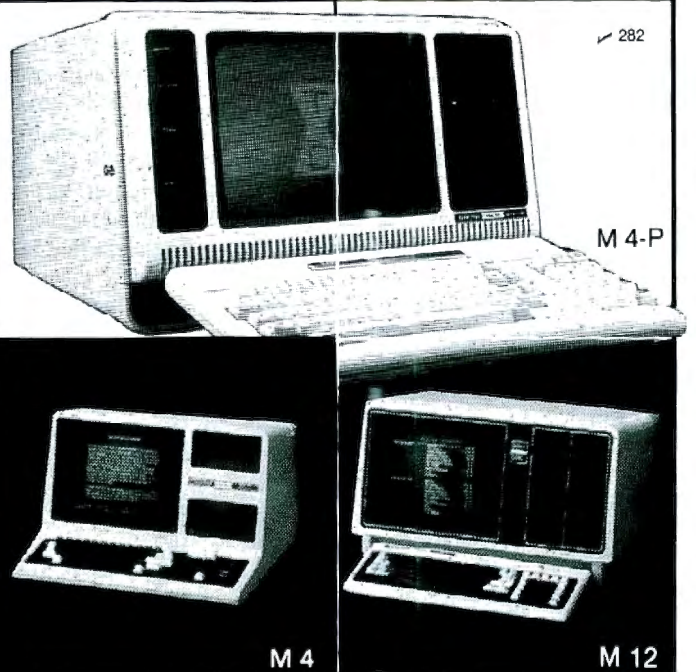


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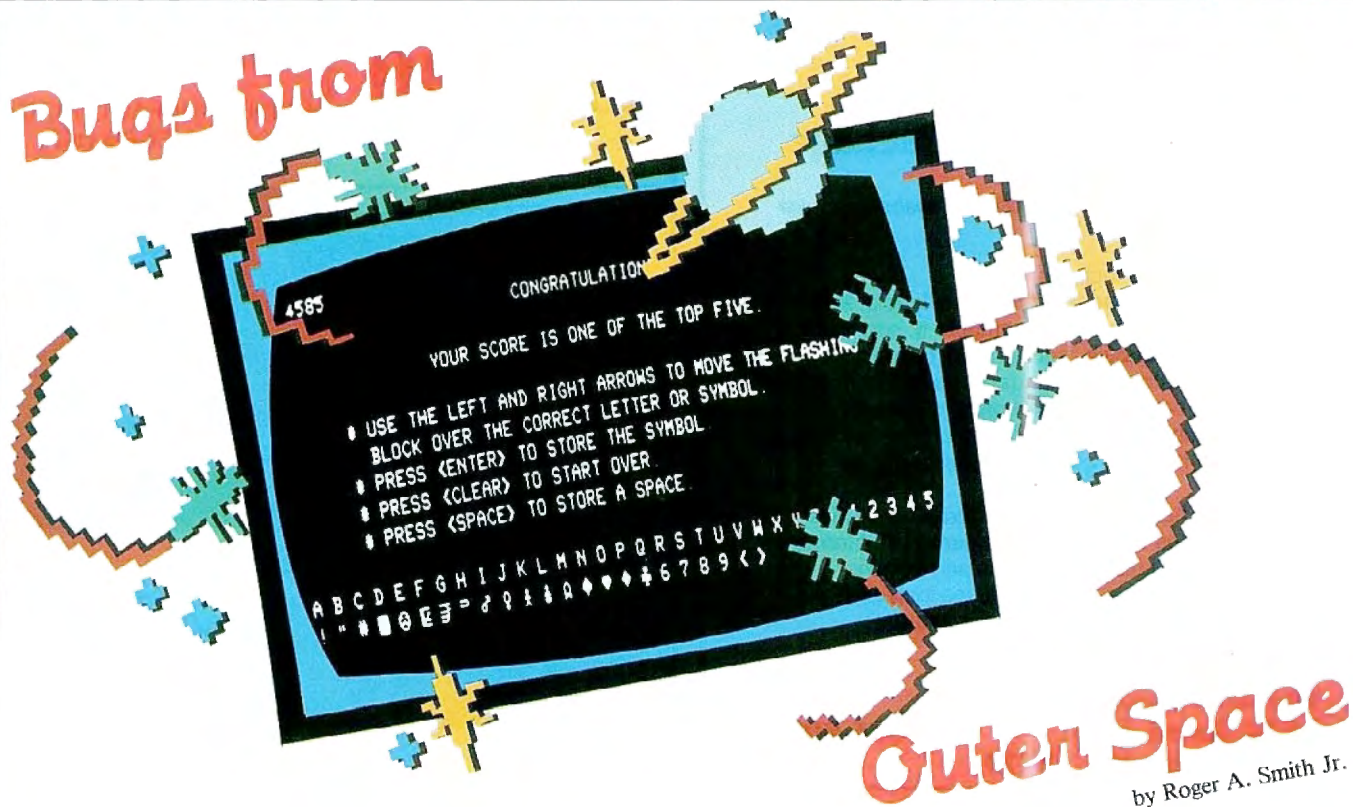
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# Bugs from



# Outer Space

by Roger A. Smith Jr.

*Editor's note: This is the sixth and last installment of a tutorial on writing machine-language arcade games for the Models I and III. The final version of the main program listing appeared last month, and game modules have appeared in every issue since March 1984.*

**H**ave you beaten the bugs, or have horrible insects overrun the earth? After playing the finished version of Bugs from Outer Space for a month, you're probably ready to challenge friends to top your score. This month's listings add a current-session scoreboard (a permanent one for disk owners), and a few other finishing touches.

Program Listings 1 and 2 (Text6A and Text6B, respectively) include a routine that keeps track of the top five scores as you play the game. Listing 1 (p. 89) creates the screen congratulating you and asking you to type in your initials; Listing 2 (p. 90) patches into the main program to save and display scores, and to correct some minor problems.

For example, you might have noticed that the program ignores the

clear key during the introductory sound routine, even though the screen says, "Press <CLEAR> to play." The code starting at Patch1 lets impatient players skip the fanfare.

Patch2 checks to see if your score is one of the top five. If it is, the "Congratulations" screen appears and the game prompts you to enter your initials.

Although most TRS-80 games have you type in your initials with the keyboard, I've chosen a method similar to most arcade games: You use the arrow keys to select a letter or symbol (including a few special characters on the Model III), then press the enter key to store it. You can press the space bar to store a space or the clear key to start over.

After getting your initials, the program moves them and your score into the last element of the table storing the top five scores. The routine starting at Sort arranges the table in order, then the game displays the updated title screen and new top scores. The routine at Patch3 initializes the high score to the value in the top-five table.

Program Listing 3 (Text6C) (p. 96) corrects an error that occurs if you and the aliens finish in a dead-

heat: If you shot the last bug on the screen (finishing the level) as a bomb or alien hit your base, the screen flashed to signal the end of the current level and the beginning of the next level while your base was still exploding. That explosion made the screen flash again, signaling that the base was hit, and the level restarted. Patch5 adds a test to the main program loop to catch this problem.

## Saving Scores and Bugs

Program Listing 4 (Text6D) is for disk systems only. It automatically loads the high scores from disk when the game starts and saves them after each game. The routine uses standard DOS calls, so it should work with most Model I or III DOSes.

I've found one problem with Model III TRSDOS, so this episode's technical instructions are more detailed than usual. To add this

---

### The Key Box



Models I and III  
16K RAM  
Assembly Language  
Editor/Assembler

---



month's code, assemble the source code listings and save the object code (machine language) to disk or tape.

Load all the object code modules in order, starting with the main program (Main5/CMD) and adding the others from Text1 onward. Don't load the last one (Text6D) unless you're using a disk system.

To save the complete game to tape, use a monitor such as Debug or T-Bug. Use a starting address of 6000 hexadecimal (hex), an ending address of 78FF hex, and an execution (TRA) address of 6DDD hex. To save Bugs/CMD to disk, except for Model III TRSDOS, use your DOS Dump command and the same addresses.

Since Model III TRSDOS doesn't like programs that load below 7000 hex, users of that system have to relocate the game higher in memory. The easiest way to do this is to add 1000 hex to the values in all the origin (ORG) and equate (EQU) statements at the beginning of the listings; for example, change the origin address in Text1 from 6000 hex to 7000 hex. Be careful—if you miss one change, the game will crash. You also need to make the changes in the Table to Text6A through Text6D.

After assembling the game with the new origins and equates, you can save it as one program by first loading the main program and then the modules, and then using the command DUMP BUGS/CMD (START = 7000, END = 88FF, TRA = 7DDD). Now, simply entering BUGS from the TRSDOS Ready prompt will start the game.

### An Unfair Advantage

By now, you're familiar with the rules of war: Use the left- and right-arrow keys to move your base, and the space bar to fire your laser cannon (you can't fire another shot until the previous one hits something or leaves the screen).

The top line, reading from left to right, shows your score, the number of bases left, the record score, and your current level; spider and star bugs are worth 10 and 25 points respectively, and saucers 50 points. Attacking bugs are worth twice the normal points.

Finally, as the bugs drop bombs or

swoop down to attack, it sometimes appears that they'll pass through your base without destroying it. What actually happens in such cases is that you run into the bomb or bug; the base is destroyed only when bombs or bugs run into you.

If you examine the source code, you'll see that several tests check to determine whether you shoot a bug

or a bug moves into your shot. The advantage is given to the human player. When you're fighting bugs from space, you need every edge. ■

*Listing 1 begins below, Listing 2 starts on p. 90, and Listings 3 and 4 are on p. 96.*

*Contact Roger Smith at 505 Ridge Lake Road, Crestview, FL 32536.*

In addition to changing the origins and equates in the earlier modules (including MAIN5), Model III TRSDOS users must add 1000 hex to the addresses in the following lines of the new modules. (TEXT6A through TEXT6D). For example, in line 00490 of TEXT6D, change LD HL,75F0H to LD HL,85F0H.

TEXT6A		TEXT6C
00110		00110 00130 00250
TEXT6B		TEXT6D
00110 00130 00140		00110 00130 00150
00150 00170 00190		00320 00360 00370
00210 00220 00300		00390 00490 00560
00370 00460 00480		
01530 01540 01760		
01770 02090 02250		
02430		

Table 1. Changes to TEXT6A through TEXT6D for Model III TRSDOS users.

### Bugs from Outer Space: Program Listing 1. Text6A, score entry screen.

```

7080      00100 ;**** PART6A
7080 20    00110   ORG      7080H
          00120 SCREEN DEFM '
          ;64 SPACES
70C0 20    00130   DEFM '          CONGRATULATIONS!
          ;64 (24 SPACES-"CONGRATS"-24 SPACES)
7100 20    00140   DEFM '
          ;64 SPACES
7140 20    00150   DEFM '          YOUR SCORE IS ONE OF THE
TOP FIVE.      ;64 (15 SPACES-"YOUR ..."-15 SPACES)
7180 20    00160   DEFM '
          ;64 SPACES
71C0 20    00170   DEFM '          * USE THE LEFT AND RIGHT ARROWS TO
MOVE THE FLASHING ;64 (6 SPACES-"* USE..."-6 SPACES)
7200 20    00180   DEFM '          BLOCK OVER THE CORRECT LETTER OR
SYMBOL.        ;64 (8 SPACES-"BLOCK..."-16 SPACES)
7240 20    00190   DEFM '          * PRESS <ENTER> TO STORE THE SYMBOL.
          ;64 (6 SPACES-"* PRESS..."-22 SPACES)
7280 20    00200   DEFM '          * PRESS <CLEAR> TO START OVER.
          ;64 (6 SPACES-"* PRESS..."-28 SPACES)
72C0 20    00210   DEFM '          * PRESS <SPACE> TO STORE A SPACE.
          ;64 (6 SPACES-"* PRESS..."-25 SPACES)
7300 20    00220   DEFM '
          ;64 SPACES
7340 41    00230   DEFM 'A B C D E F G H I J K L M N O P Q R S T U
V W X Y Z 0 1 2 3 4 5 ;64
7380 21    00240   DEFM '1 " # ' ( ) * = - + . ? ' ;24
7386 C4    00250   DEFB 196
7387 20    00260   DEFB 32
7388 C5    00270   DEFB 197
7389 20    00280   DEFB 32
738A F4    00290   DEFB 244
738B 20    00300   DEFB 32
738C F5    00310   DEFB 245
738D 20    00320   DEFB 32
738E F6    00330   DEFB 246
738F 20    00340   DEFB 32
7390 F9    00350   DEFB 249
7391 20    00360   DEFB 32
7392 FA    00370   DEFB 250
7393 20    00380   DEFB 32
7394 FD    00390   DEFB 253
7395 20    00400   DEFB 32
7396 FE    00410   DEFB 254
7397 20    00420   DEFB 32
7398 FF    00430   DEFB 255
7399 20    00440   DEFB 32
739A C0    00450   DEFB 192
739B 20    00460   DEFB 32
739C C1    00470   DEFB 193

```

Listing 1 continued

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Listing 1 continued

```

739D 20      00480      DEFB 32
739E C2      00490      DEFB 194
739F 20      00500      DEFB 32
73A0 C3      00510      DEFB 195
73A1 20      00520      DEFM ' 6 7 8 9 < > ' ; 13
73A2 20      00530      DEFM ' ' ;18 SPACES
73C0 20      00540      DEFM '
              ;64
7400 20      00550      DEFM '
              ;64
7440 20      00560      DEFM '
745C 5F      00570      DEFB 95
745D 20      00580      DEFB 32
745E 5F      00590      DEFB 95
745F 20      00600      DEFB 32
7460 5F      00610      DEFB 95
7461 20      00620      DEFB 32
7462 5F      00630      DEFB 95
7463 20      00640      DEFM '
              ;29 SPACES
7480      00650      NEXT1 EQU $
0000      00660      END
000000 TOTAL ERRORS
32490 TEXT AREA BYTES LEFT
    
```

NEXT1 7480 00650  
SCREEN 7080 00120

End

Bugs from Outer Space: Program Listing 2. Text6B, score-saving and bug-fixing patches.

```

"" 00100 ;**** PART6B
61AD      00110      ORG 61ADH ;**** PATCH TO INTRO SOUND SUB
61AD CD8074 00120      CALL PATCH1
6F1A      00130      ORG 6F1AH ;**** PATCH TO GAME OVER
6F1A C3256F 00140      JP 6F25H
6F40      00150      ORG 6F40H ;**** PATCH TO GAME OVER
6F40 C38C74 00160      JP PATCH2
6DDD      00170      ORG 6DDDH
6DDD CD3776 00180      CALL PATCH3 ;**** PATCH TO ENTRY
61CF      00190      ORG 61CFH ;**** PATCH TO INTRO
61CF C38175 00200      JP PATCH4
7080      00210      SCREEN EQU 7080H
7480      00220      ORG 7480H ;**** START OF PATCHES
7480 7C      00230      PATCH1 LD A,H ;**** PATCH TO INTRO SOUND SUB
7481 FE06   00240      CP 6
7483 C8     00250      RET 2
7484 3A4030 00260      LD A,(3840H)
7487 E602   00270      AND 2 ;ADD TEST FOR <CLEAR>
7489 E002   00280      XOR 2 ;TOGGLE BIT
748B C9     00290      RET ;RETURN
748C 215362 00300      PATCH2 LD HL,6253H ;HL=>SCORE
748F 112776 00310      LD DE,BUFFER ;DE=>BUFFER
7492 0605   00320      LD B,5 ;STORE 5 SPACES
7494 3E20   00330      LD A,32 ;A=SPACE
7496 12     00340      LOOP10 LD (DE),A
7497 13     00350      INC DE
7498 10FC   00360      DJNZ LOOP10
749A CD0362 00370      CALL 6203H ;DISPLAY SCORE SUB
749D 212C76 00380      LD HL,BUFFER+5 ;HL=> ASCII OF SCORE
74A0 112176 00390      LD DE,LAST1+5 ;DE=> LOWEST IN TABLE
74A3 CDB575 00400      CALL COMP ;COMPARE SCORES
74A6 C28375 00410      JP NZ,PATCH4 ;SKIP IF NOT
74A9 218070 00420      LD HL,SCREEN ;DISPLAY SCREEN
74AC 11003C 00430      LD DE,3C00H
74AF 010004 00440      LD BC,1024
74B2 EDB0   00450      LDIR
74B4 215362 00460      LD HL,6253H ;HL=> SCORE
74B7 11003C 00470      LD DE,3C00H ;DE=>VIDEO
74BA CD0362 00480      CALL 6203H ;DISPLAY SCORE
74BD FD214038 00490      LD IX,3840H ;IX=>KEYBOARD
74C1 21C03E 00500      LD HL,3EC0H ;HL=> VIDEO
74C4 11DC3F 00510      LD DE,3FDCH ;DE=> VIDEO
74C7 7E     00520      LOOP30 LD A,(HL) ;GET CHARACTER
74C8 12     00530      LD (DE),A ;DISPLAY CHARACTER
74C9 360F   00540      LD HL,(8FH) ;DISPLAY CURSOR
74CB 010010 00550      LD BC,1000H ;DELAY
74CE CD6000 00560      CALL 60H
74D1 FDCB0046 00570      BIT 0,(IX) ;ENTER?
74D5 280E   00580      JR Z,NENTER ;SKIP IF NOT
74D7 1A     00590      LD A,(DE)
74D8 77     00600      LD (HL),A ;RESTORE CHARACTER
74D9 13     00610      RIGHT INC DE ;BUMP POINTER
74DA 13     00620      INC DE
74DB 7B     00630      LD A,E ;EOL?
74DC FEE4   00640      CP 0E4H
74DE 2859   00650      JR Z,DONE ;SKIP IF DONE
74E0 CD0075 00660      CALL BEEP ;BEEP
74E3 18E2   00670      JR LOOP30
74E5 FDCB004E 00680      NENTER BIT 1,(IX) ;CLEAR?
74E9 2812   00690      JR Z,NCLEAR ;SKIP IF NOT
74EB 1A     00700      LD A,(DE) ;RESTORE CHR
74EC 77     00710      LD (HL),A
74ED 11DC3F 00720      LD DE,3FDCH ;RESET POINTER
74F0 D5     00730      PUSH DE
    
```

Listing 2 continued

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Listing 2 continued

```

74F1 0604      00740      LD      B,4          ;CLEAR LINE
74F3 3E5F      00750 LOOP40 LD      A,5FH
74F5 12        00760      LD      (DE),A
74F6 13        00770      INC     DE
74F7 13        00780      INC     DE
74F8 10F9      00790      DJNZ   LOOP40
74FA D1        00800      POP     DE
74FB 18CA      00810      JR     LOOP30
74FD FDCB006E 00820 NCLEAR BIT   5,(IY)          ;LEFT?
7501 280B      00830      JR     Z,NLEFT
7503 1A        00840      LD      A,(DE)
7504 77        00850      LD      (HL),A
7505 7D        00860      LD      A,L
7506 FEC0      00870      CP     0C0H          ;EOL?
7508 28BD      00880      JR     Z,LOOP30    ;LOOP IF SO
750A 2B        00890      DEC     HL
750B 2B        00900      DEC     HL          ;DECREMENT POINTER
750C 18B9      00910      JR     LOOP30      ;LOOP
750E FDCB0076 00920 NLEFT BIT   6,(IY)          ;RIGHT?
7512 280B      00930      JR     Z,NRIGHT    ;SKIP IF NOT
7514 1A        00940      LD      A,(DE)      ;RESTORE CHR
7515 77        00950      LD      (HL),A
7516 7D        00960      LD      A,L          ;START OF LINE?
7517 FE3E      00970      CP     3EH
7519 28AC      00980      JR     Z,LOOP30    ;LOOP IF SO
751B 23        00990      INC     HL          ;BUMP POINTER
751C 23        01000      INC     HL
751D 10A8      01010      JR     LOOP30      ;LOOP
751F FDCB007E 01020 NRIGHT BIT  7,(IY)          ;SPACE?
7523 2807      01030      JR     Z,NSPACE
7525 1A        01040      LD      A,(DE)      ;RESTORE CHR
7526 77        01050      LD      (HL),A
7527 3E20      01060      LD      A,32
7529 12        01070      LD      (DE),A      ;A=SPACE
752A 18AD      01080      JR     RIGHT
752C 1A        01090 NSPACE LD      A,(DE)      ;RESTORE CHR
752D 77        01100      LD      (HL),A
752E 3E5F      01110      LD      A,5FH
7530 12        01120      LD      (DE),A      ;A=CURSOR CHR
7531 010010    01130      LD      BC,1000H    ;DELAY
7534 CD6000    01140      CALL   60H
7537 188E      01150      JR     LOOP30      ;LOOP
7539 CDD075    01160 DONE CALL   BEEP
753C 21DC3F    01170      LD      HL,3FDCH
753F 112776    01180      LD      DE,BUFFER
7542 0604      01190      LD      B,4
7544 7E        01200 LOOP50 LD      A,(HL)
7545 12        01210      LD      (DE),A
7546 13        01220      INC     DE
7547 23        01230      INC     HL
7548 23        01240      INC     HL
7549 10F9      01250      DJNZ   LOOP50      ;LOOP UNTIL B=0
754B 212776    01260      LD      HL,BUFFER  ;MOVE BUFFER TO LAST LINE
754E 111C76    01270      LD      DE,LAST1
7551 010B00    01280      LD      BC,11
7554 EDB0      01290      LDTR
7556 FD21F075 01300 SORT  LD      IY,HIGH5
755A AF        01310      XOR     A          ;IY==>STORAGE
755B 32DC75    01320      LD      (FLAG),A   ;RESET FLAG
755E 0604      01330      LD      B,4
7560 C5        01340 LOOP80 PUSH   BC          ;B=5-1
7561 FDE5      01350      PUSH   IY         ;SAVE BC
7563 E1        01360      POP     HL         ;HL=IY
7564 010500    01370      LD      BC,5
7567 09        01380      ADD    HL,BC      ;HL=IY+5
7568 E5        01390      PUSH   HL
7569 010B00    01400      LD      BC,11
756C 09        01410      ADD    HL,BC
756D EB        01420      EX     DE,HL
756E E1        01430      POP     HL
756F CDB575    01440      CALL   COMP
7572 C4C275    01450      CALL   NZ,SWAP    ;COMPARE SCORES
7575 010B00    01460      LD      BC,11     ;SWAP IF NECESSARY
7578 FD09      01470      ADD    IY,BC
757A C1        01480      POP     BC
757B 10E3      01490      DJNZ   LOOP80
757D 3ADC75    01500      LD      A,(FLAG)
7580 B7        01510      OR     A
7581 20D3      01520      JR     NZ,SORT
7583 218760    01530 PATCH4 LD      HL,6087H
7586 CDB361    01540      CALL   61B3H
7589 213276    01550      LD      HL,MESS10
758C 11753C    01560      LD      DE,3C75H
758F 010500    01570      LD      BC,5
7592 EDB0      01580      LDTR
7594 21F23C    01590      LD      HL,3CF2H
7597 11F075    01600      LD      DE,HIGH5
759A 0E95      01610      LD      C,5
759C C5        01620 LOOP90 PUSH   BC          ;5 LINES
759D 060B      01630      LD      B,11
759F E5        01640      PUSH   HL         ;11 CHRS/LINE
75A0 1A        01650 LOOP95 LD      A,(DE)     ;SAVE POINTER
75A1 77        01660      LD      (HL),A    ;MOVE LINE
75A2 13        01670      INC     DE
75A3 23        01680      INC     HL
75A4 10FA      01690      DJNZ   LOOP95
75A6 E1        01700      POP     HL         ;RESTORE POINTER
75A7 014000    01710      LD      BC,64

```

Listing 2 continued

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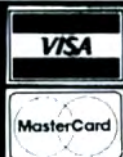
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*Listing 2 continued*

```

75AA 09      01720      ADD      HL,BC      ;POINT TO NEXT LINE
75AB C1      01730      POP      BC
75AC 0D      01740      DEC      C
75AD 20ED    01750      JR      NZ,LOOP9H ;LOOP UNTIL C=0
75AF CDD561  01760      CALL    61D5H    ;USE PART OF INTRO SUB
75B2 C3E06D  01770      JP      6DE0H    ;NEW GAME
75B5 0606    01780      COMP   LD      B,6      ;SIX DIGITS
75B7 1A      01790      LOOPC  LD      A,(DE)   ;CP (HL) AND (DE)
75B8 BE      01800      CF
75B9 3805    01810      JR      C,CARRY
75BB C0      01820      RET      NZ      ;RETURN IF NOT =
75BC 23      01830      INC     HL
75BD 13      01840      INC     DE      ;INC POINTERS
75BE 10F7    01850      DJNZ   LOOPC
75C0 AF      01860      CARRY  XOR     A      ;(HL)>(DE)
75C1 C9      01870      RET
75C2 FDE5    01880      SWAP   PUSH   IY     ;SWAP LINES
75C4 E1      01890      POP    HL     ;HL=IY
75C5 010B00  01900      LD     BC,11
75C8 E5      01910      PUSH  HL
75C9 09      01920      ADD   HL,BC   ;HL==>NEXT LINE
75CA D1      01930      POP   DE     ;DE==>LINE
75CB 060B    01940      LD     B,11
75CD 4E      01950      LOOPS  LD     C,(HL)
75CE 1A      01960      LD     A,(DE)
75CF 77      01970      LD     (HL),A
75D0 79      01980      LD     A,C
75D1 12      01990      LD     (DE),A
75D2 23      02000      INC   HL
75D3 13      02010      INC   DE
75D4 10F7    02020      DJNZ  LOOPS
75D6 3E01    02030      LD     A,1     ;SET FLAG
75D8 32DC75  02040      LD     (FLAG),A
75DB C9      02050      RET
75DC 00      02060      FLAG   DEFB   0
75DD 0E40    02070      BEEP   LD     C,40H
75DF 0670    02080      LOOPB  LD     B,70H
75E1 CD0A61  02090      CALL  618AH    ;CALL SOUNDX
75E4 10FE    02100      DJNZ  S        ;DELAY
75E6 0D      02110      DEC   C
75E7 20F6    02120      JR    NZ,LOOPB
75E9 01003A  02130      LD     BC,3A00H
75EC CD6000  02140      CALL  60H      ;DELAY
75EF C9      02150      RET
75F0 52      02160      HIGH5  DEFM  'RAS 74550' ;***** WATCH SPACING
75F1 52      02170      DEFM  'RAS 500'  ;***** EACH MUST BE
7600 52      02180      DEFM  'RAS 500'  ;***** EXACTLY 11
7611 52      02190      DEFM  'RAS 500'  ;***** CHARACTERS LONG
761C 52      02200      LAST1  DEFM  'RAS 500'
7627 20      02210      BUFFER DEFM  '
7632 54      02220      MESS10 DEFM  'TOP 5'
7637 11F575  02230      PATCH3 LD     DE,HIGH5+5 ;**** PATCH TO ENTRY
                                ;DE==>HIGH SCORE (ASCII)
763A 215162  02250      LD     HL,624FH+2 ;HL-->HIGH SCORE
763D 0603    02260      LD     B,3      ;3 BYTES
763F 1A      02270      CONV  LD     A,(DE)  ;GET CHARACTER
7640 FE20    02280      CP     32      ;SPACE?
7642 2001    02290      JR    NZ,CONV10 ;SKIP IF NOT
7644 AF      02300      XOR   A        ;ELSE A=0
7645 E60F    02310      CONV10 AND   0FH      ;MASK LOWER BITS
7647 77      02320      LD     (HL),A  ;STORE BYTE
7648 13      02330      INC   DE
7649 1A      02340      LD     A,(DE)
764A FE20    02350      CP     32      ;SPACE?
764C 2001    02360      JR    NZ,CONV20 ;SKIP IF NOT
764E AF      02370      XOR   A        ;ELSE A=0
764F E60F    02380      CONV20 AND   0FH      ;MASK LAST 4 BITS
7651 ED6F    02390      RLD
7653 13      02400      INC   DE
7654 2B      02410      DEC   HL
7655 10E8    02420      DJNZ  CONV
7657 C3BC61  02430      JP    61BCH    ;INTRO
0000 02440      END
00000 TOTAL ERRORS
29718 TEXT AREA BYTES LEFT
BEEP 75DD 02070 00660 01160
BUFFER 7627 02210 00310 00380 01180 01260
CARRY 75C0 01060 01010
COMP 75B5 01780 00400 01440
CONV 763F 02270 02420
CONV10 7645 02310 02290
CONV20 764F 02380 02360
DONE 7539 01160 00650
FLAG 75DC 02060 01320 01500 02040
HIGH5 75F0 02160 01300 01600 02230
LAST1 761C 02200 00390 01270
LOOP10 7496 00340 00360
LOOP30 74C7 00520 00670 00810 00880 00910 00980 01010 01150
LOOP40 74F3 00750 00790
LOOP50 7544 01200 01250
LOOP80 7560 01340 01490
LOOP90 759C 01620 01750
LOOP95 75A0 01650 01690
LOOPB 75DF 02080 02120
LOOPC 75B7 01790 01850
LOOPS 75CD 01950 02020
MESS10 7632 02220 01550
NCLEAR 74FD 00820 00690
ENTER 74E5 00680 00580
LEFT 750E 00920 00830
RIGHT 751F 01020 00930
NSPACE 752C 01090 01030
PATCH1 7480 00230 00120
PATCH2 748C 00300 00160
PATCH3 7637 02230 00180
PATCH4 7583 01530 00200 00410
RIGHT 74D9 00610 01080

```

*Listing 2 continued*

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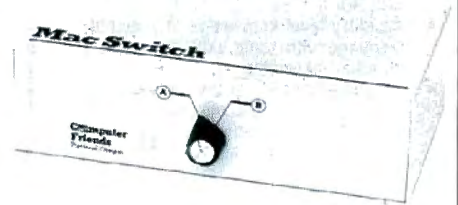
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Listing 2 continued

```
SCREEN 7000 00210 00420
SORT 7556 01300 01520
```

```
SWAP 75C2 01880 01450
```

End

### Bugs from Outer Space: Program Listing 3. Text6C, end-of-level explosion patch.

```

00100 ;**** PART6C
6ED2 00110 ORG 6ED2H ;**** PATCH TO NEXT LEVEL
6ED2 CD5A76 00120 CALL PATCH5
765A 00130 ORG 765AH
765A DD7E2A 00140 PATCH5 LD A,(IX+42) ;LEVEL DONE?
765D B7 00150 OR A
765E C8 00160 RET Z ;RETURN IF NOT
765F DD7E29 00170 LD A,(IX+41)
7662 DDB61E 00180 OR (IX+30) ;BASE HIT?
7665 2003 00190 JR NZ,YES ;SKIP IF SO
7667 3E01 00200 LD A,1 ;SET FLAG
7669 C9 00210 RET
766A DD361E00 00220 YES LD (IX+30),0 ;RESET FLAGS
766E DD362900 00230 LD (IX+41),0
7672 D1 00240 POP DE ;CLEAR STACK
7673 C3026F 00250 JP 6F02H ;JUMP TO CONT+7
7676 00260 NEXT1 EQU $
0000 00270 END
00000 TOTAL ERRORS
34679 TEXT AREA BYTES LEFT

NEXT1 7676 00260
PATCH5 765A 00140 00120
YES 766A 00220 00190
```

End

### Bugs from Outer Space: Program Listing 4. Text6D, disk scoreboard routine.

```

00100 ;***** PART6D (DISK SYSTEMS ONLY)
6DDD 00110 ORG 6DDDH
6DDD CDB177 00120 CALL LOAD
757D 00130 ORG 757DH
757D C3DF77 00140 JP SAVE
7676 00150 ORG 7676H
0100 00160 BUFFER DEFS 256
0032 00170 FCB DEFS 50
77A8 42 00180 FILENM DEFM 'BUGS/SCR'
77B0 0D 00190 DEFB 13
77B1 21A877 00200 LOAD LD HL,FILENM ;LOAD SCORES
77B4 117677 00210 LD DE,FCB ;MOVE FILENAME TO FCB
77B7 010900 00220 LD BC,9
77BA EDB0 00230 LDIR
77BC 117677 00240 LD DE,FCB ;DE==>FCB
77BF 217676 00250 LD HL,BUFFER ;HL==>BUFFER
77C2 0600 00260 LD B,0 ;LRL=256
77C4 CD2444 00270 CALL 4424H ;OPEN EXISTING FILE
77C7 2010 00280 JR NZ,ERROR1 ;SKIP IF ERROR
77C9 CD3644 00290 CALL 4436H ;READ SECTOR
77CC 200B 00300 JR NZ,ERROR1 ;SKIP ON ERROR
77CE 217676 00310 LD HL,BUFFER ;MOVE BUFFER TO
77D1 11F075 00320 LD DE,75F0H ; HIGH5 AREA
77D4 013700 00330 LD BC,55 ; 55 BYTES
77D7 EDB0 00340 LDIR
77D9 CD2844 00350 ERROR1 CALL 4428H ;CLOSE
77DC C33776 00360 JP 7637H ;JUMP TO PATCH3
77DF 3ADC75 00370 SAVE LD A,(75DCH) ;A= SORT FLAG
77E2 B7 00380 OR A
77E3 C25675 00390 JP NZ,7556H ;SORT AGAIN IF NOT ZERO
77E6 21A877 00400 LD HL,FILENM ;MOVE FILENAME
77E9 117677 00410 LD DE,FCB ; TO FCB
77EC 010900 00420 LD BC,9
77EF EDB0 00430 LDIR
77F1 117677 00440 LD DE,FCB ;DE==>FCB
77F4 217676 00450 LD HL,BUFFER ;HL==>BUFFER
77F7 0600 00460 LD B,0 ;LRL=256
77F9 CD2044 00470 CALL 4420H ;OPEN FILE
77FC 2011 00480 JR NZ,ERROR2 ;SKIP IF ERROR
77FE 21F075 00490 LD HL,75F0H ;MOVE HIGH SCORES
7801 117676 00500 LD DE,BUFFER ; TO BUFFER
7804 013700 00510 LD BC,55
7807 EDB0 00520 LDIR
7809 117677 00530 LD DE,FCB
780C CD3944 00540 CALL 4439H ;WRITE SECTOR
780F CD2844 00550 ERROR2 CALL 4428H ;CLOSE
7812 C38J75 00560 JP 7583H ;JP TO PATCH4
7815 00570 NEXT1 EQU $
0000 00580 END
00000 TOTAL ERRORS
33921 TEXT AREA BYTES LEFT
BUFFER 7676 00160 00250 00310 00450 00500
ERROR1 77D9 00350 00200 00300
ERROR2 780F 00550 00400
FCB 7776 00170 00210 00240 00410 00440 00530
FILENM 77A8 00180 00200 00400
LOAD 77B1 00200 00120
NEXT1 7815 00570
SAVE 77DF 00370 00140
```

End



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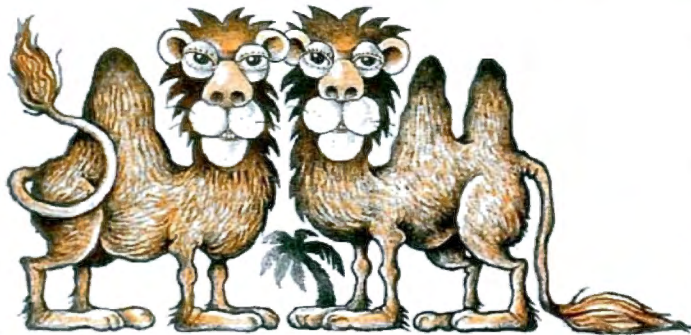
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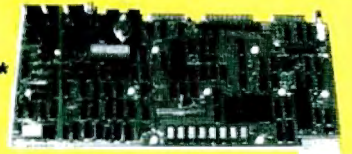
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Listing 2 continued from p. 86

```

690 PRINT@64*11,"YOUR STENCH IS UNBEARABLE";STRING$(10,176);
700 IFPR=0THEN730
710 PR=PR-1:IFPR=0THENPRINT@740,22;:GOTO730
720 PRINT@740,22;"YOU ARE COMPLETELY PARALYZED";
730 CT=0
740 IFPR=0THEN800
750 KB=PEEK(PL)AND120:IFKBTHENLC=USR0(KB):IFPEEK(PH)=0IFLC<=EXTH
EN820ELSE1650ELSE1620
760 IFPEEK(PL)AND128THEN990
770 IFPEEK(PH)THEN1440
780 IFPEEK(PS)THEN1500
790 IFPEEK(PP)THEN1030
800 IFPEEK(SH)THEN1890
810 CT=CT+1:IFCT<100THEN740
820 CU=768:PRINT@64*12,23;
830 PRINT@676,22;:A=USR3(L2+DF*16):A=USR1(LC):LC=USR0(0):IFA=0TH
EN950
840 PRINTZN(PEEK(A+2));:FORA=L5TOL5+15STEP2:IFPEEK(A+1)=0THENA=L
5+15:GOTO940
850 KV=PEEK(A)+256*PEEK(A+1)-65536:IFCU>959THENGOSUB2190
860 PRINT@CU,ZC(PEEK(KV+6)/PEEK(KV+5)*4);" ";ZN(PEEK(KV+2))" ATT
ACKS--IT ";
870 GOSUB2170:KW=RND(18):KX=(7*PEEK(KV+4)+3*PEEK(KV+3)+20)/8-(C3
+8-AM)*((PR>0)+1)/2
880 IFKW>KXTHENPRINT"COMPLETELY MISSED":GOTO930
890 KY=3*PEEK(KV+3)/2+PEEK(KV+4)/2+4
900 IFKW>KX-3THENKY=KY*3/10:PRINT"STRUCK A GLANCING BLOW":GOTO92
0
910 PRINT"SCORED A DIRECT HIT"
920 HT=HT-KY-RND(4)
930 CU=CU+64
940 NEXT:GOSUB2010
950 HT=HT+EC(3)+DF*4*(EC(3)<0):IFHT>HPTHENHT=HP
960 IFHT<=0THENPRINT@64*12,23;"CURSED RING OF REGENERATION KILLE
D YOU":GOSUB2150:GOTO2020
970 TM=TM+1:IFHT=HPOREC(3)=0ORRND(400)<>RND(400)THEN640
980 POKEL4+9,02:CR=CR-1:EC(3)=0:PRINT@64*12,23;"RING OF REGENERA
TION BURNS OUT":GOSUB2160:GOTO640
990 CLS:PRINT"COMMANDS":PRINT:PRINT"(KEYBOARD ARROWS)--GO IN TH
E SPECIFIED DIRECTION":PRINT"(A)--ATTACK A MONSTER ADJACENT TO Y
OU":PRINT"(T)--THRUST AT A MONSTER":PRINT"(P)--PARRYING ATTACK O
N A MONSTER"
1000 PRINT"(B)--BLOW UP A HOLY HAND-GRENADE, KILL ALL ADJACENT M
ONSTERS":PRINT"(G)--GRAB A TREASURE OR ITEM IN THE SPOT YOU ARE
STANDING":PRINT"(D)--DROP AN ITEM OR TREASURE"
1010 PRINT"(E)--EAT A HEALING COOKIE":PRINT"(S)--SEARCH FOR TRAP
S":PRINT"(I)--INVENTORY OF OBJECTS CARRIED":PRINT"(W)--WAIT FOR
ONE TURN":PRINT"(SHIFT KEY)--FREEZE ACTION UNTIL 'ENTER' KEY IS
PRESSED":PRINT"(SPACE BAR)--LIST OF ALL COMMANDS"
1020 GOSUB1750:CLS:GOTO630
1030 IFPEEK(PP)=128THENPRINT@64*12,23;"WAITING":GOSUB2160:GOTO82
0
1040 IFPEEK(PP)=8THENPRINT@64*12,23;"SEARCHING":GOSUB2160:POKE&H
AFFD,EC(1)OR(RND(0)+.25):GOTO820
1050 IFPEEK(PP)=1THENAM=4:GOTO1270
1060 IFPEEK(PP)=16THENAM=12:GOTO1270
1070 GOTO810
1080 PRINT@64*12,23;"YOU ARE CARRYING":CU=832:IFCR=0THENPRINT"N
OTHING AT ALL":GOTO1160

```

```

1090 FORA=L3TOL3+DF*8-4STEP4:IFPEEK(A+1)<>1THEN1120
1100 IFCU>959THENGOSUB2190
1110 PRINTZT(PEEK(A+2)-50):CU=CU+64
1120 NEXT:FORA=L4TOL4+16STEP4:IFPEEK(A+1)<>1THEN1150
1130 IFCU>959THENGOSUB2190
1140 PRINTZM(PEEK(A+2)-80):CU=CU+64
1150 NEXT
1160 GOSUB1750:PRINT@64*12,23;:GOTO730
1170 PRINT@64*12,23;:IFHH=0THENPRINT"YOU HAVE NO HOLY HAND GRENA
DES LEFT":GOTO750
1180 IFPEEK(&HADF1)=0THENPRINT"THERE ARE NOT ANY MONSTERS AROUND
YOU. ARE YOU SURE YOU WANT TO DO THIS";:GOSUB2220:PRINT@64*12,
23;:IFAN=0THEN750
1190 CU=832:PRINT@64*12,"KA-BOOM!!!!":HH=HH-1:FORA=L5TOL5+15STEP
2:IFPEEK(A+1)=0THENA=L5+15:GOTO1260
1200 KV=PEEK(A)+256*PEEK(A+1)-65536:IFCU>959THENGOSUB2190
1210 PRINT@CU,ZN(PEEK(KV+2));" IS BLOWN APART"
1220 POKEPEEK(KV)+256*PEEK(KV+1)-65536,128
1230 VL=VL+PEEK(KV+3)*10+PEEK(KV+4)*10+PEEK(KV+5):CU=CU+64:IFKV<
L2+DF*16THENPOKEKV+1,1:GOTO1260
1240 KW=RND(3775)+&HB100:IFPEEK(KW)<>128ORKW=LCTHEN1240
1250 POKEKV,KWAND255:POKEKV+1,256+(KWAND&HFF00)/256:POKEKV,PEEK(
KV+2):POKEKV+6,PEEK(KV+5)
1260 NEXT:GOTO830
1270 PRINT@64*12,23;:IFPEEK(L5+1)=0THENPRINT"NO MONSTERS IN RANG
E":AM=8:GOTO750
1280 IFPEEK(&HADF3)=0THENA=PEEK(&HADF0)+256*PEEK(&HADF1)-65536:G
OTO1340
1290 KV=2:FORA=&HADF5TO&HADFFSTEP2:IFPEEK(A)=0THENA=&HADFF:GOTO1
310
1300 KV=KV+1
1310 NEXT
1320 PRINT@64*12,22;:PRINT"WHICH MONSTER (#1-#";USING"#";KV;:PRI
NT")";:INPUTKW:IFKW>KVORKW<1THEN1320
1330 A=PEEK(L5+(KW-1)*2)+256*PEEK(L5+1+(KW-1)*2)-65536
1340 GOSUB2170:C3=(C3+AM-8)*((PR>0)+1):C2=CS+((SH<4)+1)*2*((SM>4
9)+(SM>9)+(SM>3))+AM-8+EC(4)*4:IFC2<0THENC2=0
1350 KW=RND(18):KX=(7*C3+3*C2+20)/8-PEEK(A+4)/2
1360 PRINT@64*12,23;"YOU ";:IFKW>KXTHENPRINT"COMPLETELY MISSED";
:GOTO1420
1370 KY=3*C2/2+C3/2+4
1380 IFKW>KX-3THENKY=KY*3/10:PRINT"STRUCK A GLANCING BLOW ON";:G
OTO1400
1390 PRINT"SCORED A DIRECT HIT ON";
1400 KY=KY+RND(4)+AM-8
1410 KY=PEEK(A+6)-KY:POKEA+6,KY*ABS(KY>0)
1420 PRINT"THE "ZN(PEEK(A+2)):IFPEEK(A+6)<=0THENPRINT"AND YOU K
ILLED IT":AM=8:KV=A:FORA=1TOL1:CU=832:GOTO1220
1430 CU=832:GOTO830
1440 IFPEEK(PH)=32THEN1760
1450 IFPEEK(PH)=128THEN1920
1460 IFPEEK(PH)=4THEN1170
1470 IFPEEK(PH)=16THEN1520
1480 IFPEEK(PH)=2THENAM=8:GOTO1270
1490 GOTO810
1500 IFPEEK(PS)=2THEN1080
1510 GOTO810
1520 PRINT@64*12,23;:IFCR=0THENPRINT"YOU AREN'T CARRYING ANYTHIN
G TO DROP":GOSUB2160:GOTO750
1530 FORA=L4TOL4+16STEP4:IFPEEK(A+1)<>1THEN1580

```

Listing 2 continued

Listing 2 continued

```

1540 PRINT@64*12,Z2;"DO YOU WANT TO DROP THE "ZH(PEEK(A+2)-80);:
GOSUB2220:IFAN=0THEN1580
1550 EC(PEEK(A+2)-80)=0:PRINT"OKAY, YOU DROPPED THE "ZM(PEEK(A+2)
)-80)
1560 POKELC,PEEK(A+2):POKEA,LCAND255:POKEA+1,256+(LCAND&HFF00)/2
56
1570 CR=CR-1:A=L3+255:NEXT:GOSUB2150:GOTO820
1580 NEXT:FORA=L3TOL3+DF*8-4STEP4:IFPEEK(A+1)<>1THEN1610
1590 PRINT@64*12,Z2;"DO YOU WANT TO DROP A TREASURE ";:GOSUB2220
:IFAN=0THENA=L3+255:GOTO1610
1600 PRINT"OKAY, YOU DROPPED THE "ZT(PEEK(A+2)-50):GOTO1560
1610 NEXT:PRINT"NO MORE THINGS TO DROP":GOSUB2160:GOTO750
1620 IFPEEK(PM)=1THEN1800
1630 IFPEEK(PM)=2THEN1810
1640 GOTO820
1650 CLS:PRINT:PRINT"YOU LEFT THE CATACOMBS":KV=0:FORA=1TO5:KV=K
V+ABS(EC(A)):NEXT
1660 KV=CR-KV:CR=CR-KV:RR=RR-KV:IFRR=0THEN1730
1670 KW=32-(KV<>1)*51:PRINT:PRINT"YOU ARE GIVEN "KV"HEALING COOK
ID";CHR$(KW);" FOR":PRINT"THE TREASURE";CHR$(KW);" YOU HAVE GATH
ERED":HC=HC+KV
1680 FORA=L3TOL3+DF*8-4STEP4:IFPEEK(A+1)=1THENPOKEA+1,2
1690 NEXT
1700 PRINT:PRINT"YOU HAVE NOT COMPLETED YOUR TASK AND YOU MUST R
ETURN":GOSUB1750:CLS
1710 FORA=&HBF8TO&HBFBB:IFPEEK(A)=128THENLC=A:POKE&HAC00,AAND25
5:POKE&HAC01,256+(AAND&HFF00)/256
1720 NEXT:GOTO630
1730 CLS:PRINT:PRINT"CONGRATULATIONS":PRINT:PRINT"YOU SURVIVED T
HE PERILS OF THE CATACOMBS":PRINT:PRINT"TALES OF YOUR GLORY SHAL
L SPAN THE CENTURIES"
1740 PRINT:PRINT"A NEW ADVENTURE IS WAITING. DARE YOU RISK IT?"
:PRINT:PRINT"I DARE YOU! !":GOTO2030
1750 PRINT@980,"*** PRESS 'ENTER' TO RETURN ***";:GOSUB2200:RETU
RN
1760 PRINT@64*12,Z3;:IFHC=0THENPRINT"YOU HAVE NO MORE HEALING CO
OKIES":GOSUB2160:GOTO750
1770 IFHT/HP>.6THENPRINT"YOU HAVE MANY HIT POINTS LEFT. ARE YOU
SURE YOU WANT TO DO THIS";:GOSUB2220:PRINT@64*12,Z3;:IFAN=0THEN
750
1780 PRINT"HMMHM--HEALING COOKIES ARE VERY TASTY":GOSUB2150:HC=H
C-1:HT=HP:GOTO820
1790 YV=VL+1000*(DF*2-RR)*(2+(RR>0))-TM:PRINT@CU,"SCORE
=";YV;:RETURN
1800 PRINT@64*12,Z3;"OUCH--YOU RAN INTO A MONSTER":HT=HT-RND(4):
GOSUB2010:CU=832:GOTO830
1810 KV=PEEK(LC)-90:PRINT@64*12,Z3;"YOU SET OFF A TRAP":PRINTZR(
KV):GOSUB2150:POKE&HAFFB,0
1820 IFKV<6THENHT=HT-DF*4-RND(DF*4):GOTO1880
1830 IFKV>6THEN1860
1840 LC=RND(3839)+&HB100:IFPEEK(LC)<>128THEN1840
1850 KW=(LC+65536)/256:POKE&HAC00,LC-256*KW+65536:POKE&HAC01,KW:
PRINT@64*12,Z3;:GOTO820
1860 IFKV>7THENS=SH+DF*5+RND(DF*5)+7:GOTO1880
1870 IFKV=7THENPR=DF
1880 POKELC,128:GOSUB2010:GOTO820
1890 IFPEEK(PL)=0THENPRINT@36,Z2;"FREEZE ACTION";
1900 IFPEEK(PL)<>0THENPRINT@36,Z2;:GOTO740

```

```

1910 GOSUB2160:PRINT@36,Z2;:GOSUB2160:GOTO1890
1920 A=PEEK(PM):PRINT@64*12,Z3;:IFA<50THENPRINT"NOTHING TO GRAB
HERE":GOSUB2160:GOTO750
1930 IFCR>5THENPRINT"YOU CAN'T CARRY ANY MORE THINGS":GOSUB2160:
GOTO750
1940 PRINT"YOU JUST GRABBED ";
1950 IFA>80THEN1980
1960 PRINT"A TREASURE!":PRINTZT(A-50)
1970 KV=L3+4*(A-50)-3:POKEKV,1:GOTO2000
1980 PRINT"A USEFUL ITEM.":PRINTZM(A-80):EC(A-80)=1
1990 KV=L4+4*(A-80)-3:POKEKV,1:IFPEEK(KV+2)=1THENEC(A-80)=-1
2000 CR=CR+1:POKEPH,0:POKELC,128:GOSUB2150:GOTO820
2010 IFHT>0THENRETURN
2020 CLS:PRINT:PRINT"YOU HAVE BEEN SLAIN.":PRINT:PRINT"THE CATAC
OMBS HAVE CLAIMED YET ANOTHER VICTIM.":PRINT:PRINT"DEATH BE NOT
PROUD."
2030 GOSUB2190:CLS:CU=64:GOSUB1790
2040 OPEN"R",1,"SCORES/DAT":IFLOP(1)THEN2060
2050 FIELD1,255ASMS$:FORA=1TO9:LSETMS$=STRING$(255,0):PUT1,A:NEX
T
2060 GET1,DF:FIELD1,4ASSC$,250ASMS$:YV=CVS(SC$)
2070 PRINT:PRINT"FOR DIFFICULTY "DF", THE HIGH SCORE ON RECORD I
S: ";YV:PRINT:PRINT"WITH THE ACCOMPANYING MESSAGE.":PRINTMS$
2080 IFYV>YVTHENPRINT:PRINT"YOU DID NOT MAKE HIGH SCORE. BETTE
R LUCK NEXT TIME.":GOTO2120
2090 PRINT"YOU DID IT! YOU MADE HIGH SCORE"
2100 PRINT"WRITE A MESSAGE FOR POSTERITY (UP TO 250 LETTERS)":LI
NEINPUT"AND PRESS 'ENTER' ";MT$:IFLEN(MT$)>250THENPRINT"TOO LON
G--TRY AGAIN":GOTO2100
2110 LSETSC$=MK$(YV):LSETMS$=MT$:PUT1,DF
2120 CLOSE:PRINT:PRINT"DO YOU WANT TO PLAY AGAIN";:GOSUB2220:IFA
N=0THENCLS:PRINT:PRINT"TOO BAD--THE MONSTERS NEEDED MORE OF A WO
RKOUT.":END
2130 PRINT:PRINT"SAME MAZE";:GOSUB2220:IFAN=0THENA=USR2(A)
2140 RUN
2150 FORA=1TO1500:NEXT:RETURN
2160 FORA=1TO200:NEXT:RETURN
2170 C3=CD+EC(5)*4+2-FIX((CR+1)*5/6):IFC3<0THENC3=0
2180 RETURN
2190 PRINT@960,"***** MORE INFORMATION. PRESS 'ENTER' TO CONTIN
UE *****";
2200 KV$=INKEY$:IFKV$<>CHR$(13)THEN2200
2210 PRINT@64*12,Z3;:CU=768:RETURN
2220 PRINT"(Y/N)? ";
2230 ZA=INKEY$:IFZA="Y"THENPRINTZA:AN=1:RETURN
2240 IFZA="N"THENPRINTZA:AN=0:RETURN
2250 GOTO2230
2260 DATA"CLOAK OF MAGICKS","RING OF LORD DARIEN","LENSES OF THE
ALL-SEEING","HELMET OF ST. MICHAEL","LUCIFER'S HAMMER","NECKLAC
E OF SA' ESS"
2270 DATA"RERAND'S ROBE","AXE OF BEREAVEMENT","STATUETTE OF APOL
LO","WOOL OF THE MOTHER EWE","COMB OF DIANA","EVER-CHANGING TAPE
STRY"
2280 DATA"GERARD'S HUNTING HORN","OCCAM'S RAZOR","VEIL OF THE CH
ASTE","EXCISED WART OF ZEUS","SEED OF THE TREE OF LIFE","GREAT G
OBLIN'S GOBLET"
2290 DATA"UN","LIGHTLY","MODERATELY","HEAVILY","FULLY"
2300 DATA"A HEAVY STONE BLOCK FALLS ON YOUR HEAD","A FIREBALL RO
ARS THROUGH A SMALL OPENING IN THE FLOOR","A BLADE SCYTHES DOWN
FROM THE CEILING"

```

Listing 2 continued

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Listing 2 continued

```

2310 DATA"A BOLT OF LIGHTENING TRAVELS THROUGH YOU FROM HEAD TO
TOE","ACID SQUIRTS ALL OVER YOU FROM TINY HOLES IN THE FLOOR"
2320 DATA"A TWISTING SENSATION IN YOUR GUT--YOU'VE BEEN TELEPORT
ED!","DARTS TIPPED WITH CURARE BOMBARD YOU--YOU ARE PARALYZED","
PHEW!! NOXIOUS FUMES SPRAY OVER YOUR ENTIRE BODY"
2330 DATA"STONE OF TRAP REVELATION","CHARM OF MANIFESTATION","TA
LISMAN OF REGENERATION","CHAIN OF STRENGTH","BRACERS OF DEXTERIT
Y"
2340 DATA"CRITICAL","MAINED","GASHED","SCRATCHED","HEALTHY"
    
```

End

**Catacomb Conquest: Program Listing 3. Source code for three time-saving USR routines.**

```

00100 ;
00110 ;***** HNSTRHOV/SOR
00120 ;
AB00 00130 ;          ORG      0A000H
00140 ;
00150 ;***** THIS PART OF THE PROGRAM REDISPLAYS ITEMS AND
00160 ;***** TREASURES.  IT ALLOWS YOU TO DROP MORE THAN ONE
00170 ;***** THING IN THE SAME PLACE WITHOUT LOSING ANYTHING.
00180 ;
AB00 CD7F0A 00190 CALL    0A7FH
AB03 25     00200 PUSH   HL
AB04 AF     00210 XOR    A
AB05 32FBAF 00220 LD     (0AFFBH),A
AB08 DD21C0AA 00230 LD     IX,0AAC0H
AB0C ED5B00AC 00240 LD     DE,(LOCATE)
AB10 CDABAB 00250 CALL   REDISP
AB13 DD2100AA 00260 LD     IX,0AA00H
AB17 CDABAB 00270 CALL   REDISP
00280 ;
00290 ;***** THIS PART MOVES THE WANDERING MONSTERS AROUND
00300 ;
AB1A DDE1   00310 POP    IX          ;IX CONTAINS WANDERING MONST
ER LOCATION
AB1C DD6E00 00320 BACK5 LD     L,(IX)
AB1F DD6601 00330 LD     H,(IX+1)
AB22 3600   00340 LD     (HL),80H      ;PUT A SPACE WHERE THE MONST
ER USED TO BE
AB24 7D     00350 LD     A,L
AB25 E63F   00360 AND    63
AB27 5F     00370 LE     E,A
AB28 3A00AC 00380 LD     A,(LOCATE)
AB2E E63F   00390 AND    63
AB2D BB     00400 CP     E
AB2E 2806   00410 JR     Z,CKHOV
AB30 3803   00420 JR     C,HLEFT
AB32 2C     00430 INC    L          ;MOVE RIGHT
AB33 1801   00440 JR     CKHOV
AB35 2D     00450 MLEFT DEC    L          ;MOVE LEFT
AB36 7E     00460 CKHOV LD     A,(HL)
AB37 FE80   00470 CF     80H
AB39 200E   00480 JR     NZ,NOMOVE   ;MUST BE A SPACE TO MOVE INT
O
AB3B E5     00490 PUSH   HL
AB3C ED5B00AC 00500 LD     DE,(LOCATE)
AB40 B7     00510 OR     A
AB41 ED52   00520 SBC   HL,DE
AB43 E1     00530 POP    HL
AB44 2803   00540 JR     Z,NOMOVE   ;CAN'T MOVE ON TOP OF YOUR C
HARACTER
AB46 DD7500 00550 LD     (IX),L      ;SAVE NEW LOCATION
AB49 DD6E00 00560 NOMOVE LD     L,(IX)
AB4C DD6601 00570 LD     H,(IX+1)
AB4F 7D     00580 LD     A,L
AB50 E6C0   00590 AND    0C0H
AB52 07     00600 RLCA
AB53 07     00610 RLCA
    
```

```

AB54 5F     00620 LD     E,A
AB55 7C     00630 LD     A,H
AB56 CB27   00640 SLA   A
AB58 CB27   00650 SLA   A
AB5A E63F   00660 AND    63
AB5C 83     00670 ADD   A,E
AB5D 5F     00680 LD     E,A
AB5E 3A00AC 00690 LD     A,(LOCATE)
AB61 E6C0   00700 AND    0C0H
AB63 07     00710 RLCA
AB64 07     00720 RLCA
AB65 57     00730 LD     D,A
AB66 3A01AC 00740 LD     A,(LOCATE+1)
AB69 CB27   00750 SLA   A
AB6B CB27   00760 SLA   A
AB6D E63F   00770 AND    63
AB6F 82     00780 ADD   A,D
AB70 BB     00790 CP     E
AB71 11400D 00800 LD     DE,64
AB74 281E   00810 JR     Z,SETTLE
AB76 3803   00820 JR     C,HUP
AB78 19     00830 ADD   HL,DE          ;MOVE DOWN
AB79 1803   00840 JR     CKHOV2
AB7B B7     00850 HUP   OR    A
AB7C ED52   00860 SBC   HL,DE          ;MOVE UP
AB7E 7E     00870 CKHOV2 LD     A,(HL)
AB7F FE80   00880 CP     80H
AB81 2011   00890 JR     NZ,SETTLE
AB83 E5     00900 PUSH   HL
AB84 ED5B00AC 00910 LD     DE,(LOCATE)
AB88 B7     00920 OR     A
AB89 ED52   00930 SBC   HL,DE
AB8B E1     00940 POP    HL
AB8C 2806   00950 JR     Z,SETTLE
AB8E DD7500 00960 LD     (IX),L
AB91 DD7401 00970 LD     (IX+1),H
AB94 DD6E00 00980 SETTLE LD     L,(IX)
AB97 DD6601 00990 LD     H,(IX+1)
AB9A DD7E02 01000 LD     A,(IX+2)
AB9D 77     01010 LD     (HL),A      ;PUT MONSTER NUMBER IN NEW L
OCATION
AB9E 110800 01020 LD     DE,8
ABA1 DD19   01030 ADD   IX,DE
ABA3 DD7E01 01040 LD     A,(IX+1)
ABA6 B7     01050 OR     A
ABA7 C21CAB 01060 JP     NZ,BACK5     ;MORE WANDERING MONSTERS
ABAA C9     01070 RET
ABAB DD7E01 01080 REDISP LD     A,(IX+1)
ABAE FE80   01090 CP     0B0H
ABB0 3822   01100 JR     C,PICKED    ;THIS ITEM IS NOT ON THE FLO
OR
ABB2 DD6E00 01110 LD     L,(IX)
ABB5 DD6601 01120 LD     H,(IX+1)
ABB8 E5     01130 PUSH   HL
ABB9 B7     01140 OR     A
ABBA ED52   01150 SBC   HL,DE
ABBC E1     01160 POP    HL
ABBD DD7E02 01170 LD     A,(IX+2)
ABC0 2003   01180 JR     NZ,NHERE
ABC2 32FBAF 01190 LD     (0AFFBH),A
ABC5 47     01200 NHERE LD     B,A
ABC6 7E     01210 LD     A,(HL)
ABC7 FE1B   01220 CP     27
ABC9 3801   01230 JR     C,GUARD   ;IT'S GUARDED, LEAVE THE DIS
PLAY THE SAME
ABCB 78     01240 LD     A,B
ABCC 77     01250 GUARD LD     (HL),A
ABCD 010400 01260 BACK4 LD     BC,4
ABD0 DD09   01270 ADD   IX,BC
ABD2 18D7   01280 JR     REDISP      ;CHECK ANOTHER ITEM
ABD4 B7     01290 PICKED OR    A
ABD5 C8     01300 RET          ;ALL DONE
ABD6 18F5   01310 JR     BACK4
AC00       01320 LOCATE EQU 0AC00H
    
```

Listing 3 continued

Listing 3 continued

0000 01330 END  
00000 TOTAL ERRORS End

**Catacomb Conquest: Program Listing 4. The maze generator.**

```

00100 ;
00110 ;***** MAZE/SOR
00120 ;***** ADAPTED FROM A
PROGRAM BY DAN ROLLINS
00130 ;***** BY MICHAEL E. DEVORE
00140 ;
AE00 00150 ORG 0AE00H
0002 00160 COUNT DEFS 2
AE02 2100B0 00170 START LD HL,0B000H
AE05 36BF 00180 LD (HL),0BFH
AE07 11B1B0 00190 LD DE,0B001H
AE0A 01FF0F 00200 -LD BC,0FFFH
AE0D EDB0 00210 LDIR
AE0F 3E80 00220 LD A,80H
AE11 0604 00230 LD B,4
AE13 113C00 00240 LD DE,3CH
AE16 2100B1 00250 LD HL,0B100H
AE19 CD42AF 00260 CALL FILL
AE1C 213700 00270 LD HL,55
AE1F 2200AE 00280 LD (COUNT),HL
AE22 2100B1 00290 LD HL,0B100H
AE25 0E00 00300 FINDMV LD C,0
AE27 5D 00310 LD E,L
AE28 54 00320 LD D,H
AE29 7C 00330 LD A,H
AE2A FEBC 00340 CP 0BCH
AE2C 3009 00350 JR NC,CHKSTH
AE2E 24 00360 INC H
AE2F 24 00370 INC H
AE30 CB46 00380 BIT 0,(HL)
AE32 62 00390 LD H,D
AE33 2802 00400 JR Z,CHKSTH
AE35 CB01 00410 SET 0,C
AE37 7C 00420 CHKSTH LD A,H
AE38 FEB3 00430 CP 0B3H
AE3A 3809 00440 JR C,CHKWST
AE3C 25 00450 DEC H
AE3D 25 00460 DEC H
AE3E CB46 00470 BIT 0,(HL)
AE40 62 00480 LD H,D
AE41 2802 00490 JR Z,CHKWST
AE43 CBD1 00500 SET 2,C
AE45 7D 00510 CHKWST LD A,L
AE46 B63B 00520 AND 3BH
AE48 280B 00530 JR Z,CHKEST
AE4A 7D 00540 LD A,L
AE4B D608 00550 SUB 8
AE4D 6F 00560 LD L,A
AE4E CB46 00570 BIT 0,(HL)
AE50 6B 00580 LD L,E
AE51 2802 00590 JR Z,CHKEST
AE53 CBD9 00600 SET 3,C
AE55 7D 00610 CHKEST LD A,L
AE56 B63F 00620 AND 3FH
AE58 FE34 00630 CP 34H
AE5A 300B 00640 JR NC,DONCHK
AE5C 7D 00650 LD A,L
AE5D C608 00660 ADD A,8
AE5F 6F 00670 LD L,A
AE60 CB46 00680 BIT 0,(HL)
AE62 6B 00690 LD L,E
AE63 2802 00700 JR Z,DONCHK
AE65 CBC9 00710 SET 1,C
AE67 79 00720 DONCHK LD A,C
AE68 B7 00730 OR A

```

```

AE69 2E5D 00740 JR Z,SCAN1
AE6B CDF4AE 00750 CALL RNDNUM
AE6E 114000 00760 LD DE,40H
AE71 0604 00770 LD B,4
AE73 CB4F 00780 BIT 1,A
AE75 2030 00790 JR NZ,EAST
AE77 CB57 00800 BIT 2,A
AE79 2018 00810 JR NZ,SOUTH
AE7B CB5F 00820 BIT 3,A
AE7D 201E 00830 JR NZ,WEST
AE7F 19 00840 ADD HL,DE
AE80 19 00850 ADD HL,DE
AE81 19 00860 ADD HL,DE
AE82 CD08AF 00870 NORTH CALL INCL
AE85 CD13AF 00880 CALL DECL
AE88 10F8 00890 DJNZ NORTH
AE8A B7 00900 OR A
AE8B ED52 00910 SBC HL,DE
AE8D ED52 00920 SBC HL,DE
AE8F ED52 00930 SBC HL,DE
AE91 1825 00940 JR MAIN
AE93 CD38AF 00950 SOUTH CALL INCL2
AE96 CD3DAF 00960 CALL DECL2
AE99 10F8 00970 DJNZ SOUTH
AE9B 181B 00980 JR MAIN
AE9D CD1EAF 00990 WEST CALL INCH
AEA0 CD29AF 01000 CALL DECH
AEA3 10F8 01010 DJNZ WEST
AEA5 1E11 01020 JR MAIN
AEA7 7D 01030 EAST LD A,L
AEA8 C603 01040 ADD A,3
AEA9 6F 01050 LD L,A
AEAAB 2C 01060 EAST2 INC L
AEAAC CD1FAF 01070 CALL INCHA
AEAFAF 2C 01080 INC L
AEB0 CD2AAF 01090 CALL DECHA
AEB3 10F6 01100 DJNZ EAST2
AEB5 2D 01110 DEC L
AEB6 2D 01120 DEC L
AEB7 2D 01130 DEC L
AEB8 EB 01140 HAIN EX DE,HL
AEB9 2A00AE 01150 LD HL,(COUNT)
AEB0 2B 01160 DEC HL
AEBD 2200AE 01170 LD (COUNT),HL
AEC0 7C 01180 LD A,H
AEC1 B5 01190 OR L
AEC2 2822 01200 JR Z,DONE
AEC4 EB 01210 EX DE,HL
AEC5 C325AE 01220 JP FINDMV
AEC8 24 01230 SCAN1 INC H
AEC9 24 01240 INC H
AECA 7C 01250 LD A,H
AECB FEBE 01260 CP 0BEH
AECD 3810 01270 JR C,SCAN2
AECF 26B1 01280 LD H,0B1H
AED1 7D 01290 LD A,L
AED2 C608 01300 ADD A,8
AED4 6F 01310 LD L,A
AED5 E63F 01320 AND 3FH
AED7 2804 01330 JR Z,DOWN
AED9 FE3C 01340 CP 3CH
AEDB 3802 01350 JR C,SCAN2
AEDD 2E00 01360 DOWN LD L,0
AEDF CB46 01370 SCAN2 BIT 0,(HL)
AEE1 20E5 01380 JR NZ,SCAN1
AEE3 C325AE 01390 JP FINDMV
AEE6 3E80 01400 DONE LD A,80H
AEE8 113C00 01410 LD DE,3CH
AEEB 0608 01420 LD B,8
AEED 2138BE 01430 LD HL,0BE38H
AEF0 CD42AF 01440 CALL FILL
AEF3 C9 01450 RET

```

```

AEF4 E5 01460 RNDNUM PUSH HL
AEF5 C5 01470 PUSH BC
AEF6 210400 01480 LD HL,4
AEF9 CDCC14 01490 CALL 14CCH
AEFC C1 01500 POP BC
AEFD E1 01510 POP HL
AEFE 47 01520 LD B,A
AEFF AF 01530 XOR A
AF00 37 01540 SCF
AF01 17 01550 UPB RLA
AF02 10FD 01560 DJNZ UPB
AF04 A1 01570 AND C
AF05 28ED 01580 JR Z,RNDNUM
AF07 C9 01590 RET
AF08 19 01600 ADD HL,DE
AF09 3E80 01610 INCL LD A,80H
AF0B 77 01620 INCLA LD (HL),A
AF0C 2C 01630 INC L
AF0D 77 01640 LD (HL),A
AF0E 2C 01650 INC L
AF0F 77 01660 LD (HL),A
AF10 2C 01670 INC L
AF11 77 01680 LD (HL),A
AF12 C9 01690 RET
AF13 19 01700 DECL ADD HL,DE
AF14 3E80 01710 DECLA LD A,80H
AF16 77 01720 LD (HL),A
AF17 2D 01730 DEC L
AF18 77 01740 LD (HL),A
AF19 2D 01750 DEC L
AF1A 77 01760 LD (HL),A
AF1B 2D 01770 DEC L
AF1C 77 01780 LD (HL),A
AF1D C9 01790 RET
AF1E 2D 01800 INCH DEC L
AF1F 3E80 01810 INCHA LD A,80H
AF21 77 01820 LD (HL),A
AF22 19 01830 ADD HL,DE
AF23 77 01840 LD (HL),A
AF24 19 01850 ADD HL,DE
AF25 77 01860 LD (HL),A
AF26 19 01870 ADD HL,DE
AF27 77 01880 LD (HL),A
AF28 C9 01890 RET
AF29 2D 01900 DECH DEC L
AF2A 3E80 01910 DECHA LD A,80H
AF2C B7 01920 OR A
AF2D 77 01930 LD (HL),A
AF2E ED52 01940 SBC HL,DE
AF30 77 01950 LD (HL),A
AF31 ED52 01960 SBC HL,DE
AF33 77 01970 LD (HL),A
AF34 ED52 01980 SBC HL,DE
AF36 77 01990 LD (HL),A
AF37 C9 02000 RET
AF38 B7 02010 INCL2 OR A
AF39 ED52 02020 SBC HL,DE
AF3B 18CC 02030 JR INCLA
AF3D B7 02040 DECL2 OR A
AF3E ED52 02050 SBC HL,DE
AF40 18D2 02060 JR Z,DECLA
AF42 C5 02070 FILL PUSH BC
AF43 0604 02080 LD B,4
AF45 77 02090 UPB LD (HL),A
AF46 23 02100 INC HL
AF47 10FC 02110 DJNZ UPB
AF49 C1 02120 POP BC
AF4A 19 02130 ADD HL,DE
AF4B 10F5 02140 DJNZ FILL
AF4D C9 02150 RET
AE02 02160 END START
00000 TOTAL ERRORS

```

End

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00110	LOOP	LD HL, 16382	01050	LD	A, C		02030	ADD	HL, DE
00120	LD	DE, 16383	01060	SUB	4		02040	INC	HL
00130	LD	BC, 930	01070	LD	C, A		02050	INC	HL
00140	LDDR		01080	LD	A, D		02060	DOWN2	LD A, (HL)
00150	LD	HL, 15487	01090	ADD	A, 32		02070	CF	32
00160	LD	DE, 64	01100	LD	D, A		02080	JR	Z, DOWN8
00170	LD	B, 14	01110	ALARM3	LD A, 1		02090	CP	'0'
00180	SIDE2	LD (HL), 32	01120	OUT	(255), A		02100	JR	Z, DOWN8
00190	ADD	HL, DE	01130	LD	B, D		02110	CP	'+'
00200	DJNZ	SIDE2	01140	DJNZ	S		02120	JR	Z, DOWN8
00210	CALL	BOMBS	01150	LD	A, 2		02130	JP	BLOW
00220	CALL	EXPL	01160	OUT	(255), A		02140	DOWN8	LD DE, 64
00230	CALL	TEXPL	01170	LD	B, D		02150	LD	HL, (ALT)
00240	LD	HL, (FUEL)	01180	DJNZ	S		02160	ADD	HL, DE
00250	LD	A, H	01190	INC	D		02170	LD	(ALT), HL
00260	OR	A	01200	DEC	C		02180	LD	HL, (FUEL)
00270	JP	P, FUELN	01210	JR	NZ, ALARM3		02190	INC	HL
00280	DEC	HL	01220	JP	LOOP		02200	LD	(FUEL), HL
00290	LD	(FUEL), HL	01230	SOUN3	RES 1, (IY)		02210	RET	
00300	LD	HL, OUTA	01240	SOUN4	RES 2, (IY)		02220	FOR	LD A, (DP)
00310	LD	DE, 15360	01250	LD	A, D		02230	CP	38
00320	CALL	PRINT	01260	SUB	54		02240	RET	Z
00330	CALL	DOWN9	01270	LD	L, A		02250	DEC	A
00340	LD	HL, (BOMB)	01280	LD	H, 1		02260	LD	(DP), A
00350	LD	(HL), 20H	01290	CALL	EKS		02270	LD	HL, (FUEL)
00360	LD	HL, 0	01300	JP	LOOP		02280	DEC	HL
00370	LD	(BOMB), HL	01310	DELAY9	DEC BC		02290	LD	(FUEL), HL
00380	JP	FUELAF	01320	LD	A, B		02300	RET	
00390	FUELN	DEC HL	01330	OR	C		02310	BACK	LD A, (DP)
00400	LD	(FUEL), HL	01340	JR	NZ, DELAY9		02320	CP	50
00410	LD	DE, 3C06H	01350	RET			02330	RET	Z
00420	CALL	PRINTN	01360	WAIT	A, (14400)		02340	INC	A
00430	CALL	KEYIN	01370	AND	1		02350	LD	(DP), A
00440	FUELAF	LD HL, (POINTS)	01380	JR	Z, WAIT		02360	RET	
00450	LD	A, H	01390	RET			02370	FIRE	LD A, (BOMB)
00460	AND	L	01400	KEYIN	A, (DEMO)		02380	OR	A
00470	CP	0FFH	01410	OR	A		02390	RET	NZ
00480	JR	NZ, LOPC2	01420	JR	Z, KEYIN1		02400	LD	HL, (ALT)
00490	LD	HL, 0	01430	LD	A, R		02410	LD	DE, (DP)
00500	LD	(POINTS), HL	01440	RLA			02420	ADD	HL, DE
00510	LOPC2	LD DE, 3C10H	01450	JR	KEYIN2		02430	LD	DE, 4
00520	CALL	PRINTN	01460	KEYIN1	A, (3840H)		02440	ADD	HL, DE
00530	CALL	DECOR	01470	KEYIN2	AND 0F8H		02450	LD	(BOMB), HL
00540	CALL	MIS1UP	01480	JR	Z, JOYIN		02460	BIT	0, (IY+1)
00550	CALL	PUPTRN	01490	LD	C, A		02470	RET	NZ
00560	CALL	CRSH	01500	CALL	BLANK		02480	LD	DE, 66
00570	LD	A, (14337)	01510	RL	C		02490	ADD	HL, DE
00580	CP	1	01520	CALL	C, FIRE		02500	LD	(BOMB), HL
00590	CALL	Z, WAIT	01530	RL	C		02510	RET	
00600	CALL	MIS1	01540	CALL	C, BACK		02520	CRSH	LD HL, (ALT)
00610	LD	BC, (DELAY)	01550	RL	C		02530	LD	DE, (DP)
00620	LD	A, B	01560	CALL	C, FOR		02540	ADD	HL, DE
00630	OR	C	01570	RL	C		02550	DEC	HL
00640	JP	Z, ALARM	01580	CALL	C, DOWN		02560	LD	A, (HL)
00650	HARK2	LD HL, -7	01590	RL	C		02570	CP	32
00660	ADD	HL, BC	01600	JP	C, UP		02580	JP	NZ, BLOW
00670	LD	(DELAY), HL	01610	RET			02590	BIT	0, (IY+1)
00680	ALARM	LD C, B	01620	JOYIN	IN A, (0)		02600	RET	NZ
00690	LD	A, 128	01630	XOR	0FFH		02610	LD	DE, 66
00700	ADD	A, C	01640	RET	Z		02620	ADD	HL, DE
00710	LD	D, A	01650	LD	C, A		02630	LD	A, (HL)
00720	LD	A, 23	01660	CALL	BLANK		02640	CP	32
00730	ADD	A, C	01670	RR	C		02650	JP	NZ, BLOW
00740	LD	C, A	01680	CALL	C, UP		02660	RET	
00750	BIT	0, (IY)	01690	RR	C		02670	PUPTRN	BIT 0, (IY+1)
00760	JR	NZ, ALARM2	01700	CALL	C, DOWN		02680	JR	NZ, PUTBOM
00770	BIT	1, (IY)	01710	RR	C		02690	BIT	1, (IY+1)
00780	JR	NZ, SOUN3	01720	CALL	C, FOR		02700	JR	NZ, PUTCHP
00790	BIT	2, (IY)	01730	RR	C		02710	RET	
00800	JP	NZ, SOUN4	01740	CALL	C, BACK		02720	PUTBOM	LD HL, (ALT)
00810	BIT	1, (IY+1)	01750	RR	C		02730	LD	DE, (DP)
00820	JR	NZ, ALAR11	01760	JP	C, FIRE		02740	ADD	HL, DE
00830	ALARM1	LD A, 1	01770	RET			02750	EK	DE, HL
00840	OUT	(255), A	01780	UP	LD HL, (ALT)		02760	LD	HL, BOMBER
00850	LD	B, D	01790	LD	DE, 15360		02770	JP	PRINT
00860	DJNZ	S	01800	OR	A		02780	PUTCHP	LD HL, (ALT)
00870	LD	A, 2	01810	SBC	HL, DE		02790	LD	DE, (DP)
00880	OUT	(255), A	01820	RET	Z		02800	ADD	HL, DE
00890	LD	B, D	01830	LD	DE, 15296		02810	LD	B, 5
00900	DJNZ	S	01840	ADD	HL, DE		02820	PUTCH1	LD (HL), '-'
00910	DEC	D	01850	LD	(ALT), HL		02830	INC	HL
00920	DEC	C	01860	LD	HL, (FUEL)		02840	DJNZ	PUTCH1
00930	JR	NZ, ALARM1	01870	DEC	HL		02850	LD	(HL), 176
00940	JP	LOOP	01880	LD	(FUEL), HL		02860	INC	HL
00950	ALARM11	LD B, D	01890	RET			02870	LD	B, 5
00960	DJNZ	S	01900	DOWN9	CALL BLANK		02880	PUTCH2	LD (HL), '-'
00970	LD	B, D	01910	DOWN	LD HL, (ALT)		02890	INC	HL
00980	DJNZ	S	01920	LD	DE, 3F80H		02900	DJNZ	PUTCH2
00990	LD	B, 4	01930	OR	A		02910	LD	(HL), '-'
01000	DEC	D	01940	SBC	HL, DE		02920	LD	DE, 55
01010	DEC	C	01950	RET	Z		02930	ADD	HL, DE
01020	JR	NZ, ALAR11	01960	LD	HL, (ALT)		02940	EX	DE, HL
01030	JP	LOOP	01970	LD	DE, (DP)		02950	LD	HL, CHOP
			01980	ADD	HL, DE		02960	JP	PRINT
			01990	LD	DE, 68		02970	INT	PUSH AF
			02000	ADD	HL, DE		02980	LD	A, (TCH)
			02010	BIT	0, (IY+1)		02990	XOR	3

Listing 1 continued

Listing 1 continued

03000	LD	(TCH),A	03970	LD	(HL),144	04950	RET	
03010	OUT	(255),A	03980	INC	HL	04960	DECOR	LD A,(FL)
03020	LD	A,(37E0H)	03990	LD	(HL),32	04970	OR	A
03030	LD	A,(37E0H)	04000	RET		04980	JR	NZ,FNDTRG
03040	LD	A,0D0H	04010	EXPL2	LD (HL),180	04990	LD	HL,9
03050	LD	(37E0H),A	04020	DEC	HL	05000	CALL	RND
03060	POP	AF	04030	LD	(HL),160	05010	LD	(TG),A
03070	EI		04040	DEC	HL	05020	FNDTRG	LD A,(TG)
03080	RET		04050	LD	(HL),32	05030	DEC	A
03090	TEXPL	A,(TEXPN)	04060	INC	HL	05040	JR	Z,UPM
03100	OR	A	04070	INC	HL	05050	DEC	A
03110	RET	Z	04080	INC	HL	05060	JR	Z,LEVEL
03120	LD	HL,(TEXP)	04090	LD	(HL),144	05070	DEC	A
03130	INC	HL	04100	INC	HL	05080	JR	Z,DOWNM
03140	LD	(TEXP),HL	04110	LD	(HL),32	05090	DEC	A
03150	DEC	HL	04120	RET		05100	JP	Z,BUILD
03160	DEC	A	04130	EXPL1	DEC HL	05110	DEC	A
03170	LD	(TEXPN),A	04140	LD	(HL),32	05120	JP	Z,SKY
03180	JR	TEXPLC	04150	INC	HL	05130	DEC	A
03190	EXPL	A,(EXP)	04160	LD	(HL),32	05140	JP	Z,MS1
03200	OR	Z	04170	INC	HL	05150	DEC	A
03210	RET	A	04180	LD	(HL),32	05160	JP	Z,MS2
03220	LD	HL,(EXP)	04190	RET		05170	DEC	A
03230	INC	HL	04200	MIS1UP	LD HL,(A1)	05180	JP	Z,OIL
03240	LD	(EXP),HL	04210	LD	A,H	05190	DEC	A
03250	DEC	HL	04220	OR	L	05200	JP	Z,BBRIDG
03260	DEC	A	04230	RET	Z	05210	JP	BRIDG
03270	LD	(EXP),A	04240	LD	DE,(D1)	05220	LEVEL	LD A,(FL)
03280	TEXPLC	Z,EXPL1	04250	INC	DE	05230	OR	A
03290	DEC	A	04260	LD	(D1),DE	05240	JR	NZ,LEVEL2
03300	JP	Z,EXPL2	04270	OR	A,(L1)	05250	LD	HL,8
03310	DEC	A	04280	OR	A	05260	CALL	RND
03320	JP	Z,EXPL3	04290	RET	NZ	05270	LEVEL2	DEC A
03330	DEC	A	04300	LD	BC,(ALT)	05280	LD	(FL),A
03340	JP	Z,EXPL4	04310	LD	A,6	05290	LD	HL,(GR)
03350	LD	(HL),191	04320	DIV164	SRA B	05300	LD	(HL),191
03360	DEC	HL	04330	RR	C	05310	RET	
03370	LD	(HL),191	04340	DEC	A	05320	UPM	LD A,(FL)
03380	DEC	HL	04350	JR	NZ,DIV164	05330	OR	A
03390	LD	(HL),191	04360	SBC	HL,BC	05340	JP	NZ,UPM2
03400	DEC	HL	04370	PUSH	HL	05350	LD	HL,(GR)
03410	LD	(HL),190	04380	POP	BC	05360	LD	DE,3CC0H
03420	LD	DE,-63	04390	LD	HL,(DP)	05370	SBC	HL,DE
03430	ADD	HL,DE	04400	INC	HL	05380	JR	Z,DECOR
03440	LD	(HL),176	04410	INC	HL	05390	LD	A,4
03450	INC	HL	04420	INC	HL	05400	UPM2	DEC A
03460	LD	(HL),188	04430	OR	A	05410	LD	(FL),A
03470	INC	HL	04440	SBC	HL,DE	05420	LD	HL,(GR)
03480	LD	(HL),191	04450	OR	A	05430	LD	(HL),191
03490	INC	HL	04460	SBC	HL,BC	05440	LD	DE,-64
03500	LD	(HL),180	04470	JR	Z,LMIS1	05450	ADD	HL,DE
03510	INC	HL	04480	LD	A,(D1)	05460	LD	(HL),191
03520	LD	(HL),176	04490	CP	54	05470	LD	(GR),HL
03530	LD	DE,65	04500	RET	NZ	05480	RET	
03540	ADD	HL,DE	04510	LMIS1	LD A,1	05490	DOWNM	LD A,(FL)
03550	LD	(HL),189	04520	LD	(L1),A	05500	OR	A
03560	DEC	HL	04530	SET	0,(Y)	05510	JP	NZ,DOWNM2
03570	LD	(HL),191	04540	LD	HL,(D1)	05520	LD	HL,(GR)
03580	DEC	HL	04550	DEC	HL	05530	LD	DE,3FC0H
03590	LD	(HL),191	04560	LD	(D1),HL	05540	SBC	HL,DE
03600	RET		04570	RET		05550	JP	Z,DECOR
03610	EXPL4	DEC HL	04580	MIS1	LD A,(L1)	05560	LD	A,4
03620	DEC	HL	04590	OR	A	05570	DOWNM2	DEC A
03630	DEC	HL	04600	RET	Z	05580	LD	(FL),A
03640	LD	(HL),160	04610	LD	HL,(A2)	05590	LD	HL,(GR)
03650	LD	DE,-63	04620	LD	DE,-64	05600	LD	(HL),191
03660	ADD	HL,DE	04630	ADD	HL,DE	05610	LD	DE,64
03670	LD	(HL),32	04640	LD	(A2),HL	05620	ADD	HL,DE
03680	INC	HL	04650	PUSH	HL	05630	LD	(HL),191
03690	LD	(HL),176	04660	LD	DE,3C40H	05640	LD	(GR),HL
03700	INC	HL	04670	OR	A	05650	RET	
03710	LD	(HL),188	04680	SBC	HL,DE	05660	MS1	LD HL,(GR)
03720	INC	HL	04690	JR	Z,MIS1DN	05670	LD	DE,-64
03730	LD	(HL),176	04700	POP	HL	05680	LD	(HL),191
03740	INC	HL	04710	LD	DE,(D1)	05690	ADD	HL,DE
03750	LD	(HL),32	04720	ADD	HL,DE	05700	LD	(HL),91
03760	LD	DE,65	04730	LD	A,(HL)	05710	LD	DE,(A1)
03770	ADD	HL,DE	04740	LD	(HL),91	05720	LD	A,D
03780	LD	(HL),140	04750	LD	DE,64	05730	OR	E
03790	RET		04760	ADD	HL,DE	05740	RET	NZ
03800	EXPL3	DEC HL	04770	LD	(HL),'	05750	LD	(A2),HL
03810	LD	(HL),190	04780	CP	' '	05760	LD	B,6
03820	DEC	HL	04790	RET	Z	05770	DIV169	SRA H
03830	LD	(HL),160	04800	CP	'O'	05780	RR	L
03840	DEC	HL	04810	RET	Z	05790	DJNZ	DIV169
03850	LD	(HL),32	04820	CP	'+'	05800	LD	(A1),HL
03860	LD	DE,-62	04830	RET	Z	05810	RET	
03870	ADD	HL,DE	04840	JP	SHOT	05820	MS2	LD HL,(GR)
03880	LD	(HL),32	04850	MIS1DN	HL	05830	LD	DE,-64
03890	INC	HL	04860	LD	DE,(D1)	05840	LD	(HL),191
03900	LD	(HL),32	04870	ADD	HL,DE	05850	ADD	HL,DE
03910	INC	HL	04880	LD	DE,64	05860	LD	(HL),91
03920	LD	(HL),32	04890	ADD	HL,DE	05870	RET	
03930	LD	DE,64	04900	LD	(HL),32	05880	BUILD	LD A,(FL)
03940	ADD	HL,DE	04910	LD	HL,0	05890	OR	A
03950	LD	(HL),189	04920	LD	(L1),HL	05900	JR	NZ,BUILD2
03960	INC	HL	04930	LD	(A1),HL			
			04940	LD	(D1),HL			

Listing 1 continued

Listing 1 continued

05910	LD	HL,6	06890	JR	C,BBLANK	07870	LD	(POINTS),HL
05920	CALL	RND	06900	LD	(HL),181	07880	LD	HL,0
05930	INC	A	06910	ADD	HL,DE	07890	LD	(BOMB),HL
05940	INC	A	06920	LD	(HL),151	07900	RET	
05950	BUILD2	DEC	06930	RET		07910	LD	(HL), 'O'
05960	LD	(FL),A	06940	BBLANK	LD	(HL),176	LD	(BOMB),HL
05970	LD	HL,(GR)	06950	LD	HL,DE	07920	LD	0,(Y+1)
05980	LD	(HL),191	06960	LD	(HL),131	07930	BIT	NZ
05990	LD	DE,-64	06970	RET		07940	LD	(HL), '+'
06000	ADD	HL,DE	06980	BLEFT	OR	A	RET	
06010	LD	(HL),0BBH	06990	JR	Z,BLEFT1	07970	HGROUN	LD
06020	LD	A,(FL)	07000	LD	(HL),176	07980	LD	HL
06030	OR	A	07010	ADD	HL,DE	07990	LD	(POINTS),HL
06040	RET	NZ	07020	LD	(HL),152	08000	LD	HL,0
06050	LD	(HL),0AAH	07030	RET		08010	LD	(BOMB),HL
06060	RET		07040	BLEFT1	LD	(HL),182	08020	RET
06070	LD	A,(FL)	07050	LD			08030	START
06080	OR	A	07060	RET			08040	LD
06090	JR	NZ,SKY2	07070	BOMBS	LD	HL,(BOMB)	08050	LD
06100	LD	HL,(GR)	07080	LD	A,H		08060	LD
06110	LD	DE,3CC0H	07090	OR	L		08070	LD
06120	SBC	HL,DE	07100	RET	Z		08080	LD
06130	JP	Z,DECOR	07110	LD	(HL),32		08090	LD
06140	LD	HL,(GR)	07120	LD	DE,63		08100	LD
06150	LD	DE,3DC0H	07130	ADD	HL,DE		08110	LD
06160	OR	A	07140	LD	A,(HL)		08120	LDIR
06170	SBC	HL,DE	07150	CP	32		08130	LD
06180	JP	Z,DECOR	07160	JP	Z,NOTHIN		08140	LD
06190	LD	HL,5	07170	SET	Z,(Y)		08150	LD
06200	CALL	RND	07180	CP	0BBH		08160	CP
06210	INC	A	07190	JP	Z,HBUILD		08170	JR
06220	DEC	A	07200	CP	0AAH		08180	LD
06230	LD	(FL),A	07210	JP	Z,HBUILD		08190	LD
06240	LD	HL,3	07220	CP	'O'		08200	MARK
06250	CALL	RND	07230	JR	Z,HOIL		08210	CALL
06260	LD	B,A	07240	CP	'I'		08220	LD
06270	INC	B	07250	JR	Z,HOIL		08230	LD
06280	INC	B	07260	CP	'L'		08240	CALL
06290	LD	DE,-64	07270	JR	Z,HOIL		08250	LD
06300	LD	HL,(GR)	07280	CP	191		08260	LD
06310	LD	(HL),0BBH	07290	JP	Z,HGROUN		08270	CALL
06320	ADD	HL,DE	07300	CP	91		08280	LD
06330	DJNZ	SKY3	07310	JP	Z,HGROUN		08290	LD
06340	RET		07320	JP	HBRIDG		08300	CALL
06350	LD	A,(FL)	07330	HOIL	RES	2,(Y)	08310	LD
06360	OR	A	07340	SET	1,(Y)		08320	LD
06370	JR	NZ,OIL2	07350	LD	(HL),127		08330	LD
06380	LD	A,3	07360	PUSH	HL		08340	LD
06390	OIL2	DEC	07370	LD	HL,(FUEL)		08350	LDIR
06400	LD	(FL),A	07380	LD	DE,30		08360	LD
06410	LD	HL,(GR)	07390	ADD	HL,DE		08370	LD
06420	JR	Z,OILO	07400	LD	(FUEL),HL		08380	LD
06430	DEC	A	07410	LD	HL,0		08390	LD
06440	JR	Z,OILI	07420	LD	(ROMR),HL		08400	LDIR
06450	LD	(HL), 'L'	07430	POP	HL		08410	LD
06460	RET	(HL), 'I'	07440	LD	A,(EXPN)		08420	LD
06470	OILI	LD	(HL), 'I'	OR	A		08430	LD
06480	RET		07450	OR	A		08440	LD
06490	OILO	LD	(HL), 'O'	JR	NZ,HOIL5		08450	SIDEL
06500	RET		07460	LD	DE,-64		08460	ADD
06510	BBRIDG	LD	A,(FL)	LD	HL,DE		08470	LD
06520	OR	A	07500	LD	(EXP),HL		08480	INC
06530	JR	NZ,BRIDG2	07510	LD	A,5		08490	HL
06540	LD	HL,(GR)	07520	ADD	(EXPN),A		08500	SIDEL
06550	LD	DE,15360+192	07530	ADD	HL,DE		08510	CALL
06560	SBC	HL,DE	07540	LD	DE,(ALT)		08520	CP
06570	JP	Z,DECOR	07550	OR	A		08530	JR
06580	LD	A,2	07560	SBC	HL,DE		08540	CP
06590	BRIDG2	DEC	A	RET	NC		08550	JR
06600	LD	(FL),A	07580	LD	BC,BLOW		08560	CP
06610	LD	HL,(GR)	07590	PUSH	BC		08570	CP
06620	LD	DE,-64	07600	JP	EXPL		08580	CP
06630	LD	(HL),191	07610	LD	DE,-64		08590	JP
06640	ADD	HL,DE	07620	ADD	HL,DE		08600	CP
06650	BRIGHT	OR	A	LD	(TEXP),HL		08610	JP
06660	JR	NZ,BRIGH1	07640	LD	A,5		08620	CP
06670	LD	(HL),186	07650	LD	(TEXPN),A		08630	JP
06680	AUD	HL,DE	07660	ADD	HL,DE		08640	CP
06690	LD	(HL),180	07670	ADD	HL,DE		08650	JP
06700	LD	HL,6	07680	LD	DE,(ALT)		08660	CP
06710	CALL	RND	07690	OR	A		08670	JP
06720	ADD	A,6	07700	SBC	HL,DE		08680	CP
06730	LD	(FL),A	07710	RET	NC		08690	JP
06740	LD	A,10	07720	LD	BC,BLOW		08700	CP
06750	LD	(TG),A	07730	PUSH	BC		08710	JP
06760	RET		07740	JP	TEXPL		08720	JR
06770	BRIGH1	LD	(HL),185	LD	(HL),0BBH		08730	CALL
06780	RET		07750	HBRIDG	LD	HL,(POINTS)	08740	LD
06790	BRIDG	LD	A,(FL)	LD	DE,20		08750	LD
06800	DEC	A	07780	ADD	HL,DE		08760	CALL
06810	LD	(FL),A	07790	LD	(POINTS),HL		08770	LD
06820	LD	HL,(GR)	07800	LD	HL,0		08780	LD
06830	LD	DE,-64	07810	LD	(BOMB),HL		08790	CALL
06840	LD	(HL),191	07820	RET			08800	CALL
06850	ADD	HL,DE	07830	HBUILD	LD	(HL),0BBH	08810	LD
06860	CP	2	07840	LD	HL,(POINTS)		08820	LD
06870	JR	C,BLEFT	07850	LD	DE,10		08830	CALL
06880	RRA		07860	ADD	HL,DE		08840	CALL

Listing 1 continued

# OMNITERM COMMUNICATIONS

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OMNITERM turns your personal computer into a terminal which can communicate with any other computer system, mainframe, minicomputer, or microcomputer. OMNITERM can put you in touch with your company's mainframe, for example, or your branch offices, clients, customers, and suppliers. You can send and receive files using the popular XMODEM protocol, run programs, use electronic mail systems, access remote data bases and information services. The applications are limitless.

### COMPATIBILITY AND COMPLETENESS

OMNITERM is a full featured program which offers complete control of the RS-232 settings, user definable carriage return, line feed and echoing, translation tables for all 256 characters, character and line pauses as well as XON/XOFF. These and many other possible settings guarantee that OMNITERM will communicate with any remote system using any modem including smart modems for autodial and logon.

### DESIGNED WITH USERS IN MIND

OMNITERM is run from a single main menu which keeps the user in control. You can run your printer, review the text which has scrolled off the screen, automatically dial and logon with a smart modem, and store all settings in a file for easy access. Whether you are a first time user of communications software or an expert, OMNITERM makes it easy to get the job done.

### BUY WITH CONFIDENCE

OMNITERM comes with complete, professional documentation and free telephone support. There are sample settings files for several of the most popular information services and default settings to make it simple to get started. You can buy OMNITERM with confidence since it is proven software that has been winning praise from reviewers and users since 1981.

# Omniterm

PROFESSIONAL COMMUNICATIONS SOFTWARE

### Minimum Requirements:

TRS-80  
Models I, III  
32K memory  
\$95.00

TRS-80  
Model 4  
32K memory  
\$95.00

TRS-80  
Models II,  
12, 16  
64K memory  
\$175.00

IBM PC/XT  
128K memory  
\$245.00

See your dealer or call Lindbergh Systems,  
49 Beechmont Street, Worcester, MA 01609, Telephone:  
(517) 852-0233, Source: TCA818, Delphi: LINDBERGH,  
CompuServe: 70310,267. IBM PC and IBM XT are registered  
trademarks of IBM. TRS-80 is a trademark of Tandy Corporation.

MasterCard, VISA, and C.O.D.

With at least one disk drive and an asynchronous communications board.

Listing 1 continued

```

08850 LD HL,IN3
08860 LD DE,15424
08870 CALL PRINT
08880 CALL INSTRP
08890 LD HL,IN4
08900 LD DE,15360+128
08910 CALL PRINT
08920 CALL INSTRP
08930 LD HL,ING
08940 LD DE,15384
08950 CALL PRINT
08960 CALL INSTRP
08970 LD HL,15360+960
08980 LD (GR),HL
08990 LD HL,0
09000 LD (FL),HL
09010 LD (TG),HL
09020 LD B,63
09030 INSTR5 PUSH BC
09040 CALL DECOR
09050 LD HL,16382
09060 LD DE,16383
09070 LD BC,960
09080 LDDR
09090 POP BC
09100 DJNZ INSTR5
09110 LD HL,IN5
09120 LD DE,15360
09130 CALL PRINT
09140 INSTR6 CALL KEY
09150 CP 13
09160 JR NZ,INSTR6
09170 JP START
09180 INITD DEFB 3EH
09190 INIT XOR A
09200 LD (DEMO),A
09210 JR INIT01
09220 INITM CALL PRHISC
09230 CALL KEY
09240 INIT01 CALL CLS
09250 LD IY,BSOUND
09260 LD HL,15360
09270 LD (ALT),HL
09280 LD HL,50
09290 LD (DF),HL
09300 LD HL,500
09310 LD (FUEL),HL
09320 MARK3 LD A,1
09330 LD (NUM),A
09340 ADD A,48
09350 LD (15392),A
09360 MARK1 LD HL,9100
09370 LD (DELAY),HL
09380 LD HL,0
09390 LD (POINTS),HL
09400 LD (FL),HL
09410 LD (TG),HL
09420 LD (BOMB),HL
09430 LD (A1),HL
09440 LD (D1),HL
09450 LD (L1),HL
09460 LD (A2),HL
09470 LD (TEMP),HL
09480 LD (EXP),HL
09490 LD (EXPN),HL
09500 LD HL,15360+960
09510 LD (GR),HL
09520 LD HL,FUELH
09530 LD DE,15360
09540 CALL PRINT
09550 LD HL,POINTM
09560 LD DE,15360+16
09570 CALL PRINT
09580 LD HL,MGO
09590 LD DE,15360+448+25
09600 CALL PRINT
09610 LD BC,0
09620 CALL DELAY9
09630 CALL DELAY9
09640 LD HL,15360+448+25
09650 LD B,18
09660 HG01 LD (HL),32
09670 INC HI
09680 DJNZ HG01
09690 BIT 0,(IY+1)
09700 JP NZ,LOOP
09710 EI
09720 JP LOOP
09730 TITLE DEFM 'BOMBER'
09740 DEFB 0
09750 COPYR DEFM 'Copyright
1982 by Lee Pelletier'
09760 DEFB 0
09770 PRI DEFM 'Do you want
instructions?'
09780 DEFB 95
09790 DEFB 0
09800 PR2 DEFM 'Press ENTER to continue.'
09810 DEFB 0
09820 MGO DEFM 'And here we go!'
09830 DEFB 0
09840 IN1 DEFM ' Welcome to BOMBER! This is an arcade-
type simulation in
09850 DEFM '
09860 DEFM ' which you are in control of an advanced bom
ber. Your main
09870 DEFM ' objective is to score as many points as pos
sible. To score
09880 DEFM ' points you need to hit the buildings, brid
es, and sky scrapers;
09890 DEFM ' however, you also need to avoid crashing th
e bomber or being
09900 DEFM ' shot down. The game ends when your bomber
crashes or is shot
09910 DEFM ' down by the enemy anti-aircraft missiles.
You will also have a
09920 DEFM ' limited supply of fuel which you can replun
ish only by bombing
09930 DEFM ' OIL fields. If you run out of fuel, you wi
ll crash and thereby
09940 DEFM ' end the simulation.'
09950 IN2 DEFB 0
09960 DEFM 'POINTS'
09970 DEFM 0D0DH
09980 DEFM 'Points are obtained as follows:'
09990 DEFM 0D0DH
10000 DEFB ' Buildings 10 POINTS'
10010 DEFB ' Sky scrapers 10 POINTS'
10020 DEFB ' Bridges 20 POINTS'
10030 DEFB 0D0DH
10040 DEFB 13
10050 DEFB ' To replenish your fuel supply you have
to hit oil with
10060 DEFM ' your bombs. Oil fields will blow up very f
orcefully when you
10070 DEFM ' hit them. If your bomber is too low, it wi
ll be destroyed
10080 DEFM ' and the simulation will end. Some strategy
will be needed here
10090 DEFM ' but that is part of the fun!'
10100 DEFB 0
10110 DEFB ' When the game begins, the screen will
be blank. A
10120 IN3 DEFM ' landscape will begin to scroll onto the scr
cen from the left and
10130 DEFM ' scroll off the right side of the screen. Y
our bomber therefore
10140 DEFM ' is headed to the left. The landscape will
include buildings,
10150 DEFM ' bridges, skyscrapers, mountains, valleys, p
lains, oil fields,
10160 DEFM ' and, anti-aircraft missile bases.'
10170 DEFB 0D0DH
10180 DEFM ' Missiles will launch from the missile
bases. Evasive
10190 DEFM ' action will almost always be necessary to a
void being shot down.'
10200 DEFM ' Evasive maneuvers include any combination o
f climbing, diving,
10210 DEFM ' going fast, or slowing down. Missiles are
represented by up
10220 DEFM ' arrows.'
10230 DEFB 0
10240 DEFB ' Controlling the bomber is done by the
keyboard. The up and
10250 IN4 DEFM ' down arrow keys control the bomber'
10260 DEFB 39
10270 DEFM 's altitude while the left and
10280 DEFM ' right arrow keys control the bomber'
10290 DEFB 39
10300 DEFB 's speed. The left arrow
10310 DEFM ' increases speed but uses more fuel. The ri
ght arrow decreases
10320 DEFM ' the bomber'
10330 DEFB 39
10340 DEFB 's speed. Pressing the space bar launches a
bomb.'
10350 DEFM 13
10360 DEFB 'You may have only one bomb released at a ti
me due to reloading
10370 DEFM ' time.'
10380 DEFB 0D0DH
10390 DEFM ' This program is also designed to suppor
t ALPHA PRODUCTS'
10400 DEFB 39
10410 DEFB ' joystick. Joystick control would be as
expected.'
10420 DEFM 0
10430 DEFB 'This is a typical landscape scroll. Press
ENTER to begin.'
10440 IN5 DEFM 0
10450 DEFB 'CREATE GAME MODE'
10460 IN6 DEFM

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Listing 1 continued

Listing 1 continued

```

10470 DEFW 0D0DH
10480 DEFB 0DH
10490 DEFM ' The Create Game Mode is entered from t
he title page. To
10500 DEFM 'enter this mode simply type "C". Notice th
at the title page
10510 DEFM 'contains no reference to this option. Afte
r entering this mode
10520 DEFM 'the computer will ask you several questions
for the various
10530 DEFM 'options that you wish to use. Type the app
ropriate number for
10540 DEFM 'each question. When all the options have b
een answered you
10550 DEFM 'will return to the title page. To get a de
monstration, press
10560 DEFM 'the "D" key. The computer will then cycle
in a demonstration
10570 DEFM 'mode until someone presses a key at the tit
le page.'
10580 DEFB 0DH
10590 DEFM ' To temporarily halt the simulation hit
the "@" key. To
10600 DEFM 'continue hit the <ENTER> key.'
10610 DEFB 0
10620 CRET1 DEFM '(1) SLOW, (2) MED, (3) FAST'
10630 DEFW 0DH
10640 CRET2 DEFM '(1) BECOMES FASTER, (2) SAME SPEED'
10650 DEFW 0DH
10660 CRET3 DEFM '1, 2, OR 3 BOMBERS?'
10670 DEFW 0DH
10680 CRET4 DEFM '(1) MISSILES, (2) NO MISSILES'
10690 DEFW 0DH
10700 CRET5 DEFM '(1) AIRPLANE, (2) CHOPPER'
10710 DEFW 0DH
10720 BOMBER DEFB 140
10730 DEFB 140
10740 DEFB 140
10750 DEFB 140
10760 DEFB 143
10770 DEFB 32
10780 DEFB 0
10790 CHOP DEFB 140
10800 DEFB 143
10810 DEFB 143
10820 DEFB 143
10830 DEFB 143
10840 DEFB 131
10850 DEFB 131
10860 DEFB 131
10870 DEFB '0'
10880 DEFB ' '
10890 DEFB 0
10900 PARAL DEFB 184
10910 DEFB 190
10920 DEFB 191
10930 DEFB 189
10940 DEFB 180
10950 DEFB 0
10960 PARA2 DEFB 130
10970 DEFB 164
10980 DEFB 32
10990 DEFB 152
11000 DEFB 129
11010 DEFB 0
11020 PARA3 DEFB 32
11030 DEFB 32
11040 DEFB 131
11050 DEFB 0
11060 TCH DEFB 1
11070 ALT DEFW 15360
11080 DP DEFW 50
11090 FUEL DEFW 500
11100 POINTS DEFW 0
11110 NUM DEFW 1
11120 L1 DEFW 0
11130 D1 DEFW 0
11140 A1 DEFW 0
11150 A2 DEFW 0
11160 EXP DEFW 0
11170 EXPN DEFW 0
11180 TEMP DEFW 0
11190 DELAY DEFW 0
11200 DEMO DEFB 0
11210 SEED DEFB 0
11220 HISC DEFB 1FH
11230 BSOUND DEFB 0
11240 TRANS DEFB 1
11250 TEXPN DEFB 0
11260 TEXP DEFW 0
11270 FUELM DEFM 'FUEL='
11280 DEFB 0
11290 OUTA DEFM 'OUT OF FUEL!'
11300 DEFB 0
11310 POINTM DEFM 'POINTS='
11320 DEFB 0
11330 MPRDSK DEFM 'Place a formatted disk in drive 0.'

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11340 DEFB 0
11350 MHISC DEFM 'High scores:'
11360 DEFB 0
11370 FL DEFW 0
11380 TG DEFW 0
11390 BOMB DEFW 0
11400 GR DEFW 15360+960
11410 CURSP DEFW 3C00H
11420 PRINT LD (CURSP),DE
11430 PRINT1 LD A,(HL)
11440 OR A
11450 RET Z
11460 CALL CHAR
11470 INC HL
11480 JP PRINT1
11490 KEY LD A,(DEMO)
11500 OR A
11510 JR NZ,KEY1
11520 JP 73
11530 KEY1 LD BC,6000H
11540 KEY2 CALL 43
11550 CP 1
11560 JR Z,KEY3
11570 OR A
11580 RET NZ
11590 DEC BC
11600 LD A,B
11610 OR C
11620 JR NZ,KEY2
11630 LD A,13
11640 RET
11650 KEY3 XOR A
11660 LD (DEMO),A
11670 JP MARK
11680 INSTRP HL,PR2
11690 LD DE,15360+960
11700 CALL PRINT
11710 INSTRQ CALL KEY
11720 CP 13
11730 JR NZ,INSTRQ
11740 CALL CLS
11750 RET
11760 PRINTN LD BC,-10000
11770 CALL CNVRT
11780 LD BC,-1000
11790 CALL CNVRT
11800 LD BC,-100
11810 CALL CNVRT
11820 LD BC,-10
11830 CALL CNVRT
11840 LD A,L
11850 ADD A,48
11860 LD (DE),A
11870 RET
11880 CHAR PUSH HL
11890 LD HL,(CURSP)
11900 CP 0DH
11910 JR Z,CHAR1
11920 CP 128
11930 JR NC,CHAR2
11940 CP 96
11950 JR C,CHAR2
11960 SUB 32
11970 CHAR2 LD (HL),A
11980 INC HL
11990 LD (CURSP),HL
12000 POP HL
12010 RET
12020 CHAR1 LD (HL),32
12030 INC HL
12040 LD A,L
12050 AND 63
12060 JP NZ,CHAR1
12070 LD (CURSP),HL
12080 POP HL
12090 RET
12100 CLS LD HL,15360
12110 LD DE,15361
12120 LD BC,1023
12130 LD (HL),32
12140 LDTR
12150 RET
12160 CNVRT LD A,47
12170 CNV1 INC A
12180 ADD HL,BC
12190 JP C,CNV1
12200 SBC HL,BC
12210 LD (DE),A
12220 INC DE
12230 RET
12240 BLOW CALL PUTTRN
12250 LD Y,(ALT)
12260 LD DE,(DP)
12270 ADD Y,DE
12280 LD BC,(DELAY)
12290 LD A,B
12300 ADD A,70
12310 LD L,A

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Listing 1 continued

Listing 1 continued

12320	LD	H,1	13280	OR	128	14260	JR	C,SCUP2
12330	PUSH	HL	13290	LD	(HL),A	14270	CP	'Z'+1
12340	LD	(Y+1),191	13300	REV1	32	14280	JR	NC,SCUP2
12350	LD	(Y+2),191	13310	JP	Z,REV3	14290	LD	(IX+20),A
12360	LD	(Y+3),191	13320	REV4	HL	14300	LD	(HL),A
12370	LD	(Y+4),143	13330	DEC	BC	14310	INC	HL
12380	POP	HL	13340	LD	A,B	14320	SCUP3	CALL
12390	PUSH	HL	13350	OR	C	14330	CP	'A'
12400	CALL	EXS	13360	JP	NZ,REV2	14340	JR	C,SCUP31
12410	LD	(Y-60),136	13370	JP	BLOWCN	14350	CP	'Z'+1
12420	LD	(Y-59),132	13380	REV3	LD	14360	JR	NC,SCUP3
12430	LD	(Y-1),161	13390	JP	REV4	14370	LD	(IX+21),A
12440	LD	(Y),143	13400	BLOWCN	POP	14380	LD	(HL),A
12450	LD	(Y+2),159	13410	DJNZ	REV	14390	INC	HL
12460	LD	(Y+3),143	13420	LD	HL,100H	14400	JR	SCUP4
12470	LD	(Y+4),140	13430	CALL	EXS	14410	SCUP31	CP
12480	LD	(Y+6),162	13440	LD	A,(NUM)	14420	JR	NZ,SCUP3
12490	LD	(Y+7),177	13450	ADD	A,47	14430	LD	(IX+20),95
12500	LD	(Y+8),129	13460	LD	(15392),A	14440	DEC	HL
12510	LD	(Y+62),130	13470	SUB	48	14450	JR	SCUP2
12520	LD	(Y+65),131	13480	LD	(NUM),A	14460	SCUP4	CALL
12530	LD	(Y+66),129	13490	JP	NZ,GONEXT	14470	CP	49H
12540	LD	(Y+67),130	13500	LD	HL,PR2	14480	JR	C,SCUP41
12550	LD	(Y+69),129	13510	LD	DE,15392	14490	CP	'Z'+1
12560	POP	HL	13520	CALL	PRINT	14500	JR	NC,SCUP4
12570	PUSH	HL	13530	LD	A,(DEMO)	14510	LD	(IX+22),A
12580	CALL	EXS	13540	OR	A	14520	LD	(HL),A
12590	LD	(Y-67),160	13550	JR	NZ,WRKEY2	14530	INC	HL
12600	LD	(Y-64),140	13560	LD	A,(400CH)	14540	JR	SCUP5
12610	LD	(Y-60),128	13570	OR	A	14550	SCUP41	CP
12620	LD	(Y-59),128	13580	JR	NZ,WRKEY2	14560	JR	Z,SCUP42
12630	LD	(Y-57),132	13590	LD	A,(HISCR)	14570	CP	8
12640	LD	(Y-4),160	13600	CP	1FH	14580	JR	NZ,SCUP4
12650	LD	(Y-2),132	13610	JR	NZ,WRKEY2	14590	LD	(IX+21),95
12660	LD	(Y-1),128	13620	ID	HL,(5F14H)	14600	DEC	HL
12670	LD	(Y),129	13630	LD	DE,(POINTS)	14610	JR	SCUP3
12680	LD	(Y+1),140	13640	SBC	HL,DE	14620	SCUP42	LD
12690	LD	(Y+2),143	13650	JP	C,SCUP	14630	LD	(IX+22),A
12700	LD	(Y+3),132	13660	WRKEY2	CALL	14640	LD	(HL),A
12710	LD	(Y+4),128	13670	CP	13	14650	INC	HL
12720	LD	(Y+5),132	13680	JR	NZ,WRKEY2	14660	JR	SCUP6
12730	LD	(Y+6),128	13690	JP	START	14670	SCUP5	CALL
12740	LD	(Y+7),160	13700	LD	DE,(POINTS)	14680	CP	13
12750	LD	(Y+8),146	13710	LD	HL,(5F00H)	14690	JR	Z,SCUP6
12760	LD	(Y+9),129	13720	OR	A	14700	CP	8
12770	LD	(Y+62),128	13730	SBC	HL,DE	14710	JR	NZ,SCUP5
12780	LD	(Y+64),136	13740	LD	HL,5F00H	14720	LD	(IX+22),95
12790	LD	(Y+65),132	13750	LD	IX,15616	14730	DEC	HL
12800	LD	(Y+66),128	13760	JR	C,SCUP1	14740	JR	SCUP4
12810	LD	(Y+67),128	13770	LD	HL,(5F05H)	14750	SCUP6	LD
12820	LD	(Y+68),160	13780	SBC	HL,DE	14760	LD	(37E1H),A
12830	LD	(Y+69),128	13790	LD	HL,5F05H	14770	LD	HC,0
12840	POP	HL	13800	LD	IX,15744	14780	CALL	60H
12850	PUSH	HL	13810	JR	C,SCUP1	14790	LD	DE,9
12860	CALL	EXS	13820	LD	HL,(5F0AH)	14800	CALL	GET41
12870	LD	(Y-67),128	13830	SBC	HL,DE	14810	LD	HL,5F00H
12880	LD	(Y-66),160	13840	LD	HL,5F0AH	14820	CALL	PUSSEC
12890	LD	(Y-65),128	13850	LD	IX,15872	14830	JP	START
12900	LD	(Y-64),160	13860	JR	C,SCUP1	14840	GONEXT	CALL
12910	LD	(Y-57),128	13870	LD	HL,(5F0FH)	14850	LD	HL,15360
12920	LD	(Y-59),144	13880	SBC	HL,DE	14860	LD	(ALT),HL
12930	LD	(Y-4),128	13890	LD	HL,5F0FH	14870	LD	DE,50
12940	LD	(Y-3),136	13900	ID	IX,16000	14880	LD	(DP),DE
12950	LD	(Y-2),128	13910	JR	C,SCUP1	14890	LD	HL,0
12960	LD	(Y),140	13920	LD	HL,(5F14H)	14900	LD	(BOMB),HL
12970	LD	(Y+2),160	13930	SBC	HL,DE	14910	LD	HL,400
12980	LD	(Y+3),128	13940	ID	HL,5F14H	14920	LD	(FUEL),HL
12990	LD	(Y+4),136	13950	LD	IX,16128	14930	LD	HL,15424
13000	LD	(Y+5),128	13960	JR	C,SCUP1	14940	LD	BC,959
13010	LD	(Y+7),128	13970	RET		14950	GONXT1	LD
13020	LD	(Y+8),128	13980	PUSH	DE	14960	CP	128
13030	LD	(Y+9),128	13990	PUSH	HL	14970	JR	NZ,GONXT2
13040	LD	(Y+64),128	14000	LD	D,H	14980	LD	(HL),32
13050	LD	(Y+65),129	14010	LD	E,L	14990	GONXT2	INC
13060	LD	(Y+68),128	14020	LD	HL,5F19H	15000	DEC	BC
13070	POP	HL	14030	OR	A	15010	LD	A,B
13080	CALL	EXS	14040	SBC	HL,DE	15020	OR	C
13090	LD	(Y-66),128	14050	LD	B,H	15030	JR	NZ,GONXT1
13100	LD	(Y-64),128	14060	LD	C,L	15040	LD	HL,15360
13110	LD	(Y-59),128	14070	LD	DE,5F1DH	15050	LD	B,64
13120	LD	(Y-3),128	14080	LD	HL,5F18H	15060	GONXT3	LD
13130	LD	(Y),128	14090	LDDR		15070	INC	HL
13140	LD	(Y+1),128	14100	POP	HL	15080	DJNZ	GONXT3
13150	LD	(Y+2),128	14110	POP	DE	15090	LD	HL,FUELM
13160	LD	(Y+4),128	14120	LD	(HL),E	15100	LD	DE,15360
13170	LD	(Y+65),128	14130	INC	(HL),D	15110	CALL	PRINT
13180	LD	Y,BSOUND	14140	LD	HL	15120	LD	HL,POINTM
13190	LD	B,4	14150	PUSH	HL	15130	LD	DE,15376
13200	REV	PUSH	14160	HL	IX	15140	CALL	PRINT
13210	LD	BC	14170	PUSH	IX	15150	LD	(NUM)
13220	LD	HL,15360	14180	CALL	PRHISC	15160	ADD	A,48
13230	REV2	LD	14190	POP	IX	15170	LD	(15392),A
13240	CP	80H	14200	POP	HL	15180	CALL	DECOR
13250	JR	C,REV1	14210	LD	(IX+20),95	15190	LOOP	JP
13260	CPL	80H	14220	LD	(IX+21),95	15200	SHOT	LD
13270	AND	63	14230	LD	(IX+22),95	15210	LD	DE,(DP)
			14240	SCUP2	CALL	15220	ADD	HL,DE
			14250	CP	'A'	15230	LD	(TEMP),HL

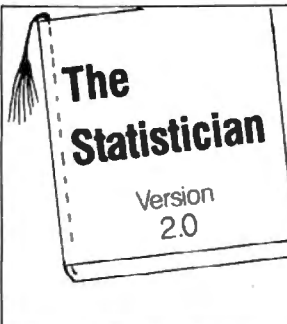
Listing 1 continued



Listing 1 continued

15240	LD	DE, 64	
15250	ADD	HL, DE	
15260	LD	A, (HL)	
15270	CP	32	
15280	JP	NZ, BLOW	
15290	ADD	HL, DE	
15300	LD	A, (HL)	
15310	CP	32	
15320	JP	NZ, BLOW	
15330	SHOT1	LD	DE, (TEMP)
15340	LD	HL, PARA1	
15350	CALL	PRINT	
15360	LD	DE, (TEMP)	
15370	LD	HL, 64	
15380	ADD	HL, DE	
15390	EX	DE, HL	
15400	LD	HL, PARA2	
15410	CALL	PRINT	
15420	LD	HL, (TEMP)	
15430	LD	DE, 128	
15440	ADD	HL, DE	
15450	EX	DE, HL	
15460	LD	HL, PARA3	
15470	CALL	PRINT	
15480	LD	HL, (TEMP)	
15490	LD	DE, 194	
15500	ADD	HL, DE	
15510	LD	A, (HL)	
15520	CP	32	
15530	JP	NZ, BLOW	
15540	LD	BC, 4000H	
15550	SHOT2	DEC	BC
15560	LD	A, B	
15570	OR	C	
15580	JP	NZ, SHOT2	
15590	LD	HL, (TEMP)	
15600	LD	B, 5	
15610	SHOT3	LD	(HL), 32
15620	INC	HL	
15630	DJNZ	SHOT3	
15640	LD	HL, (TEMP)	
15650	LD	DE, 64	
15660	ADD	HL, DE	
15670	LD	(TEMP), HL	
15680	JP	SHOT1	
15690	PRHISC	CALL	CLS
15700	LD	HL, MHISC	
15710	LD	DE, 15408	
15720	CALL	PRINT	
15730	LD	IX, 15616	
15740	LD	DE, 5F00H	
15750	LD	B, 5	
15760	PRH11	LD	A, 6
15770	SUB	B	
15780	ADD	A, 48	
15790	LD	(IX+4), A	
15800	LD	(IX+6), ' -'	
15810	LD	(IX+7), ' -'	
15820	LD	(IX+8), ' -'	
15830	LD	A, (DE)	
15840	INC	DE	
15850	LD	L, A	
15860	LD	A, (DE)	
15870	INC	DE	
15880	LD	H, A	
15890	LD	A, (DE)	
15900	INC	DE	
15910	LD	(IX+20), A	
15920	LD	A, (DE)	
15930	INC	DE	
15940	LD	(IX+21), A	
15950	LD	A, (DE)	
15960	INC	DE	
15970	LD	(IX+22), A	
15980	PUSH	BC	
15990	LD	BC, 30	
16000	ADD	IX, BC	
16010	PUSH	DE	
16020	PUSH	IX	
16030	POP	DE	
16040	CALL	PRINTN	
16050	POP	DE	
16060	LD	BC, 98	
16070	ADD	IX, BC	
16080	POP	BC	
16090	DJNZ	PRH11	
16100	RET		
16110	RND	PUSH	HL
16120	LD	A, (SEED)	
16130	LD	C, A	
16140	RLA		
16150	RLA		
16160	RLA		
16170	RLA		
16180	ADC	A, C	
16190	XOR	97H	
16200	RRA		

Listing 1 continued



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Listing 1 continued

16210	ADC	A,55H	17170	SET	3,(IY-1)	18140	LD	(BOOT1+1),A
16220	LD	B,A	17180	CREAT4	LD HL,CRET5	18150	LD	HL,LOOP
16230	LD	A,R	17190	CALL	PRINT1	18160	LD	DE,100H
16240	XOR	B	17200	CALL	CRKEY	18170	PUSH	BC
16250	LD	(SEED),A	17210	JR	NZ,CRBOM	18180	CALL	GET41
16260	POP	HL	17220	CRCHOP	LD (IY+1),1	18190	POP	BC
16270	RND2	CP	17230	JR	CREAT5	18200	PUSH	BC
16280	JR	C,RND3	17240	CRBOM	LD (IY+1),2	18210	CALL	PUTSEC
16290	SUB	L	17250	SET	4,(IY-1)	18220	POP	BC
16300	JR	RND2	17260	CREAT5	JP START	18230	DJNZ	AUTO1
16310	RND3	INC	17270	SHREG	DBF B	18240	LD	DE,0
16320	RET	A	17280	DEFB	66H	18250	CALL	GET41
16330	BLANK	LD HL,(ALT)	17290	DEFB	72H	18260	LD	HL,BOOT
16340	LD	DE,(DP)	17300	SHIFT	LD A,(SHREG)	18270	CALL	PUTSEC
16350	ADD	HL,DE	17310	LD	DE,(SHREG+1)	18280	LD	HL,5E00H
16360	BIT	0,(IY+1)	17320	LD	B,E	18290	LD	B,0
16370	JR	NZ,BLANK1	17330	LD	C,D	18300	AUTO4	LD (HL),0
16380	BIT	1,(IY+1)	17340	LD	H,A	18310	INC	HL
16390	JR	NZ,BLANK2	17350	XOR	C	18320	DJNZ	AUTO4
16400	RET		17360	RR	D	18330	LD	A,20H
16410	BLANK1	LD B,6	17370	RR	D	18340	LD	IX,5E00H
16420	BLANK1	LD (HL),32	17380	XOR	D	18350	LD	(IX+2),A
16430	INC	HL	17390	RR	B	18360	LD	(IX+3),A
16440	DJNZ	BLANK1	17400	RR	E	18370	LD	(IX+4),A
16450	RET		17410	RR	E	18380	LD	(IX+7),A
16460	BLANK2	LD B,12	17420	RR	E	18390	LD	(IX+8),A
16470	BLANK2	LD (HL),32	17430	XOR	E	18400	LD	(IX+9),A
16480	INC	HL	17440	AND	1	18410	LD	(IX+12),A
16490	DJNZ	BLANK2	17450	LD	(SHREG),A	18420	LD	(IX+13),A
16500	LD	DE,55	17460	LD	A,H	18430	LD	(IX+14),A
16510	ADD	HL,DE	17470	RRA		18440	LD	(IX+17),A
16520	LD	B,10	17480	RR	B	18450	LD	(IX+18),A
16530	BLANK2	LD (HL),32	17490	RR	C	18460	LD	(IX+19),A
16540	INC	HL	17500	LD	E,B	18470	LD	(IX+22),A
16550	DJNZ	BLANK2	17510	LD	D,C	18480	LD	(IX+23),A
16560	RET		17520	LD	(SHREG+1),DE	18490	LD	(IX+24),A
16570	CRKEY	CALL 73	17530	JR	C,NPLS	18500	LD	DE,9
16580	CP	49	17540	LD	A,1	18510	LD	(TSEC),DE
16590	JR	C,CRKEY	17550	OUT	(255),A	18520	LD	H,5EH
16600	CP	52	17560	NPLS	LD A,(TEXS)	18530	CALL	PUTSEC
16610	JR	NC,CRKEY	17570	LD	B,A	18540	LD	HL,PR2
16620	SUB	49	17580	DJNZ	\$	18550	LD	DE,15424
16630	RET		17590	LD	A,2	18560	CALL	PRINT
16640	CREAT	CALL CLS	17600	OUT	(255),A	18570	CALL	49H
16650	LD	IX,BSOUND	17610	RET		18580	JP	START
16660	LD	(IY-1),0	17620	EXS	LD A,2	18590	TSEC	DEFW 0
16670	LD	HL,CRET1	17630	LD	(TEXS),A	18600	BOOT	LD A,(37ECH)
16680	LD	DE,15360	17640	EXS1	LD A,(TEXS)	18610	BIT	0,A
16690	CALL	PRINT	17650	CP	L	18620	JR	NZ,BOOT
16700	CALL	CRKEY	17660	RET	Z	18630	LD	A,0D0H
16710	JR	Z,SLOW	17670	LD	B,A	18640	LD	(37ECH),A
16720	DEC	A	17680	DJNZ	\$	18650	LD	DE,9
16730	JR	Z,MED	17690	ADD	A,H	18660	LD	(TSEC),DE
16740	FAST	LD HL,3500	17700	LD	(TEXS),A	18670	LD	B,6
16750	LD	(MARK1+1),HL	17710	PUSH	HL	18680	DJNZ	\$
16760	JR	CREAT1	17720	CALL	SHIFT	18690	BOOT1	LD B,0
16770	MED	LD HL,9100	17730	POP	HL	18700	LD	HL,5F00H
16780	LD	(MARK1+1),HL	17740	JR	EXS1	18710	BOOT2	PUSH BC
16790	SET	0,(IY-1)	17750	TEXS	DEFB 0	18720	CALL	GETSEC-BOOT+4200H
16800	JR	CREAT1	17760	PUTSEC	LD A,1	18730	POP	BC
16810	SLOW	LD HL,15400	17770	LD	(37E1H),A	18740	DJNZ	BOOT2
16820	LD	(MARK1+1),HL	17780	LD	DE,(TSEC)	18750	XOR	A
16830	CREAT1	LD HL,CRET2	17790	LD	(37EEH),DE	18760	LD	(400CH),A
16840	CALL	PRINT1	17800	LD	A,0A8H	18770	JP	START
16850	CALL	CRKEY	17810	LD	(37EFH),A	18780	GETSEC	LD A,1
16860	JR	Z,FASTER	17820	LD	DE,37EFH	18790	LD	(37E1H),A
16870	SAME	LD HL,0	17830	DJNZ	D,12	18800	LD	DE,(TSEC)
16880	LD	(MARK2+1),HL	17840	DJNZ	\$	18810	LD	(37EEH),DE
16890	JR	CREAT2	17850	JR	PUT22	18820	LD	A,88H
16900	FASTER	LD HL,-7	17860	PUT21	RRA	18830	LD	(37ECH),A
16910	LD	(MARK2+1),HL	17870	JR	NC,PUT3	18840	LD	DE,37EFH
16920	SET	1,(IY-1)	17880	PUT22	LD A,(37ECH)	18850	LD	B,12
16930	CREAT2	LD HL,CRET3	17890	BIT	1,A	18860	DJNZ	\$
16940	CALL	PRINT1	17900	JR	Z,PUT21	18870	JR	GET22
16950	CALL	CRKEY	17910	LD	A,(HL)	18880	GFT21	RRA
16960	JR	Z,ONE	17920	LD	(DE),A	18890	JR	NC,GET3
16970	DEC	A	17930	INC	HL	18900	GET22	LD A,(37ECH)
16980	JR	Z,TWO	17940	JR	PUT22	18910	BIT	1,A
16990	THREE	LD A,3	17950	PUT3	LD A,0D0H	18920	JR	Z,GET21
17000	LD	(MARK3+1),A	17960	LD	(37ECH),A	18930	LD	A,(DE)
17010	JR	CREAT3	17970	JP	GET4	18940	LD	(HL),A
17020	TWO	LD A,2	17980	AUTO	CALL CLS	18950	INC	HL
17030	LD	(MARK3+1),A	17990	LD	DE,15360	18960	JR	GET22
17040	JR	CREAT3	18000	LD	HL,MPRDSK	18970	GET3	LD A,0D0H
17050	ONE	LD A,1	18010	CALL	PRINT	18980	LD	(37ECH),A
17060	LD	(MARK3+1),A	18020	CALL	49H	18990	GET4	LD DE,(TSEC)
17070	SET	2,(IY-1)	18030	LD	A,1	19000	INC	E
17080	CREAT3	LD HL,CRET4	18040	LD	(37E1H),A	19010	LD	A,E
17090	CALL	PRINT1	18050	LD	BC,0	19020	CP	10
17100	CALL	CRKEY	18060	CALL	DELAY9	19030	JR	NZ,GET5
17110	JR	Z,YMIS	18070	LD	HL,PEND	19040	LD	E,0
17120	NMIS	LD A,0C9H	18080	OR	A	19050	INC	D
17130	LD	(MISLUP),A	18090	OR	A	19060	GET41	LD (37EEH),DE
17140	JR	CREAT4	18100	SBC	HL,DE	19070	LD	A,1FH
17150	YMIS	LD A,2AH	18110	INC	H	19080	LD	(37ECH),A
17160	LD	(MISLUP),A	18120	LD	B,H	19090	LD	B,12
			18130	LD	A,H	19100	DJNZ	\$

Listing 1 continued

# Tidbit #8

Here's how you program this in Basic:

```
X=PEEK(293):IF X=73 THEN GOTO (MOD III) ELSE GOTO (MOD I)
```

In machine language, you could use this 7-byte routine:

```
LD A,(0125H) ;Get the test character
CP 49H ;Is it 49H, meaning a Model III?
JR NZ,MODI ;No, so jump to the Model I routine
(MOD III routine starts here)
```

In writing Assembly-language programs that run on both the Models I and III, programmers often use code specific to one machine. Programs of this nature sometimes prompt you to identify the machine you're working on so that the program properly invokes machine-specific routines. However, your program can determine this on its own because Model I ROMs are slightly different from the Model III ROMs.

The official Radio Shack checkpoint is at memory location 293 decimal (0125 hexadecimal [hex]). If you PEEK that location and it's 73 decimal (49 hex), your program is running on a Model III. If it is any other number, your program is running on a Model I.

A more efficient location to check if you're running a machine-language program is 84 decimal (54 hex). In a Model I, that location always contains a 1, but it is never a 1 on a Model III. By testing this location, your machine-language code can be 1 byte shorter. Here's how to check for the type of machine using only 6 bytes:

```
LD A,(0054H) ;Get the test character
DEC A ;See if it is a 1 by subtracting 1
JR Z,MODI ;Go to Model I routine if result is 0
(Model III routine starts here)
```

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Listing 1 continued

```

19118 GET42 LD A,(37ECh)
19120 BIT 0,A
19130 JR NZ,GET42
19140 GET5 LD (TSEC),DE
19150 RET
19160 PEND EQU $
19170 END START

```

End

Bombs Away!: Program Listing 2. Bomber comment lines.

```

00001 ;this protects my interests
00002 ;PERMISSION GRANTED FOR PERSONAL USE ONLY
00003 ;PROGRAM MUST CONTAIN THIS NOTICE
00100 ;ORG program at a convenient location
00110 ;HL= screen end -1
00120 ;DE= screen end
00130 ;BC= # of bytes to move
00140 ;move the screen to the right (landscape scroll)
00150 ;HL= right edge to blank
00160 ;DE= # of bytes to bump to get to the next line
00170 ;B= # of lines to blank
00180 ;blank the right side
00190 ;go to next line
00200 ;continue until done
00210 ;go move bomb and blow up any hits
00220 ;blow up any oilfields
00230 ;
00240 ;HL= amount of fuel left
00250 ;get sign byte for fuel
00260 ;test sign bit
00270 ;jump if still has fuel left
00280 ;else lower amount of fuel
00290 ;store new amount
00300 ;get 'Out of fuel' message
00310 ;print at beginning of screen
00320 ;
00330 ;force bomber down (out of fuel)
00340 ;get bomb location
00350 ;erase bomb from screen
00360 ;0 means that no bomb has been launched
00370 ;stop bomb from continuing down
00380 ;skip printing amount
00390 ;decrease amount of fuel left
00400 ;store new amount
00410 ;get location to print new amount
00420 ;go print new amount
00430 ;get input from user and move bomber
00440 ;get amount of points scored so far
00450 ;get 1st byte
00460 ;AND it with the 2nd byte
00470 ;check for negative
00480 ;jump if positive value
00490 ;HL=0
00500 ;raise score back to zero
00510 ;DE= location to print score
00520 ;print score
00530 ;put the targets on the screen
00540 ;test if missile should be launched
00550 ;print bomber or chopper
00560 ;test to see if bomber crashed
00570 ;get byte from 1st keyboard row
00580 ;test if '@' pressed
00590 ;if pressed, wait till <ENTER> to continue
00600 ;go process the current missile
00610 ;get delay value in BC
00620 ;A=B
00630 ;or in reg. C
00640 ;if delay = 0, then don't lower count
00650 ;lower count by 7
00660 ;add negative 7 to current value
00670 ;restore new delay value
00680 ;C=B
00690 ;A=128
00700 ;add A with high byte of delay value
00710 ;store in D
00720 ;A=23
00730 ;add A with delay byte high
00740 ;store back in C
00750 ;test if missile just launched
00760 ;go make missile warning sound
00770 ;OIL field blown up?
00780 ;go make explosion sound
00790 ;hit building/bridge, etc. ?
00800 ;go make explosion
00810 ;are we using a chopper?
00820 ;go silent if chopper
00830 ;A=1
00840 ;make 1/2 a pulse
00850 ;B=D
00860 ;count for B (D) counts
00870 ;A=2
00880 ;make second 1/2 of a pulse
00890 ;B=D

```

```

00900 ;count for B (D) counts
00910 ;lower count in D (for shorter delays)
00920 ;lower sound length counter
00930 ;go if not done
00940 ;go continue game cycle at top
00950 ;get count in B
00960 ;delay for count of B
00970 ;get count in B
00980 ;delay for count of B
00990 ;delay a bit more (so timing will be right)
01000 ;decrease D
01010 ;lower length count
01020 ;go if not done
01030 ;continue cycle at top
01040 ;erase missile launched flag
01050 ;get length count
01060 ;lower by 4
01070 ;restore in C
01080 ;get frequency count
01090 ;increase by 32
01100 ;restore in D
01110 ;A=1
01120 ;make 1/2 pulse
01130 ;get D in B
01140 ;count down
01150 ;A=2
01160 ;make 1/2 pulse
01170 ;get B=D
01180 ;count down
01190 ;increment the intra-note delay
01200 ;count down length
01210 ;go if still not done
01220 ;go continue cycle at top
01230 ;reset OIL field exploded flag
01240 ;reset explosion flag
01250 ;A=D
01260 ;lower by 54
01270 ;L=A
01280 ;set up format for explosion subroutine
01290 ;make explosion sound
01300 ;go continue cycle at top
01310 ;lower BC count
01320 ;A=B
01330 ;OR in C
01340 ;go if BC <> 0
01350 ;return
01360 ;get keyboard entry
01370 ;check for <ENTER> pressed
01380 ;go if <ENTER> not pressed
01390 ;return
01400 ;get demonstration flag
01410 ;is it a demo?
01420 ;No
01430 ;get a random action
01440 ;rotate bits into position
01450 ;jump past normal entry
01460 ;get pilot's entry from keyboard
01470 ;mask out unneeded bits
01480 ;go check joystick if no keys
01490 ;store key presses in C
01500 ;erase bomber from screen
01510 ;test for space bar
01520 ;go fire bomb
01530 ;test for right arrow
01540 ;move bomber back
01550 ;test for left arrow
01560 ;move bomber forward
01570 ;test for down arrow
01580 ;move bomber down
01590 ;test for up arrow
01600 ;move bomber up
01610 ;return
01620 ;get input from joystick
01630 ;reverse bits for testing
01640 ;return if no entry
01650 ;store entry into C
01660 ;erase bomber from screen
01670 ;up?
01680 ;move bomber up
01690 ;down?
01700 ;move bomber down
01710 ;forwards?
01720 ;move bomber forwards
01730 ;slow down?
01740 ;slow bomber down
01750 ;Fire?
01760 ;go drop bomb
01770 ;return
01780 ;HL= altitude of plane
01790 ;DE= top of screen
01800 ;clear C flag
01810 ;test for bomber at top
01820 ;return if bomber at top
01830 ;DE=15360-64
01840 ;restore HL to one line up
01850 ;store new altitude
01860 ;get fuel left
01870 ;lower amount of fuel

```

Listing 2 continued

Listing 2 continued

```

01880 ;store new amount
01890 ;return
01900 ;erase the bomber from the screen
01910 ;HL= altitude of plane
01920 ;DE= lowest line for bomber
01930 ;clear C flag
01940 ;test for bomber at bottom
01950 ;return if bomber already at bottom
01960 ;HL= altitude
01970 ;DE= displacement from left
01980 ;find bomber's location
01990 ;DE= 68
02000 ;find location just below bomber
02010 ;test for chopper
02020 ;go if not a chopper          <=====>
02030 ;bump again for chopper    !
02040 ;                            !
02060 ;get byte just under bomber <=====
02070 ;nothing below?
02080 ;yes                          <=====>
02090 ;just a bomb below?        !
02100 ;yes                          <=====>
02110 ;just a bomb?              !
02120 ;yes                          <=====>
02130 ;go blow up bomber if crashed !
02140 ;DE=64                      <=====
02150 ;get altitude
02160 ;raise to lower line
02170 ;restore altitude
02180 ;get fuel
02190 ;increase (gliding)
02200 ;restore amount
02210 ;return
02220 ;get displacement from left
02230 ;compare with left-most position
02240 ;return if can't go further
02250 ;lower displacement
02260 ;restore displacement
02270 ;get fuel
02280 ;lower amount
02290 ;restore amount
02300 ;return
02310 ;get displacement
02320 ;compare with right-most position
02330 ;return if can't go further
02340 ;raise displacement
02350 ;restore displacement
02360 ;return
02370 ;get low byte of bomb location
02380 ;test for zero
02390 ;return if bomb already launched
02400 ;get altitude
02410 ;get displacement
02420 ;add the two
02430 ;DE=4
02440 ;bump HL to rear of plane
02450 ;store location into bomb location variable
02460 ;test for chopper
02470 ;return if not
02480 ;DE=66
02490 ;bump HL more
02500 ;restore newer bomb location
02510 ;return
02520 ;get altitude
02530 ;get displacement
02540 ;get bomber location
02550 ;decrease pointer
02560 ;get byte
02570 ;check for something in front
02580 ;blow up plane if crashed
02590 ;test for chopper
02600 ;return if bomber
02610 ;DE=66
02620 ;bump pointers
02630 ;get byte
02640 ;test for something
02650 ;go if crash
02660 ;return
02670 ;test for bomber          <=====>
02680 ;go if bomber              !
02690 ;test for chopper        <=====>
02700 ;go if chopper            !
02710 ;return                    !
02720 ;get altitude              <=====
02730 ;get displacement        !
02740 ;add together              !
02750 ;put into DE              !
02760 ;HL=> bomber code string !
02770 ;go print bomber          !
02780 ;get altitude              <=====
02790 ;get displacement
02800 ;add together
02810 ;B=5 (5 '-' for blades)
02820 ;store '-'                <=====
02830 ;bump HL                    !
02840 ;go if not done           <=====

```

```

02850 ;store hub to blade
02860 ;bump HL
02870 ;B=5
02880 ;store '-'                <=====
02890 ;bump HL                    !
02900 ;                          <=====>
02910 ;store space
02920 ;DE=55
02930 ;bump to next line
02940 ;store to DE
02950 ;HL= code string for chopper
02960 ;
02970 ;save AF
02980 ;get last pulse bits
02990 ;toggle bits 0 and 1
03000 ;restore new pulse bits
03010 ;output chopper pulses
03020 ;read interrupt register
03030 ; to clear interrupts
03040 ;A=0D0H
03050 ;reset PDC controller
03060 ;get AF again
03070 ;re-enable interrupts
03080 ;return
03090 ;see EXPL below at 3190 for explanation
03100 ;
03180 ;jump to continuation code          <=====>
03190 ;get current oil field explosion status !
03200 ;test for zero                    !
03210 ;return if no explosion            !
03220 ;get explosion location            !
03230 ;bump pointer                      !
03240 ;restore new location              !
03250 ;bump back                          !
03260 ;decrement frame status            !
03270 ;store new status                  !
03280 ;jump to frame #1                  <=====
03290 ;lower A
03300 ;jump to frame #2
03310 ;lower A
03320 ;jump to frame #3
03330 ;lower A
03340 ;jump to frame #4
03350 ;go output frame #5
03360 ;
03600 ;return
03610 ;output frame #4
03620 ;
03790 ;return
03800 ;output frame #3
03810 ;
04000 ;return
04010 ;output frame #2
04020 ;
04120 ;return
04130 ;output frame #1
04140 ; (the numbers of the frames are in the
04150 ; reverse order in which they are displayed)
04160 ;
04190 ;return
04200 ;get altitude of the missile
04210 ;A=H
04220 ;or in L
04230 ;return if no missile on screen
04240 ;DE= displacement of missile
04250 ;bump DE
04260 ;restore new displacement
04270 ;A= missile launched flag
04280 ;test for already launched
04290 ;return if already launched
04300 ;get bomber's altitude into BC
04310 ;A=6 (to divide by 64)
04320 ;shift B                          <=====
04330 ;rotate C                            !
04340 ;lower A count                      !
04350 ;continue if not done              <=====>
04360 ;subtract BC from HL
04370 ;let BC=HL
04380 ;
04390 ;HL=displacement of bomber
04400 ;bump displacement
04410 ;
04430 ;clear C
04440 ;find difference in bomber's vs. missile's
displacement
04450 ;clear C
04460 ;test if delta displacement = delta altitude
04470 ;jump if equal                      <=====>
04480 ;get missile's displacement        !
04490 ;compare with max                    !
04500 ;return if not max                  !
04510 ;A=1 (or any non-zero value)      <=====
04520 ;store into launch flag
04530 ;set missile launch flag (for sound routines)
04540 ;get missile displacement
04550 ;lower
04560 ;restore
04570 ;return

```

Listing 2 continued

Listing 2 continued

```

04580 ;get launch flag
04590 ;test for zero
04600 ;return if not launched yet (MISLUP does the launching)
04610 ;get altitude of missile
04620 ;DE= -64
04630 ;add DE to HL
04640 ;restore new altitude
04650 ;save altitude on stack
04660 ;DE= altitude limit of missiles
04670 ;clear C
04680 ;compare current altitude with limit
04690 ;jump if reached limit
04700 ;get HL
04710 ;DE= missile's displacement
04720 ;add altitude with displacement
04730 ;get what's in front of missile
04740 ;store missile char
04750 ;DE=64
04760 ;update altitude to old position
04770 ;erase old missile
04780 ;hit nothing?
04790 ;return if nothing
04800 ;hit bomb?
04810 ;return if bomb
04820 ;hit bomb?
04830 ;return if bomb
04840 ;jump if plane shot down
04850 ;get HL off stack
04860 ;get displacement
04870 ;add altitude and displacement
04880 ;DE=64
04890 ;add together
04900 ;erase old missile char
04910 ;HL=0
04920 ;erase launch flag
04930 ;zero altitude
04940 ;zero displacement
04950 ;return
04960 ;get target length flag
04970 ;is it zero
04980 ;no
04990 ;HL=9 (there are 9 targets)
05000 ;get a random # in A
05010 ;store target #
05020 ;A= target #
05030 ;go to correct target generator
05040 ;
05220 ;produce level ground
05230 ;is length = 0
05240 ;no
05250 ;HL=8 (for ground 1 to 8 units long)
05260 ;get a random # in A
05270 ;lower length count
05280 ;store length
05290 ;HL=level of ground
05300 ;make level ground
05310 ;return
05320 ;produce upwards part of a mountain
05330 ;is length =0
05340 ;no
05350 ;get position of ground
05360 ;DE=maximum level for ground
05370 ;compare ground with top level
05380 ;can't go higher, get new target
05390 ;A=4 (mountains go up 4 lines)
05400 ;lower count level #
05410 ;store length
05420 ;HL= ground position
05430 ;store ground
05440 ;amount to raise ground 1 line
05450 ;adjust ground pointer
05460 ;store ground
05470 ;store new ground pointer
05480 ;return
05490 ;make downward part of a mountain
05500 ;is length = 0
05510 ;no
05520 ;HL=level of ground on screen
05530 ;DE=lowest ground position allowable
05540 ;compare HL & DE
05550 ;go get a new target #
05560 ;A=4 (mountains go down 4 levels at a time)
05570 ;lower length of this target
05580 ;store new length
05590 ;HL= level of the ground
05600 ;store ground
05610 ;DE=64 (used to lower the level of the ground)
05620 ;lower ground level
05630 ;store ground
05640 ;store ground level pointer
05650 ;return
05660 ;make a missile ; HL= ground level
05670 ;DE=-64 (used to adjust ground level pointer)
05680 ;store ground under missile
05690 ;adjust ground pointer
05700 ;store an up arrow (the symbol for a missile)

05710 ;DE= altitude of current missile
05720 ;check for altitude = 0 (no missile out yet)
05730 ; (ditto)
05740 ;return if missile already out
05750 ;store altitude pointer
05760 ;B=6 (shift altitude right 6 times for divide by 64)
05770 ;shift H register
05780 ;shift L register
05790 ;repeat till done
05800 ;store altitude divided by 64 in A1
05810 ;return
05820 ;make a "dud" missile ; HL= level of ground
05830 ;DE=-64 (see above)
05840 ;store ground
05850 ;adjust ground pointer
05860 ;store missile symbol (up arrow)
05870 ;return
05880 ;make a building target
05890 ;is length = 0 ?
05900 ;no
05910 ;HL= 6
05920 ;make a random number from 1 to 6
05930 ;increment length
05940 ; (ditto)
05950 ;lower length value
05960 ;store new length
05970 ;HL= level of the ground
05980 ;store ground under building
05990 ;DE=-64
06000 ;adjust ground pointer
06010 ;store a piece of building
06020 ;get length again
06030 ;is length = 0 ?
06040 ;no. return
06050 ;if yes then put an "end cap" on the building
06060 ;return
06070 ;make a sky-scraper
06080 ;is length = 0 ?
06090 ;go if not
06100 ;HL= level of the ground
06110 ;DE= top level (too high to build sky scrapers)
06120 ;compare HL & DE
06130 ;go get another target if too high
06140 ;HL= level of ground
06150 ;DE= next highest location (still too high)
06160 ;clear C flag
06170 ;compare
06180 ;go get another target
06190 ;HL=5
06200 ;get a random # from 1 to 5
06210 ;raise #
06220 ;lower length
06230 ;store new length
06240 ;HL=3
06250 ;get a random value
06260 ;store # in B
06270 ;raise #
06280 ;raise #
06290 ;DE=-64
06300 ;HL= level of ground
06310 ;store a sky-scraper building part
06320 ;bump pointer to next story
06330 ;
06340 ;return
06350 ;make an oil field
06360 ;is length = 0 ?
06370 ;no
06380 ;set length equal to 3
06390 ;lower current length of oil field
06400 ;store new length
06410 ;HL= current ground location
06420 ;go if zero (print 1st letter in "OIL")
06430 ;lower length again
06440 ;go if now printing "I"
06450 ;print "L" on screen
06460 ;return
06470 ;print "I"
06480 ;return
06490 ;print "O"
06500 ;return
06510 ;make the beginning part of a bridge
06520 ;is length = 0 ?
06530 ;no
06540 ;HL=ground location
06550 ;DE=top row possible for landscape
06560 ;compare HL & DE
06570 ;go get a new target
06580 ;set length = 2
06590 ;lower length
06600 ;store new length
06610 ;HL= ground location
06620 ;used to bump pointers around
06630 ;store ground under bridge
06640 ;bump HL to next level
06650 ;test length byte
06660 ;go if not zero

```

Listing 2 continued

Listing 2 continued

```

06670 ;store part of bridge |
06680 ;bump pointers |
06690 ;store more bridge |
06700 ;bound random # from 1-6 |
06710 ;get a random # |
06720 ;add some more to length |
06730 ;store length in variable PL |
06740 ;A=10 (number of next target generator) |
06750 ;store target # of next part of bridge |
06760 ;return |
06770 ;store some bridge <===== |
06780 ;return |
06790 ;make end part of a bridge |
06800 ;lower count left |
06810 ;store new length |
06820 ;HL= position of ground |
06830 ;DE= -64 (pointer bump value) |
06840 ;store ground under bridge |
06850 ;bump pointer to screen |
06860 ;check length of bridge left |
06870 ;go if printing left part of bridge =====> |
06880 ;check odd/even to alternate struts |
06890 ;go if on odd cycle ----> |
06900 ;store bridge part |
06910 ;bump pointer to next level |
06920 ;store bridge part |
06930 ;return |
06940 ;store bridge part <---- |
06950 ;bump pointer to next level |
06960 ;store bridge part |
06970 ;return |
06980 ;is length now = 0 ? <----- |
06990 ;yes, go put last piece on bridge =====> |
07000 ;put bridge part |
07010 ;bump pointer to next level |
07020 ;put bridge part |
07030 ;return <----- |
07040 ;put bridge part <===== |
07050 ;return |
07060 ;this routine moves the bomb and blows up any |
07070 ;is bomb position =# ? hits |
07080 ; |
07090 ;return if no bomb is out |
07100 ;bump pointer |
07110 ;blank out bomb character |
07120 ;DE= 63 (bump bomb to next location) |
07130 ;bump pointer |
07140 ;get this byte to see if we hit anything |
07150 ;are we still in air? |
07160 ;yes, go update bomb status |
07170 ;set explosion noise flag |
07180 ;is it a building? |
07190 ;yes |
07200 ;is it a building? |
07210 ;yes |
07220 ;is it an oil-field? |
07230 ;yes |
07240 ; (ditto) |
07250 ; |
07260 ;is it a chunk of ground? |
07290 ;yes |
07300 ;is it a missile? |
07310 ;yes |
07320 ;must be a bridge |
07330 ;blow up oil fields ; reset 1st explosion flag |
07340 ;set oil-field's special flag |
07350 ;store a blown-up character in oil |
07360 ;save pointer |
07370 ;HL= amount of fuel |
07380 ;DE= 30 (bomber gets 30 more units of fuel) |
07390 ;add 30 to current amount of fuel |
07400 ;save new amount of fuel |
07410 ;HL=0 |
07420 ;zero memory location (bomb is now dead) |
07430 ;get pointer from stack |
07440 ;get explosion status flag |
07450 ;is it zero? |
07460 ;no, use secondary backup |
07470 ;DE=-64 |
07480 ;bump pointer up |
07490 ;store pointer for explosion routine |
07500 ;A=5 |
07510 ;set explosion status at beginning |
07520 ;bump pointer |
07530 ;bump again |
07540 ;DE= altitude of bomber |
07550 ;clear C flag |
07560 ;is bomber too close to explosion? |
07570 ;no, everything is OK |
07580 ;BC= blow up subroutine for plane |
07590 ;push on stack (like a RET address) |
07600 ;go blow up oil (and then plane) |
07610 ;alternate oil field blow up routine |
07620 ; (see above for explanation) |
07630 ; |
07750 ;hit a bridge ; store a "squashed" char |
07760 ;get amount of points |

```

Listing 2 continued

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Listing 2 continued

```

07770 ;DE=20
07780 ;add 20 points to score
07790 ;store new amount of points
07800 ;HL = 0
07810 ;zero bomb status
07820 ;return
07830 ;hit a building ; store a "squashed" piece of bridge
07840 ;get amount of points
07850 ;DE=10
07860 ;add 10 points to score
07870 ;store new amount
07880 ;HL=0
07890 ;zero bomb status
07900 ;return
07910 ;store bomb character
07920 ;store pointer location for bomb
07930 ;check for chopper
07940 ;return if not a chopper
07950 ;store a chopper's bomb character
07960 ;return
07970 ;hit ground ; get amount of points
07980 ;lower by one
07990 ;store new amount of points
08000 ;HL=0
08010 ;zero bomb status
08020 ;return
08030 ;program begins here ; disable interrupts
08040 ;set stack to a nice place
08050 ;A= byte for JP opcode
08060 ;store in RAM vectors
08070 ;HL= location to vector interrupts
08080 ;store address of vector
08090 ;HL= ROM location for division support code
08100 ;DE= RAM location to move to
08110 ;BC= length
08120 ;move it
08130 ;HL= 1st screen location
08140 ;A= 127
08150 ;store value into screen memory
08160 ;compare value again
08170 ;if not the same then no lowercase video
    
```

```

08180 ;change program for lowercase support
08190 ;
08200 ;disable interrupts
08210 ;clear screen
08220 ;HL=> title of program
08230 ;DE=location to print title
08240 ;
08250 ;HL=> copyright notice
08260 ;DE= location to print
08270 ;
08280 ;HL=> question for instructions
08290 ;DE= screen location to print question
08300 ;
08310 ;HL= top of video
08320 ;DE= next location
08330 ;BC= length
08340 ;store block graphics character in (HL)
08350 ;draw a line on top
08360 ;now draw a line on the bottom
08370 ;
08410 ;now draw the lines on the side; HL= top of screen
08420 ;DE= # to bump pointer
08430 ;B=15 (for 15 lines)
08440 ;store block graphic char <=====
08450 ;bump HL |
08460 ;store block on other side |
08470 ;bump HL to next line |
08480 ;count down for all lines =====>
08490 ;get a key-press
08500 ;do we want instructions?
08510 ;yes
08520 ;check for "NO" answer to start game
08530 ;yes
08540 ;check lowercase
08550 ;
08560 ;check lowercase
08570 ;
08580 ;check for create game mode entry
08590 ;yes
08600 ;lowercase
08610 ;
08620 ;check for demonstration mode entry
    
```

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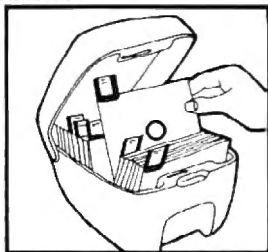
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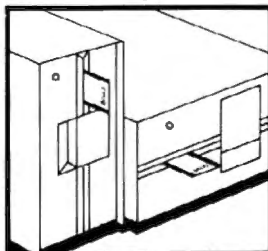
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Listing 2 continued

```

08630 ;yes
08640 ;lowercase
08650 ;
08660 ;check for <ENTER>
08670 ;go start at common code entry (for player OR demo mode)
08680 ;check to see if we want to make a self-loading disk
08690 ;yes
08700 ;check lowercase also
08710 ;
08720 ;go get another key-press
08730 ;clear screen for instructions
08740 ;HL=> title
08750 ;DE= location to print
08760 ;
08770 ;HL= 1st instruction block
08780 ;DE= location to print
08790 ;
08800 ;call code to print bottom message and wait for key-press
08810 ;now we simply repeat the above procedure for the rest of
08820 ; the instructions
08830 ;
08970 ;HL= bottom left of screen
08980 ;store ground position
08990 ;HL= 0
09000 ;zero length flag
09010 ;zero target #
09020 ;B= 63 (for 63 iterations)
09030 ;save B on stack <=====
09040 ;call target printing routine !
09050 ;set up registers to move screen to the right !
09060 ; !
09080 ;move the screen to the right !
09090 ;get B from stack !
09100 ;and count down until done =====>
09110 ;HL= message to print on top
09120 ;DE= location to print it
09130 ;
09140 ;get a key entry <=====
09150 ;check for <ENTER> !
09160 ;go get another key if not <ENTER> =====>
09170 ;go to the start of the program again
09180 ;byte for a LD A,# opcode
09190 ;zero A
09200 ;store A in DEMO flag
09210 ;continue past high score print =====>
09220 ;print the high scores !
09230 ;wait for a key-press !
09240 ;go clear screen <=====
09250 ;IX= BSOUND , used for flag updates
09260 ;place the bomber at the top of the screen
09270 ;
09280 ;displace the bomber 50 from the left
09290 ;
09300 ;give the bomber 500 units of fuel
09310 ;
09320 ;give the bomber X bombers (X may change by create mode)
09330 ;store number of bombers
09340 ;add ASCII '0' to value
09350 ;place # left on screen
09360 ;HL= amount of delay to start with
09370 ;store starting delay in temporary variable
09380 ;HL=0
09390 ;zero the amount of points
09400 ;zero the target length flag
09410 ;zero the target variable
09420 ;zero the bomb position
09430 ;zero the missile's altitude
09440 ;zero the missile's displacement
09450 ;zero its "launched" flag too
09460 ;zero its 2nd altitude variable
09470 ;empty out variable "TEMP"
09480 ;zero out the oil explosion variables
09490 ;
09500 ;LET HL= bottom of ground position
09510 ;store ground location
09520 ;HL=> amount of fuel message
09530 ;DE= beginning of screen
09540 ;
09550 ;HL=> # of points message
09560 ;DE= position to print message
09570 ;
09580 ;HL=> 'And here...' message
09590 ;DE= location to print
09600 ;
09610 ;load maximum delay value into BC
09620 ;delay
09630 ;delay some more
09640 ;HL= location where we just printed the message
09650 ;B= # of letters printed
09660 ;blank out line <=====
09670 ;bump pointer !
09680 ;repeat till blanked out =====>
09690 ;test chopper flag
09700 ;go if its a bomber plane
09710 ;enable the chopper "ch ch ch" sound
09720 ;go begin game

```

Listing 2 continued

Listing 2 continued

```

09730 ;title message
09740 ;end marker
09750 ;copyright message
09760 ;
09770 ;title page question
09780 ;
09800 ;continuation message to print
09810 ;
09820 ;beginning start message
09830 ;
09840 ;now some instruction strings
09850 ;
10620 ;create game mode messages
10630 ;
10720 ;string for bomber
10730 ;
10790 ;string for chopper
10800 ;
10900 ;strings for parachute
10910 ;
11060 ;TCH is used to toggle the sound to port $PFH between 1 and
2 so as to create the chopper's rotor blade pulses
11070 ;ALT contains the bomber's current altitude (in terms of the
screen's memory locations)
11080 ;DP is the bomber's displacement from the left edge of the
screen
11090 ;FUEL contains the amount of fuel that the bomber has left
to use
11100 ;POINTS is the variable that contains the amount of points
that a bomber currently has
11110 ;NUM contains the # of "men" which the player currently has
11120 ;LL is a flag indicating that the missile has been launched
11130 ;DL contains the current displacement of the missile
11140 ;AL contains the altitude of the missile (in terms of screen
position)
11150 ;A2 contains the altitude of the missile divide by 64
11160 ;EXP contains the location of the current oilfield explosion
11170 ;EXPN is a counter indicating which frame to display on the
oil-field explosions
11180 ;TEMP is merely a temporary holder of various values
11190 ;DELAY contains the amount of delay between movements of the
bomber. It normally counts down to produce shorter delays.
11200 ;DEMO is a flag. If (DEMO) is non-zero, then the game is in
the demonstration mode.
11210 ;SEED is simply a neat little value to help in producing the
next random #
11220 ;HISCR simply contains a number of flags to indicate whether
it is OK or not to allow the current score to become a high score
11230 ;BSOUND contains 1 bit flags indicating what sound to make
11240 ;TRANS contains a 1 for a plane or a 2 for a chopper
11250 ;TEXPN is similar to EXPN
11260 ;TEXP is like EXP
11270 ;various display messages
11280 ;
11370 ;PL is a counter that is used to indicate the length of the
current target that is appearing on the screen
11380 ;TG is a number value that indicates what target is being di
splayed on the screen
11390 ;BOMB is used to hold the location of the current bomb. A v
alue of zero means that no bomb has been launched
11400 ;GR holds the current altitude of the ground
11410 ;CURSP is a program variable used to hold the cursor's curre
nt position
11420 ;move a message from HL to DE
11430 ;<----->
11440 ; ;
11450 ; ;
11460 ; ;
11470 ;<----->
11480 ;KEY is used to get input from the user
11490 ;if in DEMO mode, then simply provide an <ENTER> after a set
time delay
11500 ;
11600 ;subroutine used to print message on screen bottom and wait
for keyboard input
11690 ;
11760 ;PRINTN is used to print the number stored in HL to the loca
tion pointed to by DE
11770 ;
11880 ;CHAR prints a character on the screen
11890 ;
12100 ;CLS is used to blank out the screen
12110 ;
12160 ;CNVRT is a subroutine called by PRINTN to print one digit o
f a number
12170 ;
12240 ;BLOW is called when the bomber crashes, is shot down, etc.
12250 ;
12340 ;1st we blow up the plane
12350 ;
12400 ;make explosion noise
12410 ;copy same procedure for the rest of the explosion
12420 ;
13190 ;B=4 (flash the screen 4 times)
13200 ;save BC on stack
13210 ;HL= beginning of screen
13220 ;BC= 1024 (reverse all screen locations)

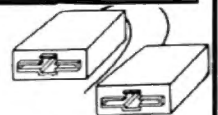
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Listing 2 continued

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Listing 2 continued

```

13230 ;get character
13240 ;is it a graphic character?
13250 ;no, it isn't
13260 ;reverse bits
13270 ;mask out top bits
13280 ;set top bit
13290 ;restore character
13300 ;check for space
13310 ;jump to special handler
13320 ;bump pointer
13330 ;decrement counter
13340 ;check for done counting
13350 ;
13360 ;continue till done reversing
13370 ;jump to continuation
13380 ;store a solid block for spaces
13390 ;continue at common code
13400 ;get BC from stack
13410 ;continue for 4 flashes
13420 ;load HL with initialization value
13430 ;make explosion sound
13440 ;get number of bombers left
13450 ;get ASCII value of one less
13460 ;store new # of bombers on screen
13470 ;add 47, subtract 48 is equal to DEC
13480 ;store new number of bombers in NUM
13490 ;continue game if still have bombers left
13500 ;get message to print
13510 ;location
13520 ;
13530 ;get DEMO mode value (computer can't get high score)
13540 ;test for demonstration mode
13550 ;go is demonstration mode
13560 ;if (400CH)=0 then disk was auto-loading
13570 ;
13580 ;Can't update if on DOS disk
13590 ;Is the game in the proper mode for an update?
13600 ;
13610 ;go if not in proper mode
13620 ;get lowest high-score
13630 ;get current points
13640 ;compare the two
13650 ;update high scores if have a better one
13660 ;get input from user
13670 ;test for <ENTER>
13680 ;wait if not
13690 ;continue at game's start
13700 ;SCUP is the SCORE UPdater ; get current amount of points
13710 ;get highest high score
13720 ;clear C flag
13730 ;compare the 2 values
13740 ;HL= beginning of output sector
13750 ;IX= screen location to update
13760 ;go if beat this score
13770 ;if not, keep going down the scores till we find one that we
      bit
13780 ;
13980 ;save registers for later use
13990 ;
14000 ;move value to DE
14010 ;
14020 ;load HL with end of sector high scores
14030 ;clear C flag
14040 ;get the length of move
14050 ;store length in BC
14060 ;
14070 ;set up DE & HL for block move of high scores
14080 ;
14090 ;move the scores up in memory
14100 ;pop values off stack
14110 ;
14120 ;store high score in high score buffer
14130 ;
14160 ;save needed registers
14170 ;
14180 ;print the high scores on the screen
14190 ;retrieve the saved registers
14200 ;
14210 ;blank out the old initials with underlines
14220 ;
14240 ;get a character
14250 ;compare character with legal bounds
14260 ;
14290 ;save the first initial on screen
14300 ;save initial in high score buffer
14310 ;bump pointer
14320 ;repeat the procedure for 3 initials
14330 ;
14410 ;check for backspace
14420 ;get another character if not a backspace
14430 ;backspace the high-score updater
14440 ;
14460 ;just repeat the procedure AGAIN (3rd initial)
14470 ;
14670 ;now wait for confirming <ENTER> or a backspace
14680 ;

```

Listing 2 continued

Listing 2 continued

```
14750 ;now output the sector to the disk drive
14760 ;start the drive motor
14770 ;now wait for the drive to start up
14780 ;
14790 ;DE= track 0, sector 9
14800 ;store the new track, sector
14810 ;HL= buffer location
14820 ;output the sector to disk
14830 ;go back to the program beginning
14840 ;continuation code to continue game for multiple
      players
14850 ;reset program variables as needed (see INIT)
14860 ;
14930 ;start here to switch 120's with 32's
14940 ;go for 959 bytes
14950 ;get byte at HL
14960 ;test for blank graphic
14970 ;go if not          <=====>
14980 ;switch in an ASCII space      |
14990 ;bump pointer          <=====
15000 ;decrement counting variable
15010 ;test for zero
15020 ;
15040 ;now blank out the top line on the screen
15050 ;
15090 ;now reprint the fuel and points messages
15100 ;
15150 ;get bomber #
15160 ;adjust to ASCII value
15170 ;store to screen
15180 ;call DECOR to provide continuous targets
15190 ;continue with the game
15200 ;SHOT is called when the bomber is shot down by a
      missile
15210 ;get displacement
15220 ;find the plane's position
15230 ;store in TEMP
15240 ;adjust to one line down
15250 ;
15260 ;get byte under plane
15270 ;
15280 ;go if not enough room to parachute
15290 ;
15320 ;go if not enough room to parachute
15330 ;get location to put parachute
15340 ;get 1st parachute string
15350 ;print 1st row of parachute
15360 ;continue for the rest of the parachute
15370 ;
15480 ;get value in TEMP
15490 ;and displace it down 3 lines, right 2 spaces
15500 ;
15510 ;get whatever is below parachute
15520 ;compare with value for air
15530 ;go if hit something
15540 ;delay some before moving parachute down
15550 ;
15590 ;get value in TEMP
15600 ;B=5
15610 ;blank out top of parachute <=====
15620 ;bump pointer          <===== |
15630 ;continue till blanked          <=====>
15640 ;HL= location of parachute
15650 ;DE= 64 (enough to move parachute down one line)
15660 ;bump to lower location on screen
15670 ;store new location
15680 ;continue printing & moving parachute
15690 ;PRHISC prints a high-score page
15700 ;get message to print & print it
15710 ;
15730 ;point IX to the screen
15740 ;DE= location of high scores in memory
15750 ;5 high scores to print
15760 ;A=6
15770 ;subtract B (to adjust a 5 to 1, 4 to 2, etc.)
15780 ;add 48 to adjust to ASCII
15790 ;store ASCII value to screen
15800 ;put in a few dashes
15810 ;
15830 ;get the person's score
15840 ;
15880 ;HL now has the score
15890 ;get 1st initial
15900 ;bump DE pointer
15910 ;display 1st initial on screen
15920 ;repeat for second initial
15930 ;
15950 ;repeat again for 3rd initial
15960 ;
15980 ;save BC
15990 ;BC=30
16000 ;offset IX by 30 (position to print score)
16010 ;save DE
16020 ;transfer IX to DE
16030 ;
16040 ;print the score on the screen
```

Listing 2 continued

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Listing 2 continued

```

16050 ;get DE
16060 ;BC=98
16070 ;bump IX to new location
16080 ;get BC from stack
16090 ;continue high score print for all 5 high scores
16100 ;return
16110 ;RND produces a random # between 1 and the value in HL
16120 ;get seed #
16130 ;store in C
16140 ;juggle the bits around a bit (no pun intended)
16150 ;
16240 ;now use R register to really mix things up
16250 ;store new seed number
16260 ;get HL again
16270 ;compare # with maximum value <=====
16280 ;go if number OK ==> !
16290 ;adjust number ! !
16300 ;go test again ==> !=
16310 ;raise value by one <=====
16320 ;return
16330 ;BLANK is called to crase the bomber from the screen
16340 ;
16350 ;get the position of the bomber
16360 ;test for plane
16370 ;go if plane <=====>
16380 ;test for chopper !
16390 ;go if chopper !
16400 ;return !
16410 ;length=6 <=====
16420 ;blank out character <=====
16430 ;bump pointer !
16440 ;continue till done <=====>
16450 ;return
16460 ;blank out the chopper
16470 ;blank out character <=====
16480 ;bump pointer !
16490 ;continue till done <=====>
16500 ;DE=55 (amount to offset HL to next line on chopper)
16510 ;offset pointer HL
16520 ;there are 12 characters to blank
16530 ;blank out character <=====
16540 ;bump pointer !
16550 ;continue till done <=====>
16560 ;return
16570 ;CRKEY gets a number key from 1-3
16580 ;check for low end
16590 ;nope, no good
16600 ;check high end
16610 ;get another key-press if no good
16620 ;adjust input to binary
16630 ;return
16640 ;CREAT inputs numbers to create a different game
16650 ;set IY to BSOUND flags
16660 ;blank out HISCR flags for update permission
16670 ;get message to print on screen
16680 ;DE= top of screen to print message
16690 ;
16700 ;input a number from CRKEY
16710 ;if 0 then make game slow
16720 ;test for 1
16730 ;if 1 then make game medium speed
16740 ;HL= value for fast game
16750 ;store delay value in Initialization routine
16760 ;continue w/ next question
16770 ;just like above
16780 ;
16790 ;set flag for proper speed for high score update
16800 ;go continue at CREAT1
16810 ; (ditto for comments)
16820 ;
16830 ;go ask about speed changes during game
16840 ;
16930 ;ask about how many bombers to give the player
16940 ;
17080 ;ask about whether or not to allow missiles to be
    launched
17090 ;
17180 ;ask about whether to use a plane or a chopper
17190 ;
17260 ;continue at game's beginning
17270 ;SHREG is merely a 3 byte variable to provide random
    static sound
17280 ;
17300 ;SHIFT is called to update SHREG and output a pulse to
17310 ; the cassette port depending on whether or not the
    bits
17320 ; are set or reset
17330 ;juggle the bits around a bit
17340 ;
17530 ;skip outputting a pulse if C flag is set
17540 ;
17550 ;output a positive pulse to port
17560 ;get delay value
17570 ;store in B register
17580 ;delay a while
17590 ;A=2 (for negative pulse)
17600 ;output a negative pulse to port
17610 ;return
17620 ;EXS makes an explosion sound
17630 ;store an initial delay value
17640 ;get delay value from TEXS
17650 ;compare with the defined explosion length
17660 ;return if reached explosion length
17670 ;store delay in B
17680 ;delay for a while
17690 ;add in delta offset for the delay byte
17700 ;store new delay in TEXS
17710 ;save HL
17720 ;call SHIFT to generate (?) a pulse
17730 ;get HL again
17740 ;continue updating until explosion is done
17750 ;TEXS is a variable used by SHIFT and EXS to make
    explosion sounds
17760 ;PUTSEC is used to output a sector to disk
17770 ;on entry:
17780 ; HL=> RAM buffer
17790 ; TSEC contains the sector/track in that byte order
17800 ;for additional info on disk I/O, see another source
17810 ;
17810 ;
17980 ;AUTO writes a self loading disk to the disk in drive
    # 0
17990 ;load DE with screen beginning
18000 ;HL= message to wait for enter
18010 ;
18020 ;wait for input from user
18030 ;A=1 (select and start drive #0)
18040 ;start disk drives
18050 ;BC= maximum delay
18060 ;delay a while to get drives moving
18070 ;HL now points to the programs end
18080 ;DE= start of program- 100H bytes
18090 ;clear C flag
18100 ;get the difference
18110 ;raise the value of sectors by one
18120 ;store in B
18130 ;get in A
18140 ;store # of sectors to boot routine
18150 ;prepare HL to point to top of program
18160 ;DE=100H (track 1, sector 0)
18170 ;save BC
18180 ;store the sector in TSEC
18190 ;get BC again
18200 ;save BC (need sector count) <=====
18210 ;output sector to disk !
18220 ;get sector count again !
18230 ;continue output till done <=====>
18240 ;now output boot sector
18250 ;
18280 ;zero out a page of memory
18290 ;256 elements
18300 ;zero memory location <=====
18310 ;bump pointer !
18320 ;continue till zeroed <=====>
18330 ;now let A= blank space
18340 ;set IX to buffer
18350 ;zero out the initials
18360 ;
18500 ;DE= track 0, sector 9
18510 ;store location to begin output
18520 ;HL=> 5E00H
18530 ;output blank sector
18540 ;print done message
18550 ;
18570 ;wait for input
18580 ;go to start
18590 ;TSEC is used to hold the current track & sector
18600 ;BOOT is the automatic disk boot routine
18610 ;test BUSY status
18620 ;wait for FDC to be ready
18630 ;clear FDC
18640 ;
18650 ;start input at track 0, sector 9
18660 ;
18670 ;delay a bit
18680 ;
18690 ;this value is updated by AUTO
18700 ;load program at 5F00H
18710 ;save BC
18720 ;get sector
18730 ;get BC
18740 ;continue till program loaded
18750 ;zero A
18760 ;store "booted" flag in memory
18770 ;begin program
18780 ;GETSEC is like PUTSEC but puts info at (HL) from
18790 ; the track/sector defined by TSEC
18800 ;
19160 ;mark the program's end
19170 ;begin program at START

```

End

**Bombs Away!: Program Listing 3. Sound routine 1.**

```

00100 ;Public Domain      May 1983
00110                ORG      6000H
00120 START          LD        D,1                ;start at minimum delay
00140 LP1            LD        A,1                ;output 1st 1/2 pulse
00150                OUT      (255),A
00160                LD        B,D
00170                DJNZ     $                    ;delay for D counts
00180                LD        A,2                ;output 2nd 1/2 pulse
00190                OUT      (255),A
00200                LD        B,D
00210                DJNZ     $                    ;delay for D counts
00220                INC      D                    ;change to lower frequency
00240                JP        LP1                 ;continue forever
00260                END      START

```

End

**Bombs Away!: Program Listing 4. Sound routine 2.**

```

00100 ;Public Domain      May 1983
00110                ORG      6000H
00120 SHREG          DEFB     0
00130                DEFB     66H
00140                DEFB     72H
00150 SHIFT          LD        A,(SHREG)          ;get values from memory variable
00160                LD        DE,(SHREG+1)
00170                LD        B,E
00180                LD        C,D
00190                LD        H,A
00200                XOR      C                    ;juggle the bits around
00210                RR        D
00220                RR        D
00230                XOR      D
00240                RR        B
00250                RR        E
00260                RR        E
00270                RR        E
00280                RR        E
00290                AND      1
00300                LD        (SHREG),A
00310                LD        A,H
00320                RRA                          ;rotate everything to the right
00330                RR        B
00340                RR        C
00350                LD        E,B
00360                LD        D,C
00370                LD        (SHREG+1),DE      ;restore value to memory variable
00380                JR        C,NPLS            ;if C then don't generate a pulse
00390                LD        A,1                ;generate a positive pulse
00400                OUT      (255),A
00410 NPLS           LD        A,(TEXS)
00420                LD        B,A
00430                DJNZ     $                    ;delay a while
00440                LD        A,2
00450                OUT      (255),A            ;generate a negative pulse
00460                RET                          ;return to calling routine
00470 EXS            CALL     SHIFT              ;generate a pulse
00480                LD        A,(TEXS)          ;increase delay
00490                INC      A                    ; to get lower frequencies
00500                LD        (TEXS),A          ;restore new value
00510                LD        B,A
00520                DJNZ     $                    ;delay a while
00530                JP        EXS                ;continue forever
00540 TEXS           DEFB     0
00550                END      EXS

```

End

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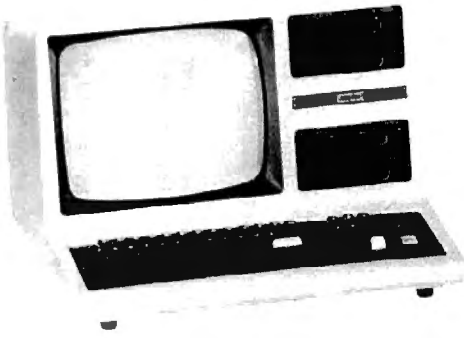
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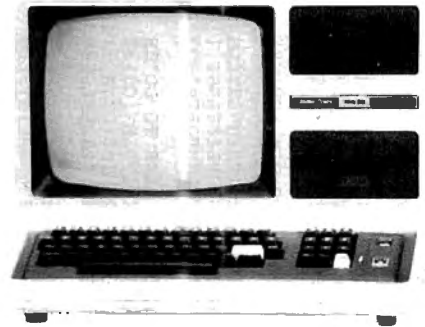


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```
20 CLEAR120:DEFSTRA-D:DEFINTE-Z:DIMX,B1(53),A(78),B(53),E(53),F(78)
,I(53),V(53):CLS:RANDOM
30 PRINT@87,CHR$(168)STRING$(15,140)CHR$(148):PRINT@151,CHR$(170)"
X - M A R T "CHR$(149):PRINT@215,CHR$(130)STRING$(15,131)CHR$(1
29)
40 PRINT"
```

EXPLORE X MART AND OBTAIN 12 CORRECT ITEMS TO WIN.  
SOME ITEMS AID YOU IN GETTING OTHERS.  
SOME COMMANDS: GET, DROP, LOOK, QUIT, AND MORE.

GOOD LUCK!

```
50 QR=1:FORG=1TO78:READA(G),F(G):NEXT:J=2:FORG=1TO53:READB(G),B1(G)
,E(G),I(G),V(G):NEXT:PORT=1TO4:AS=AS+CHR$(RND(4)+64):NEXT:PRINT"
<ENTER> TO BEGIN
```

```
60 IFINKEY$<>"
```

```
"THEN60
```

```
70 D5="YOU DON'T HAVE IT.":D8="NOT YET.":D="IT'S NOT HERE.":B="YOU
ALREADY DID.":DF="SOMETHING FELL OUT.":DZ="SOMETHING'S INSIDE.":D
N="IT IS.":CLS:DG="THE RAT BIT YOU TO DEATH!":DH="NOT POSSIBLE.":D
O="DONE.
```

```
80 PRINTCHR$(28)STRING$(2,30);:R1=1:R2=17:Q=0:GOSUB1170:A2=A(J):PR
INT"YOU'RE ";:IFLEN(A2)<>1THENPRINTA2;:IFV>1ANDJ<5PRINT" PARKING L
OT.":GOTO100ELSEIFJ=32ORJ=33PRINT" SIDE OF THE GROCERY SECTION."EL
SEPRINT"
```

```
90 IFA2="A"THENPRINT"ON THE SIDEWALK."ELSEIFA2="B"THENPRINT"IN AN
ALLEY."ELSEIFA2="C"THENPRINT"STANDING ON A STREET CORNER."ELSEIFA2
="D"THENPRINT"IN A HALLWAY."ELSEIFA2="E"THENPRINT"SOMEWHERE IN THE
STOCKROOM.
```

```
100 IFJ=43PRINT"HERE'S A";:GOSUB1280:PRINT" BEHIND YOU."ELSEIFJ=4
4ANDE(22)<>2PRINT"A GIANT RAT GUARDS AN ENVELOPE."ELSEIFJ=58PRINT"
A RUSTY OLD TRASH CAN IS SMELLING UP THE PLACE."ELSEIFJ=55ORJ=56PR
INT"A HIGH FENCE IS BESIDE YOU.
```

```
110 IFJ=8THENIFE(6)=2ANDE(7)=2THENPRINT"A ROBOT HERE IS SAYING: 'P
RESS CORRECT CODE'."ELSEPRINT"A TALKING ROBOT STANDS HERE.
```

```
120 IFJ=56ANDE(1)<>2THENPRINT"A SCORPION HERE DOESN'T LOOK FRIENDL
Y."ELSEIFJ=36ORJ=24THENPRINT"HERE'S A SIGN HERE.
```

```
130 IFJ<>17THEN150ELSEPRINT"A LADY'S SAYING: ";:IFV=0THENPRINT"YOU
R I.D. PLEASE."ELSEIFV=1THENPRINT"THAT'LL BE ";:FORX=1TO53:IFE(X)=
1THENIFV(X)<>0ANDX<>45ANDX<>46THENP!=P!+4.25
```

```
140 IFV=1THENNEXT:IFP!=0THENPRINT"... YOU AREN'T BUYING ANYTHING?"
ELSEPRINTUSING"$##,##.":P!ELSEIFV=2THENE(18)=1:PRINT"THANK YOU...
(SHE HANDS YOU SOMETHING).
```

```
150 IFJ=36THENPRINT"IN FRONT OF YOU IS A";:GOSUB1280:PRINT".
```

```
160 P=0:PRINTCHR$(31);:FORX=1TO53:IFE(X)<>0THENNEXT:GOTO180ELSEIFI
(X)=JTHENIFP=0THENP=1:PRINT"ITEMS AROUND YOU:
";:X=X-1ELSEIFPOS(0)+LEN(B(X))<62THENPRINTB(X)". ";ELSEPRINT"
"B(X)". ";
```

```
170 NEXT:PRINT
```

```
180 R1=18:R2=35:GOSUB1170:IFJ=78THEN220ELSEPRINT:PRINT"YOU MAY GO:
";:H=F(J):IFHAND1PRINT" WEST";
```

```
190 IFHAND2PRINT" NORTH";
```

```
200 IFHAND4PRINT" EAST";
```

```
210 IFHAND8PRINT" SOUTH";
```

```
220 R1=36:R2=53:GOSUB1170:IFE(15)<>2THENI(51)=I(15)
230 IFQH<>0THENPRINT@576,"SMASH ONE AND SWALLOW THE OTHER.":GOTO28
0
```

```
240 IFJ=56ANDE(1)=1ANDRND(2)=2THENE(1)=2:FORT=1TO2000:NEXT:PRINT@5
12,"THE "B(1)" CHASED THE SCORPION AWAY!":FORT=1TO2000:NEXT:GOTO80
```

```
250 IFJ=63PRINT@512,"CAUGHT FOR JAY-WALKING!":FORT=1TO2000:NEXT:J=
68:E(52)=1:GOTO80
```

```
260 IFJ<>36ANDJ<>43ANDQR=3THENA="THE MANAGER THREW YOU OUT FOR OPE
NING THE STOCKROOM DOOR!":GOTO1220
```

```
270 IFJ=3ANDC3="S"THENIFE(18)=2THENFORX=1TO52:IFE(X)<>1THENNEXTELS
EIFV(X)<>0ANDX<>34ANDX<>40ANDX<>43THENA="CAUGHT FOR SHOPLIFTING! (
YOU TOOK SOMETHING WITHOUT PAYING!)":GOTO1220ELSENEXTELSEFORT=1TO9
99:NEXT:GOTO1240
```

```
280 C1="":C2="":C3="":A="":PRINT@512,"WHAT WOULD YOU LIKE TO DO"CH
R$(30);:INPUTC3:IFC3="":THEN280ELSEPRINTCHR$(31);:FORX=1TOLEN(C3):I
FMID$(C3,X,1)<>" THENNEXTELSEX=X+1:C1=LEFT$(C3,3):C2=MID$(C3,X,3)
290 D1=LEFT$(C3,X-2):D2=MID$(C3,X,LEN(C3)-1):IFC3="QUIT"2310ELSEIF
QH<>0THEN340
```

```
300 IFC1<>"PUM"THEN320ELSEIFC2="BAS"THENIFJ=I(19)THENIFE(35)=1THEN
IFLEN$(B(19),1)="F"THENB(19)=RIGHT$(B(19),10):GOTO80ELSEPRINTBELS
EPRINTD8ELSEPRINTD8ELSEPRINTDH
```

```
310 GOTO280
```

```
320 IFC2="BOX"ORC2="HAN"THENPRINT"USE COLOR.":GOTO280ELSEIFC2="DOO
"THENIFJ<>36ANDJ<>43THENPRINT"NO DOORS HERE.":GOTO280ELSE390ELSEIF
C3="I"ORLEFT$(C3,3)="INV"THEN190
```

```
330 IFJ=78THENM=J:X=0:GOTO360
```

```
340 IFC1="WAL"ORC1="GO"ORC1="RUN"ORC1="LEFT$(C2,1)
```

```
350 M=J:X=0:IFC3="N"AND(HAND2)X=7ELSEIFC3="S"AND(HAND8)X=-7ELSEIFC
3="W"AND(HAND1)X=-1ELSEIFC3="E"AND(HAND4)X=1
```

```
360 J=J+X:X=1:IF(C3="S"ORC3="N"ORC3="W"ORC3="E")THENIFM=JTHENA="CA
N'T GO THERE"ELSEIFQH=0THEN80ELSEQS=1
```

```
370 IFQH=1THENCLS:FORT=1TO20:NEXT:PRINT"YOU WAKE UP!":FORT=1TO20:N
EXT:X=X+1:IFX<31THEN370ELSEJ=69:QH=0:GOTO80
```

```
380 IFQH<>0THENQH=QH-1:IFQS=1THENQS=0:GOTO80ELSEPRINT"WHAT?":GOTO2
80
```

```
390 IFC1<>"GET"ANDC1<>"TAK"THEN520ELSEIFC2="INV"THEN1190ELSEIF(C2=
"ENV"ORC2="RAT")ANDE(22)<>2THENIFJ=44THENA=DG:GOTO1220ELSEA=D:GOTO
990
```

```
400 IFC2<>"BUL"THEN420ELSEIFE(50)=2THENIFE(27)=1THENIFRIGHT$(B(20)
,1)="")THENE(50)=0:I(50)=J:Q=13:X=50:E(X)=0:GOTO470ELSEPRINT"TOO H
OT."ELSEPRINTD8ELSE420
```

```
410 GOTO280
```

```
420 IFC2="REC"THENIFE(51)=2THENIFJ=22THENIFE(15)=1THENB(15)="RECOR
D ALBUM":E(51)=3:PRINTDO:GOTO280ELSEPRINT"GET A COVER FOR IT.":GOT
O280ELSEPRINTD:GOTO280ELSEPRINTB:GOTO280
```

```
430 IFC2="BAL"THENIFJ=19THENPRINT"IT'S TAPED TO THE WALL.":GOTO280
ELSEPRINTD:GOTO280ELSEIFC2="BAS"THENIFLEFT$(B(19),1)="F"THENIFJ=29
THENPRINT"IT'S FLAT.":GOTO280ELSEA=D
```

```
440 IFC2="COI"ORC2="SCO"THENIFE(1)<>2THENIFJ=I(36)THENA="THE SCORP
ION ATE YOU ALIVE!":GOTO1220ELSEPRINTD:GOTO280
```

```
450 FORX=1TO53
```

```
460 IFB1(X)<>C2NEXT:PRINT"GET WHAT?":GOTO280ELSEIFI(X)<>JTHENPRINT
D:GOTO280ELSEIFE(X)=1THENA="YOU ALREADY HAVE IT"ELSEIFE(X)>1THENA=
D
```

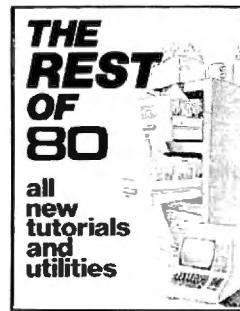
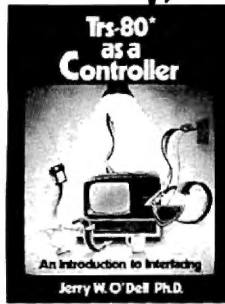
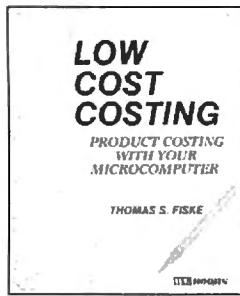
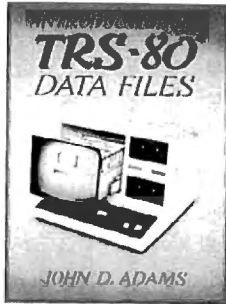
```
470 IFE(X)<>0THEN520ELSEIFE(2)=1THENL=14ELSEL=4
```

```
480 IFC2="CAR"THENQ=3
```

```
490 IFQ>LTHENPRINT"CAN'T CARRY ANYMORE.":GOTO280ELSEPRINT"GOT IT.":
E(X)=1:IFC2="BRO"ANDE(29)=2THENPRINT"SOMETHING WAS UNDER IT.":E(2
9)=0
```

```
500 IFC2="BAG"ANDE(4)=2ANDJ=2THENPRINTDF:E(4)=0ELSEIFC2="BOO"THENI
```

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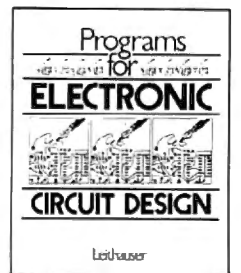
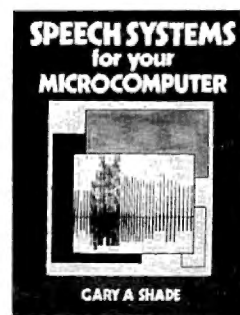
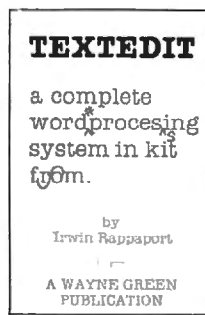
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**Bombs Away!: Program Listing 1.  
Bomber/SRC.**

```

00100 ORG 6000H
00110 LOOP LD HL,16382
00120 LD DE,16383
00130 LD BC,930
00140 LDDR
00150 LD HL,15487
00160 LD DE,64
00170 LD B,14
00180 SIDE2 LD (HL),32
00190 ADD HL,DE
00200 DJNZ SIDE2
00210 CALL BOMBS
00220 CALL EXPL
00230 CALL TEXPL
00240 LD HL,(FUEL)
00250 LD A,H
00260 OR A
00270 JP P,FUELN
00280 DEC HL
00290 LD (FUEL),HL
00300 LD HL,OUTA
00310 LD DE,15360
00320 CALL PRINT
00330 CALL DOWN9
00340 LD HL,(BOMB)
00350 LD (HL),20H
00360 LD HL,0
00370 LD (BOMB),HL
00380 JP FUELAF
00390 FUELN DEC HL
00400 LD (FUEL),HL
00410 LD DE,3C06H
00420 CALL PRINTN
00430 CALL KEYIN
00440 FUELAF LD HL,(POINTS)
00450 LD A,H
00460 AND L
00470 CP 0FFH
00480 JR NZ,LOPC2
00490 LD HL,0
00500 LD (POINTS),HL
00510 LOPC2 LD DE,3C10H
00520 CALL PRINTN
00530 CALL DECOR
00540 CALL MIS1UP
00550 CALL PUTTRN
00560 CALL CRSH
00570 LD A,(14337)
00580 CP 1
00590 CALL Z,WAIT
00600 CALL MIS1
00610 LD BC,(DELAY)
00620 LD A,B
00630 OR C
00640 JP Z,ALARM
00650 HARK2 LD HL,-7
00660 ADD HL,BC
00670 LD (DELAY),HL
00680 ALARM LD C,B
00690 LD A,128
00700 ADD A,C
00710 LD D,A
00720 LD A,23
00730 ADD A,C
00740 LD C,A
00750 BIT 0,(IY)
00760 JR NZ,ALARM2
00770 BIT 1,(IY)
00780 JR NZ,SOUN3
00790 BIT 2,(IY)
00800 JP NZ,SOUN4
00810 LD 1,(IY+1)
00820 ALARM1 NZ,ALARM1
00830 LD A,1
00840 OUT (255),A
00850 LD B,D
00860 DJNZ $
00870 LD A,2
00880 OUT (255),A
00890 LD B,D
00900 DJNZ $
00910 DEC D
00920 DEC C
00930 JR NZ,ALARM1
00940 JP LOOP
00950 ALARM1 LD B,D
00960 DJNZ $
00970 LD B,D
00980 DJNZ $
00990 LD B,4
01000 DEC D
01010 DEC C
01020 JR NZ,ALARM1
01030 JP LOOP

```

```

01040 ALARM2 RES 0,(IY)
01050 LD A,C
01060 SUB 4
01070 LD C,A
01080 LD A,D
01090 ADD A,32
01100 LD D,A
01110 ALARM3 LD A,1
01120 OUT (255),A
01130 LD B,D
01140 DJNZ $
01150 LD A,2
01160 OUT (255),A
01170 LD B,D
01180 DJNZ $
01190 INC D
01200 DEC C
01210 JR NZ,ALARM3
01220 JP LOOP
01230 SOUN3 RES 1,(IY)
01240 SOUN4 RES 2,(IY)
01250 LD A,D
01260 SUB 54
01270 LD L,A
01280 LD H,1
01290 CALL EXS
01300 JP LOOP
01310 DELAY9 DEC BC
01320 LD A,B
01330 OR C
01340 JR NZ,DELAY9
01350 LD RET
01360 WAIT LD A,(14400)
01370 AND 1
01380 JR Z,WAIT
01390 RET
01400 KEYIN LD A,(DEMO)
01410 OR A
01420 JR Z,KEYIN1
01430 LD A,R
01440 RLA
01450 JR KEYIN2
01460 KEYIN1 LD A,(3840H)
01470 KEYIN2 AND 0F8H
01480 JR Z,JOYIN
01490 LD C,A
01500 CALL BLANK
01510 RL C
01520 CALL C,FIRE
01530 RL C
01540 CALL C,BACK
01550 RL C
01560 CALL C,FOR
01570 RL C
01580 CALL C,DOWN
01590 RL C
01600 JP C,UP
01610 RET
01620 JOYIN IN A,(0)
01630 XOR 0FFH
01640 RET Z
01650 LD C,A
01660 CALL BLANK
01670 RR C
01680 CALL C,UP
01690 RR C
01700 CALL C,DOWN
01710 RR C
01720 CALL C,FOR
01730 RR C
01740 CALL C,BACK
01750 RR C
01760 JP C,FIRE
01770 RET
01780 UP LD HL,(ALT)
01790 LD DE,15360
01800 OR A
01810 SBC HL,DE
01820 RET Z
01830 LD DE,15296
01840 ADD HL,DE
01850 LD (ALT),HL
01860 LD HL,(FUEL)
01870 DEC HL
01880 LD (FUEL),HL
01890 RET
01900 DOWN9 CALL BLANK
01910 DOWN LD HL,(ALT)
01920 LD DE,3F80H
01930 OR A
01940 SBC HL,DE
01950 RET Z
01960 LD HL,(ALT)
01970 LD DE,(DP)
01980 ADD HL,DE
01990 LD DE,68
02000 ADD HL,DE
02010 BIT 0,(IY+1)

```

```

02020 JR NZ,DOWN2
02030 ADD HL,DE
02040 INC HL
02050 INC HL
02060 DOWN2 LD A,(HL)
02070 CF 32
02080 JR Z,DOWN8
02090 CP 10
02100 JR Z,DOWN8
02110 CP 4
02120 JR Z,DOWN8
02130 JP BLOW
02140 DOWN8 LD DE,64
02150 LD HL,(ALT)
02160 ADD HL,DE
02170 LD (ALT),HL
02180 LD HL,(FUEL)
02190 INC HL
02200 LD (FUEL),HL
02210 RET
02220 FOR LD A,(DP)
02230 CP 38
02240 RET Z
02250 DEC A
02260 LD (DP),A
02270 LD HL,(FUEL)
02280 DEC HL
02290 LD (FUEL),HL
02300 RET
02310 BACK LD A,(DP)
02320 CP 50
02330 RET Z
02340 INC A
02350 LD (DP),A
02360 RET
02370 FIRE LD A,(BOMB)
02380 OR A
02390 RET NZ
02400 LD HL,(ALT)
02410 LD DE,(DP)
02420 ADD HL,DE
02430 LD DE,4
02440 ADD HL,DE
02450 LD (BOMB),HL
02460 BIT 0,(IY+1)
02470 RET NZ
02480 LD DE,66
02490 ADD HL,DE
02500 LD (BOMB),HL
02510 RET
02520 CRSH LD HL,(ALT)
02530 LD DE,(DP)
02540 ADD HL,DE
02550 DEC HL
02560 LD A,(HL)
02570 CP 32
02580 JP NZ,BLOW
02590 BIT 0,(IY+1)
02600 RET NZ
02610 LD DE,66
02620 ADD HL,DE
02630 LD A,(HL)
02640 CP 32
02650 JP NZ,BLOW
02660 RET
02670 PUTTRN BIT 0,(IY+1)
02680 JR NZ,PUBOM
02690 BIT 1,(IY+1)
02700 JR NZ,PUTCHP
02710 RET
02720 PUBOM LD HL,(ALT)
02730 LD DE,(DP)
02740 ADD HL,DE
02750 EX DE,HL
02760 LD HL,BOMBER
02770 JP PRINT
02780 PUTCHP LD HL,(ALT)
02790 LD DE,(DP)
02800 ADD HL,DE
02810 LD B,5
02820 PUTCH1 LD (HL),'-'
02830 INC HL
02840 DJNZ PUTCH1
02850 LD (HL),176
02860 INC HL
02870 LD B,5
02880 PUTCH2 LD (HL),'-'
02890 INC HL
02900 DJNZ PUTCH2
02910 LD (HL),' '
02920 LD DE,55
02930 ADD HL,DE
02940 EX DE,HL
02950 LD HL,CHOP
02960 JP PRINT
02970 INT PUSH AF
02980 LD A,(TCH)
02990 XOR 3

```

Listing 1 continued

Listing continued

```
990 IFCL="UNL"ANDC2="DOO"THENIFQR=2THENA=DNELSEIFQR=3ORQR=4THENA=D
NELSEIFQR=1THENIFE(12)=1THENQR=2:GOTO80ELSE=D8
1000 IFCL="CLO"ANDC2="DOO"THENIFQR=1ORQR=2THENA=DNELSEIFQR=3THENQR
=4:F(36)=12:F(43)=6:GOTO80
1010 IFCL="PRE"THENIFJ=8THENIFE(7)=2THENIFE(6)=2THENIFD2=ASTHENPRI
NT"RIGHT! YOUR PRIZE...":FORT=1TO800:NEXT:E(6)=0:GOTO80ELSE="WRON
G"ELSE="ONLY ONE PRIZE"ELSE=D8ELSE=D8
1020 IFCL="INS"ANDC2="CAS"THENIFJ=8THENIFE(7)<>2THENPRINTDO:E(7)=2
:FORT=1TO800:NEXT:GOTO80ELSE=BELSE="NOT HERE
1030 IFCL="BRE"ANDC2="JAR"THENIFE(34)=2THENIFE(26)=1THENE(34)=0:I(
34)=J:PRINTDF:FORT=1TO800:NEXT:GOTO80ELSE="WITH WHAT?"ELSE=B
1040 IFCL="CUT"ANDC2="PAC"THENIFLEFT$(B(25),1)="P"THENIFE(29)=1THE
NB(25)="CUT "+B(25):A=DOELSE=D8ELSE=B
1050 IF(C1="POP"ORC1="POK")ANDC2="BAL"THENIFE(45)=2THENIFJ=19THENI
FE(44)=1THENE(45)=0:E(13)=2:PRINT"POP! IT FLEW AWAY AND "DF:FORT=1
TO2000:NEXT:GOTO80ELSE="YOU DON'T HAVE ANY SHARP OBJECTS"ELSE=DE
LSEA=B
1060 IPC3<>"SLEEP"THEN1080ELSEIFJ=69THENIFF(62)=13THENF(62)=9:PRIN
T"YOU FALL ASLEEP...":FORT=1TO800:NEXT:T!-1:FORX=1TO100:PRINTTAB(S
IN(T!)*31+31)"Z":T!+1:1:NEXT:QH=25ELSE="YOU'RE NOT TIRED NOW"EL
SEA="NOT HERE
1070 IFQH=25ANDA=" "THENFORT=1TO1:J=RND(34):IFV(J)=2THEN80ELSE=T-1
:NEXT
1080 IFCL="SMA"ANDC2="IRO"THENIFQA=0THENA=DO+" (THE IRON BALL LOOK
S DIFFERENT NOW)":QA=1ELSEIFQA=1THENPRINT"IT TURNS TO DUST AND REV
EALS SOMETHING.":I(53)=J:FORT=1TO1500:NEXT:E(52)=2:QA=2:GOTO80
1090 IFCL="SWA"ANDC2="PIL"THENIFE(53)<>2THENJ=67:PRINT"YOU'RE MAGI
CALLY TRANSPORTED OUT AND ARE NOW FREE!":E(53)=2:FORT=1TO3000:NEXT
:GOTO80ELSE=B
1100 IFCL="SHO"ANDC2="I.D"THENIFJ=17THENIFV=0THENV=1:E(5)=2:GOTO80
ELSE=BELSE=D8
1110 IFLEFT$(C3,3)<>"PAY"THEN1140ELSEIFJ<>17THENPRINTD8:GOTO280ELS
EIFV=0THENA=D8ELSEIFV=2THENA=B
1120 IFV<>1THEN1150ELSEDD="YOU DON'T HAVE ENOUGH MONEY":A="O":IFP!
=51THENIFE(46)=1ANDE(45)=1THENE(45)=2ELSE=D8ELSE=IFP!<50THENIFE(46
)<>1THENA=D8ELSE=14)=1
1130 IFA="O"THENV=2:E(46)=2:GOTO80
1140 IFCL="DEC"ANDC2="PAP"THENIFE(39)=1ANDE(24)=1THENA=DO:Y=1ELSE
=D8
1150 IFA=" "THENPRINTDHELSEPRINTA;:D9=RIGHT$(A,1):IFD9<>" "ANDD9<>"
?"ANDD9<>"1"THENPRINT".
1160 GOTO280
1170 FORX=R1TOR2:IFE(X)<>1THENNEXT:RETURNELSEI(X)=J:IFX<>2THENQ=Q+
1
1180 NEXT:RETURN
1190 PRINT"YOU HAVE:":P=0:FORX=1TO53:IFE(X)<>1THENNEXTELSEIFP=0THE
NP=1:X=X-1:NEXTELSEIFPOS(X)+LEN(B(X))<62THENPRINTB(X)". ";:NEXTELS
EPRINT:PRINTB(X)". ";:NEXT
1200 IFP=0THENPRINT"NOTHING.":GOTO280ELSE280
1210 PRINT@576,"SURE?":;GOSUB1300:PRINTA;:IFN=0THEN280ELSEF=1
1220 IFP=0THENPRINT@576;
1230 PRINT"A"
PLAY AGAIN?":GOSUB1300:IFN=1THENRUNELSECLS:END
1240 FORX=1TO53:IFE(X)<>1THENELSEIFV(X)=3THENW=W+1
1250 NEXT:IFW<>12THEN1270ELSEFORT=1TO20:CLS:PRINT@203,"Y Y OOO
U U W W I I I I I N N
Y Y O O U U W W I N N N
Y O O U U W W W I N N N"
1260 PRINT"
Y O O U U W W W I N N N
```

```
Y OOO UUU W W I I I I N N":FORS=1TO100
:NEXTS,T:GOTO1230
1270 CLS:PRINT"YOU DIDN'T GET ALL THE ITEMS ON YOUR LIST!":FORM=15
2TO408STEP64:PRINT@X,"Y O U L O S E !":NEXT:GOTO1230
1280 IFQR=1THENPRINT" LOCKED";ELSEIFQR=2THENPRINT"N UNLOCKED";ELSE
IFQR=3THENPRINT"N OPEN";ELSEPRINT" CLOSED";
1290 PRINT" DOOR";:RETURN
1300 A=INKEY$:IFA=" "THEN1300ELSEIFA="Y"THENN=1:RETURNELSEIFA="N"TH
ENN=0:RETURNELSE1300
1310 DATA A DEAD-END STREET,4,IN THE WEST,7,IN THE,5,IN THE EAST
,5,A,5,A,5,C,3,IN THE ELECTRONICS DEPARTMENT,6,BESIDE THE ENTRANCE
DOOR,3
1320 DATABESIDE THE EXIT DOOR,8,IN THE MEDICINE SECTION,4,D,7,D,3,
A,10,IN THE STEREO DEPARTMENT,14,FACING A LADY BEHIND A COUNTER,11
1330 DATA FACING A CHECK-OUT COUNTER,8,FACING THREE CROWDED CHECK-O
UT COUNTERS,10,IN THE TOYS DEPARTMENT,12,D,11,A,10,IN THE MUSIC DE
PARTMENT. THERE'S A RECORD PLAYER HERE,14,STANDING IN A CROWDED HA
LLWAY,15
1340 DATA IN THE BOOKS DEPARTMENT (A CHECK-OUT COUNTER IS TO THE
SOUTH),15,IN THE SHOES DEPARTMENT,15,IN THE FITTING ROOM,5,IN A HA
LLWAY. BESIDE YOU THERE'S A CLOSET WITH A
COMBINATION LOCK ON IT,11,A,10,IN THE SPORTING GOODS DEPARTMENT,14
1350 DATA AMONG RACKS OF CLOTHES,15,FACING AN INFORMATION COUNTER,1
5,IN THE WEST,15,IN THE EAST,7,D,11,A,10,IN A SEMI-DARK CORNER,12,
IN THE TOOLS DEPARTMENT
1360 DATA 9,IN THE COFFEE SHOP FACING A TABLE AND A CHAIR,8,IN THE
LOST & FOUND OFFICE. THERE'S A LARGE DESK HERE,8,IN THE RESTROOM,8
,IN THE LAMPS SECTION,8,A,10,E,6,B,5,B,7,B,7,B,3,A,10,E,12,E,1
,B,0,B,10,B,10
1370 DATA IN A DRIVEWAY WHERE A LARGE TRUCK IS PARKED,10,AT THE COR
NER,8,B,6,B,5,B,7,B,13,STANDING BESIDE A MANHOLE,13
1380 DATA IN A NARROW STREET,13,FACING A LARGE AVENUE,0,B,10,INSIDE
A PHONE BOOTH,2,B,10,INSIDE THE POLICE OFFICE,2,IN JAIL. THE JAIL
BARS ARE BLOCKING THE WAY,4
1390 DATABESIDE A BUNK. NEXT TO THE BUNK IS A SINK,5,IN THE JAIL.
THERE ARE BRICK WALLS AROUND YOU,1,C,12,A,13,A,13,A,13,A,5,A,5,C,1
,INSIDE THE TRUCK,0
1400 DATA POODLE,POO,0,1,0,SHOPPING CART,CAR,0,2,0,PAPER BAG,BAG,0,
2,0,WALLET,WAL,2,2,0,I.D. CARD,I.D,2,2,0,WATCH,WAT,2,8,3,CASSETTE,
CAS,0,13,2,CALCULATOR,CAL,0,15,2,MANUAL,MAN,0,15,2,MAGAZINE,MAG,2,
15,3
1410 DATA GREEN MARKER,MARK,2,16,3,PLASTIC KEY,KEY,0,19,2,BALLOON,BA
L,0,19,2,CHANGE,CHA,2,20,0,EMPTY ALBUM COVER,ALB,2,27,3,BOOT,BOO,0
,25,2,NOTE,NOT,2,25,2
1420 DATA SLIP,SLI,2,36,2,FLAT BASKETBALL,BAS,0,29,3,GLOVES,GLO,0,3
0,2,JACKET,JAC,0,67,0,SLICE OF CHEESE,CHE,0,32,2,COUPON,COU,0,34,2
,PIECE OF PAPER,PAP,0,35,0
1430 DATA PACKAGE OF NAILS,PAC,0,37,2,HAMMER,HAM,0,37,2,LIT LAMP,LA
M,0,41,2,BROWN BOX,BRO,0,43,0,SCISSORS,SCI,2,43,0,ENVELOPE,ENV,0,4
4,0
1440 DATA CATALOG,CAT,0,38,2,RED BOX,RED,0,51,0,GLASS JAR,JAR,0,51,
0,RUBBER DUCK,DUK,2,51,3,AIR PUMP,PUM,0,78,0,OLD COIN,COI,0,56,0,M
ESSAGE,MES,0,57,0,WIRE,WIR,2,58,0
1450 DATA CODEBOOK,COD,0,59,0,BLUE HANDKERCHIEF,BLU,2,67,3,PINK HAN
DKERCHIEF,PIN,0,30,2,SHOPPING LIST,LIS,1,2,0,GLASSES,GLA,2,44,3,SH
ARP NAIL,NAI,2,37,2
1460 DATA DOLLAR BILL,DOL,2,19,2,FIFTY DOLLAR BILL,BIL,2,2,0,BAG OF
PEANUTS,PEA,2,39,3,BATTERIES,BAT,2,15,3,INSTANT CAMERA,CAM,2,27,3
,LIGHT BULB,BUL,2,41,3,RECORD,REC,2,22,2,IRON BALL,IRO,2,69,0,MAGI
C PILL,PIL,0,79,0
```

End

Wall Games: Program Listing. Unassembled listing for Noc Out.

```

00100 ; NOC OUT (requires 16K)
00110 ; Version 830701.1 ASM Z80
00120 ; Latest: 840513
00130 ; Copyright 1984 by
00140 ; Andrew J. Shoemaker &
00150 ; Arthur A. Gleckler
00160 ; -----
00170 ORG 7000H
00180 EXEC LD HL,3C00H ;Beginning of program
00190 LD SP,STACK ;Set stack
00200 DI ;Disable interrupts
00210 LD A,15 ;Turn off cursor
00220 CALL 33H ;
00230 XOR A ;Disable 32 character-
00240 OUT (255),A ; per-line mode
00250 LD DE,3C01H ;Clear screen
00260 LD BC,3FFH ;
00270 LD (HL),80H ;
00280 LDIR ;
00290 GAMOVR NOP ;Game over
00300 CALL TITLE ;Display title
00310 KEY> CALL 2BH ;Get key
00320 CF 30H ;Is it numeric?
00330 JF C,KEYS ;No: get another key
00340 CF 3AH ;
00350 JF NC,KEYS ;
00360 SUB 2EH ;Set speed
00370 LD (DELAYN+1),A ;
00380 START NOP ;Game begins
00390 SETUP LD SP,STACK ;Reset stack
00400 LD HL,3C00H ;Clear screen
00410 LD DE,3C01H ;
00420 LD BC,3FFH ;
00430 LD (HL),80H ;
00440 LDIR ;
00450 LD HL,SCRMMSG ;Display initial score
00460 LD DE,3FC1H ; and ball count
00470 LD BC,34H ;
00480 LDIR ;
00490 LD HL,WALMSG ;Display initial wall
00500 LD DE,3FF7H ; number
00510 LD BC,8 ;
00520 LDIR ;
00530 LD HL,3F9CH ;Initialize paddle pos'n
00540 LD (PADDLE),HL ;
00550 LD A,70H ;
00560 LD (PK),A ;
00570 LD A,7EH ;Initialize ball pos'n
00580 LD (BX),A ;
00590 LD A,56H ;
00600 LD (BY),A ;
00610 LD A,-1 ;Initialize ball velocity
00620 LD (XI),A ;
00630 LD A,-1 ;
00640 LD (YI),A ;
00650 NEWALL LD A,8FH ;Display new wall
00660 LD (WALTOP),A ;
00670 LD (WALTOP+1),A ;
00680 LD (WALTOP+2),A ;
00690 LD A,85H ;
00700 LD (WALTOP+3),A ;
00710 LD HL,WALTOP ;
00720 LD DE,WALTOP+4 ;
00730 LD BC,13CH ;
00740 LDIR ;
00750 LD HL,3FFEH ;Increment wall number
00760 LD B,2 ;
00770 CALL ASCADD ;
00780 XOR A ;Reset old ball pos'n

```

```

00790 LD (OX),A ;
00800 LD A,2 ;
00810 LD (OY),A ;
00820 LD A,50H ;Set number of blocks
00830 LD (BLKFLT),A ;
00840 GAME NOP ;Main game loop
00850 LD HL,PDL ;Draw lower paddle
00860 LD DE,(PADDLE) ;
00870 LD BC,0AH ;
00880 LDIR ;
00890 LD HL,(PADDLE) ;Draw upper paddle
00900 LD DE,380H ;
00910 OR A ;
00920 SBC HL,DE ;
00930 EX DE,HL ;
00940 LD HL,PDL ;
00950 LD BC,0AH ;
00960 LDIR ;
00970 LD A,(OX) ;Erase old ball
00980 LD E,A ;
00990 LD A,(OY) ;
01000 LD D,A ;
01010 PUSH DE ;
01020 CALL RESET ;
01030 POP DE ;
01040 INC E ;
01050 CALL RESET ;
01060 LD A,(BX) ;Draw new ball and
01070 SRL A ; test for collision
01080 LD (OX),A ;
01090 LD E,A ;
01100 LD A,(BY) ;
01110 SRL A ;
01120 LD (OY),A ;
01130 LD D,A ;
01140 PUSH DE ;
01150 CALL POINT ;
01160 CALL NZ,HITBLK ;Yes: hit brick or paddle
01170 POP DE ;
01180 PUSH DE ;
01190 INC E ;
01200 CALL POINT ;Test other pixel of ball
01210 CALL NZ,HITBLK ;Yes: hit brick or paddle
01220 POP DE ;
01230 PUSH DE ;
01240 CALL SET ;Draw ball
01250 POP DE ;
01260 INC E ;
01270 CALL SET ;
01280 LD A,(XI) ;Update ball pos'n
01290 LD B,A ;
01300 LD A,(BX) ;
01310 ADD A,B ;
01320 ADD A,B ;
01330 LD (BX),A ;
01340 LD A,(BY) ;
01350 LD B,A ;
01360 LD A,(YI) ;
01370 ADD A,B ;
01380 LD (BY),A ;
01390 TESTS LD A,(BY) ;Test for hitting sides,
01400 CP 58H ; top, or bottom
01410 CALL NC,LOSEBL ;Hit the bottom
01420 LD A,(BY) ;
01430 CP 2 ;
01440 CALL C,LOSEBL ;Hit the top
01450 LD A,(BX) ;
01460 CP 6 ;
01470 JR NC,NOTWRT ;
01480 LD A,(XI) ;Hit right side
01490 BIT 7,A ;

```

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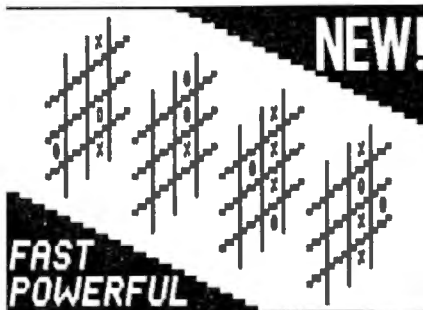
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```

01500 JR Z,NOTWRT ;
01510 NEG ;Bounce against side
01520 LD (XI),A ;
01530 LD A,50 ;Side bounce sound
01540 CALL SOUND ;
01550 NOTWRT LD A,(BK) ;
01560 CP 0F8H ;
01570 JR C,DELAY ;
01580 LD A,(XI) ;Hit left side
01590 BIT 7,A ;
01600 JR NZ,DELAY ;
01610 NEG ;Bounce against side
01620 LD (XI),A ;
01630 LD A,50 ;Side bounce sound
01640 CALL SOUND ;
01650 DELAY LD BC,(DELAYN) ;Get speed
01660 CALL PAUSE ;No: delay
01670 LD A,(BLKLEFT) ;Is wall gone?
01680 OR A ;
01690 JP Z,NEWALL ;Yes: draw new wall
01700 LD A,(3840H) ;Check keys
01710 CP 6 ;Is it BREAK & CLEAR ?
01720 JP Z,GAMOVR ;Yes: game over
01730 CP 20H ;Is it left arrow?
01740 JR Z,LEFT ;Yes: move paddle left
01750 CP 40H ;Is it right arrow?
01760 JR Z,RIGHT ;Yes: move paddle right
01770 LD A,(3801H) ;Is it 'e' ?
01780 CP 1 ;
01790 JR Z,ATKEY ;Yes: pause
01800 JP GAME ;Continue game loop
01810 ATKEY LD A,(3840H) ;Pause until ENTER is
01820 CP 1 ; pressed
01830 JR NZ,ATKEY ;
01840 JP GAME ;
01850 LEFT LD A,(PADDLE) ;Move paddles left
01860 CP 7FH ; unless at left edge
01870 JP Z,GAME ; of screen
01880 LD HL,(PADDLE) ;
01890 DEC HL ;
01900 LD (PADDLE),HL ;
01910 LD A,(PX) ;
01920 SUB 4 ;
01930 LD (PX),A ;
01940 JP GAME ;
01950 RIGHT LD A,(PADDLE) ;Move paddles right
01960 CP 0B7H ; unless at right edge
01970 JP Z,GAME ; of screen
01980 LD HL,(PADDLE) ;
01990 HL ;
02000 LD (PADDLE),HL ;
02010 LD A,(PX) ;
02020 ADD A,4 ;
02030 LD (PX),A ;
02040 JP GAME ;
02050 SET CALL SCALC ;Turn pixel on
02060 OR (HL) ;
02070 LD (HL),A ;
02080 RET ;
02090 RESET CALL BCALC ;Turn pixel off
02100 XOR 255 ;
02110 AND (HL) ;
02120 LD (HL),A ;
02130 RET ;
02140 POINT CALL BCALC ;Test if pixel on/off
02150 AND (HL) ;
02160 RET ;
02170 BCALC LD A,D ;Bit and memory
02180 CP 30H ; location calculation
02190 RET NC ; for SET, RESET, POINT
02200 LD A,E ;

```

```

02210 CP B0H ;
02220 RET NC ;
02230 LD A,D ;
02240 LD B,0FFH ;
02250 BCALC1 INC B ;
02260 SUB 3 ;
02270 JP P,BCALC1 ;
02280 ADD A,3 ;
02290 SLA A ;
02300 LD C,A ;
02310 LD L,B ;
02320 LD H,0 ;
02330 LD B,6 ;
02340 BCALC2 ADD HL,HL ;
02350 DJNZ BCALC2 ;
02360 LD D,0 ;
02370 SRL E ;
02380 JR NC,BCALC3 ;
02390 INC C ;
02400 BCALC3 ADD HL,DE ;
02410 LD DE,3C00H ;
02420 ADD HL,DE ;
02430 LD B,C ;
02440 INC B ;
02450 LD A,1 ;
02460 BCALC4 SLA A ;
02470 DJNZ BCALC4 ;
02480 SRL A ;
02490 RET ;
02500 HITBLK LD A,25 ;Brick or paddle bounce
02510 CALL SOUND ; sound
02520 LD A,(BY) ;Ball hit brick or
02530 CP 54H ; paddle
02540 JR NC,HITPDL ;Hit bottom paddle
02550 LD A,(BY) ;
02560 CP 8 ;
02570 JP C,HITUPD ;Hit top paddle
02580 SRL L ;Adjust for precision
02590 SRL L ;
02600 SLA L ;
02610 SLA L ;
02620 LD B,4 ;Erase brick
02630 HITBL1 LD (HL),B0H ;
02640 INC HL ;
02650 DJNZ HITBL1 ;
02660 LD A,(YI) ;Bounce against brick
02670 NEG ;
02680 LD (YI),A ;
02690 LD A,(BLKLEFT) ;Decrement number of
02700 DEC A ; bricks
02710 LD (BLKLEFT),A ;
02720 LD HL,3FCDH ;Increment score
02730 LD B,6 ;
02740 CALL ASCADD ;
02750 RET ;
02760 HITPDL LD A,(PX) ;Ball hit lower paddle
02770 LD B,A ;
02780 LD A,(BK) ;
02790 SUB B ;
02800 SRL A ;Adjust for precision
02810 SRL A ;
02820 SRL A ;
02830 SLA A ;
02840 LD E,A ;
02850 LD D,0 ;
02860 LD HL,BOUNCE ;Look up bounce velocity
02870 ADD HL,DE ; in table according
02880 LD A,(HL) ; to section of paddle
02890 LD (XI),A ; hit
02900 INC HL ;
02910 LD A,(HL) ;
02920 LD (YI),A ;

```

Listing continued



Listing continued

```

02930 RET ;
02940 BOUNCE DEFB -1 ;Bounce velocity table
02950 DEFB -1 ;
02960 DEFB -1 ;
02970 DEFB -2 ;
02980 DEFB 1 ;
02990 DEFB -2 ;
03000 DEFB 1 ;
03010 DEFB -1 ;
03020 DEFB 1 ;
03030 DEFB -1 ;
03040 ASCADD LD C,1 ;ASCII add routine
03050 ASCAD1 LD A,(HL) ;Adds one to ASCII
03060 ADD A,C ; number of length B
03070 LD (HL),A ; ending at location
03080 CP 3AH ; HL on the screen
03090 JR NZ,NOCARY ;Carry not set
03100 LD A,30H ;Reset digit to '0'
03110 LD (HL),A ;
03120 LD C,1 ;Set carry
03130 JR CARRY ;
03140 NOCARY LD C,0 ;Reset carry
03150 CARRY DEC HL ;
03160 DJNZ ASCAD1 ;Do digits
03170 RET ; until finished
03180 LOSEBL LD A,(EX) ;Ball off top or bottom
03190 ADD A,0CH ;Reset ball velocity
03200 LD (BX),A ; and pos'n
03210 LD A,54H ;
03220 LD (BY),A ;
03230 LD A,-1 ;
03240 LD (YI),A ;
03250 LD A,(3FDFH) ;Decrement ball count
03260 DEC A ; on screen
03270 LD (3FDFH),A ;
03280 LD A,(OX) ;Reset old ball pos'n
03290 LD E,A ;
03300 LD A,(OY) ;
03310 LD D,A ;
03320 PUSH DE ;
03330 CALL RESET ;
03340 POP DE ;
03350 INC E ;
03360 CALL RESET ;
03370 LD BC,8000H ;Pause before next ball
03380 CALL PAUSE ;
03390 LD A,(3FDFH) ;
03400 CP 30H ;
03410 JP Z,GAMOV ;
03420 JP GAME ;Resume game
03430 TITLE LD HL,3C00H ;Clear top 15 lines of
03440 LD DE,3C01H ; screen
03450 LD BC,3BFH ;
03460 LD (HL),80H ;
03470 LDIR ;
03480 LD HL,NOCOUT ;Draw title
03490 LD DE,3C4DH ;
03500 LD BC,25H ;
03510 LDIR ;
03520 LD HL,NOC1 ;
03530 LD DE,3C8DH ;
03540 LD BC,23H ;
03550 LDIR ;
03560 LD HL,NOC2 ;
03570 LD DE,3CCDH ;
03580 LD BC,23H ;
03590 LDIR ;
03600 LD HL,COPYM ;Display copyright
03610 LD DE,3D43H ;
03620 CALL MESSAG ;

```

```

03630 LD HL,DIFF ;Display difficulty
03640 LD DE,3DD5H ; question
03650 CALL MESSAG ;
03660 LD HL,DRCTM1 ;Display directions
03670 LD DE,3E5BH ;
03680 CALL MESSAG ;
03690 LD HL,DRCTM2 ;
03700 LD DE,3EC9H ;
03710 CALL MESSAG ;
03720 LD HL,DRCTM3 ;
03730 LD DE,3FL2H ;
03740 CALL MESSAG ;
03750 RET ;
03760 MESSAG LD A,(HL) ;Message display routine
03770 CP 40H ;Is it '@'?
03780 RET Z ;Yes: return
03790 LD (DE),A ;No: display character
03800 INC HL ;
03810 INC DE ;
03820 JR MESSAG ;
03830 PADDLE DEFW 0 ;Paddle pos'n
03840 PDL DEFB 80H ;Paddle characters
03850 DEFB 8CH ;
03860 DEFB 8CH ;
03870 DEFB 8CH ;
03880 DEFB 8CH ;
03890 DEFB 8CH ;
03900 DEFB 8CH ;
03910 DEFB 8CH ;
03920 DEFB 8CH ;
03930 DEFB 80H ;
03940 BX DEFB 0 ;Ball X pos'n
03950 BY DEFB 0 ;Ball Y pos'n
03960 PX DEFB 0 ;X pos'n of paddles
03970 OX DEFB 0 ;Old X pos'n of ball
03980 OY DEFB 0 ;Old Y pos'n of ball
03990 XI DEFB 0 ;Ball X velocity
04000 YI DEFB 0 ;Ball Y velocity
04010 DELAYN DEFW 0 ;Speed
04020 BLKLFT DEFB 0 ;Bricks left
04030 SCRMSG DEFM 'Score: 000000';Score & ball number
04040 DEFM ' ' ;
04050 DEFM 'Balls left: 9' ;
04060 DEFM ' Press "@" ' ;
04070 DEFM 'to pause.' ;
04080 WALTOP EQU 3D40H ;Pos'n of top brick
04090 WALMSG DEFM 'Wall: 00' ;Wall number
04100 PAUSE EQU 60H ;Pause routine
04110 EDTASM EQU 8E9AH ;Assembler return addr.
04120 OVRMSG DEFM 'Game over' ;Game over message
04130 NOCOUT DEFB 0B0H ;NOCOUT title
04140 DEFB 80H ;
04150 DEFB 80H ;
04160 DEFB 80H ;
04170 DEFB 0B0H ;
04180 DEFB 80H ;
04190 DEFB 80H ;
04200 DEFB 0B0H ;
04210 DEFB 0B0H ;
04220 DEFB 0B0H ;
04230 DEFB 80H ;
04240 DEFB 80H ;
04250 DEFB 80H ;
04260 DEFB 0B0H ;
04270 DEFB 0B0H ;
04280 DEFB 0B0H ;
04290 DEFB 80H ;
04300 DEFB 80H ;
04310 DEFB 80H ;
04320 DEFB 80H ;
04330 DEFB 80H ;

```

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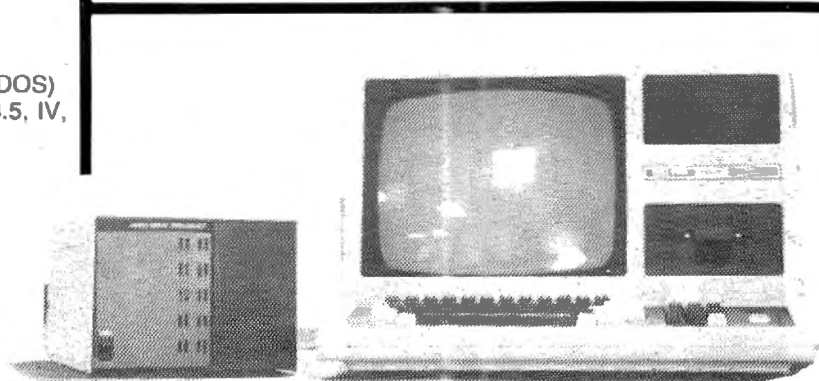
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Sales requires a Model I or III, Basic, and a printer. You can use it with a cassette (16K RAM minimum) or a disk (32K RAM minimum) system.

## How to Use Sales

When you run the program, screen 1 reminds you to put your printer on line; if you don't, the computer hangs up. The program sends data to the printer automatically.

On screen 2, you can decide whether you or the computer will figure the salesmen's commission rate. The latter is useful if the commission rate is a straight percentage of the sales amount. If you figure commissions on a varying formula for different salesmen—using special bonuses, for example—you'll have to supply the numbers yourself.

Screen 3 asks how many salesmen or territories the report will cover. It also prompts you for the time period covered by the reports, and the date you're preparing the report.

The program starts prompting you for data for the individual reports on screen 4. It tells you the number of the report you're working on, and asks you for the number of sales for each salesman or territory.

On screen 5, you enter the name of the salesman or the territory number. You also enter the salesman's commission and sales to date. These figures will usually come from the previous month's report.

Screen 6 describes how you should enter sales data and the date.

You enter sales data in screen 7. The program redisplay this screen once for each sale you specified in screen 4. It tells you which report you're working on, which sale you're entering, and how many reports you have left to enter.

First, enter the date in the format indicated in screen 6. Then enter the customer's name, using up to 45 characters. You can use commas to separate data.

Now enter the purchase order number. You can also use the sales receipt or lease number. You can combine numbers and letters here.

Next, enter the part code or vendor number, using up to five characters. The program won't accept multiple part numbers; if you need them, you'll have to reallocate the Print Using statement in line 1400.

Finally, enter the dollar amount of the sale without a dollar sign. Be certain you're entering the amount of the sale and not a final price with taxes.

If you earlier told the program to calculate a commission, it now displays that figure. I used double-precision math, so you might see a slight delay. If you need to enter the commission yourself, the program prompts you for the number.

The program now asks you if the data you've entered is correct. If you answer no, it takes you back through the prompts. If you hit the enter key, the report goes to the printer.

I print 132 characters across on 9½-inch tractor-feed fanfold paper. The printer will not automatically form-feed to the top of the next page. Make sure the printer is in condensed mode.

When you're done printing, hit any key to go to the start of the next report.

When the program finishes with all of the reports, it produces a bar graph of the total period sales for all salesmen. The graph is set for sales in the thousands, one character for each \$1,000 in sales.

Sales is a simple program for small businesses. If your needs are greater, you might want to expand it to include a save routine or more complex math functions. ■

## The Key Box



Models I and III  
16K RAM Cassette Basic  
32K RAM Disk Basic  
Printer

You can reach Glen E. Sparks at 6186 Custer, S. Rockwood, MI 48179.

SALESMAN'S COMMISSION BOOK  
DATE OF REPORT

PERIOD COVERED: APR 1984

TERRITORY/SALESMAN: DAVE GOODMAN

PREVIOUS COMM (YTD) BAL--- \$9,500.00  
PREVIOUS SALES (YTD) BAL--- \$95,000.00

STRAIGHT COMMISSION RATE OF .1 PERCENT

DATE	CUSTOMER NAME	PO#	PC	SALE AMT	COMM AMT	YTD COMM
02APR84	PARKER IND,LTD	PIL 435	88	6,245.77	624.58	10,124.58
10APR84	WILSON CORP,IND	344598	65	9,888.45	988.85	11,113.42
GRAND TOTALS				16,134.22	1,613.42	
NEW BALANCE SALES (YTD)				\$111,134.22		

SALESMAN'S COMMISSION BOOK  
DATE OF REPORT

PERIOD COVERED: APR 1984

TERRITORY/SALESMAN: TERR 0, SMITH,MI

PREVIOUS COMM (YTD) BAL--- \$2,454.77  
PREVIOUS SALES (YTD) BAL--- \$24,547.88

STRAIGHT COMMISSION RATE OF .1 PERCENT

DATE	CUSTOMER NAME	PO#	PC	SALE AMT	COMM AMT	YTD COMM
05APR84	JACK'S KITCHEN SUPPLIES	876 877	75	2,451.55	245.16	2,699.93
13APR84	DOGS TO GO	234	66	1,658.11	165.81	2,865.74
21APR84	BOB'S HIDEAWAY	456	12	854.11	85.41	2,951.15
GRAND TOTALS				4,963.77	496.38	
NEW BALANCE SALES (YTD)				\$29,511.65		

SALESMAN'S COMMISSION BOOK  
DATE OF REPORT

PERIOD COVERED: APR 1984

TERRITORY/SALESMAN: J.Q. WITHERSPOON

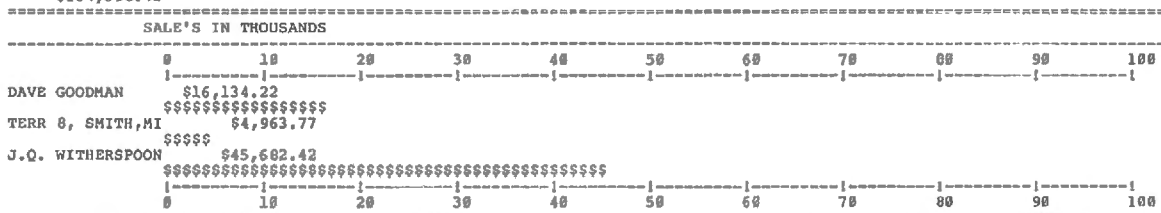
PREVIOUS COMM (YTD) BAL--- \$45,050.55  
PREVIOUS SALES (YTD) BAL--- \$45,050.55

STRAIGHT COMMISSION RATE OF .1 PERCENT

DATE	CUSTOMER NAME	PO#	PC	SALE AMT	COMM AMT	YTD COMM
12APR84	BIG MOTORS INC	BMI 23445 A87	456	23,147.88	2,314.79	47,320.34
18APR84	BIGGER MOTORS INC	876 DD98 EE	87	12,658.77	1,265.88	48,586.22
24APR84	WORLD MOTORS INC	WMI 87 DET 8765	87	9,875.77	987.58	49,573.79
GRAND TOTALS				45,682.42	4,568.24	
NEW BALANCE SALES (YTD)				\$90,732.97		

SALESMEN/TERRITORIES SALES BAR GRAPH  
DATE OF REPORT

SALESMEN'S PREVIOUS YEAR TO DATE SALES  
\$164,598.43



TOTAL SALES THIS PERIOD  
\$66,780.41

NEW TOTAL SALES YEAR TO DATE  
\$231,378.84

Figure. Sample reports.

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- #9005 Divvy Up-Dividing Words into Syllables

### Vocabulary Skills Series (ages 10 to adult)

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- #9007 Shadow Boxing-Homographs and Homos
- #9008 Alike or Not?-Homographs/Homophones
- #9009 Magic Clues-Context to Determine Meaning
- #9010 Word Track-Selecting the Precise Meaning

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## Program Listing. Sales.

```

100 REM ---Sales-----
110 REM Model III with line printer capable of 132 character mode
120 REM Approx 15K needed to run program
130 REM *****
140 REM ** GLEN E SPARKS **
150 REM** 6186 CUSTER
160 REM** S. ROCKWOOD, MI, 48179
170 CLS
180 REM*****
190 REM *** USER DOCUMENTATION ON SCREEN ***
200 REM*****
210 PRINT"THIS IS A SALESMAN'S COMMISSION AND SALES TOTALS REPORT"
220 PRINT"YOU WILL BE PROMPTED BY THE PROGRAM FOR EACH PART OF THE
REPORT"
230 PRINT:PRINT
240 PRINT"!!! MAKE CERTAIN PRINTER IS ON LINE !!!"
250 PRINT"!!IREPORT GOES TO PRINTER AUTOMATICALLY!!!"
260 PRINT"!!! PLEASE DO SO NOW !!!"
270 PRINT:PRINT
280 PRINT"<<<< HIT ANY KEY TO START >>>>"
290 IFINKEY$=" "THEN290
300 REM*****
310 REM ** MAIN BODY OF PROG **
320 REM*****
330 LPRINTCHR$(27);CHR$(20)'SET PRINTER TO CONDENSED MODE-THIS IS
CODED FOR LPVII AND DMP400
340 CLEAR2500
350 DEFDBL C,D,E,F,W-Z
360 REM----DIM STATEMENTS SET FOR 15 REPORTS,50 SALES EACH-
370 DIMA$(50):DIMB$(50):DIMC$(50):DIMD$(50):DIME(50):DIMF(50):DIMY
(50):DIMW(50):DIMYTD(50):DIMW1(15):DIMW2(15):DIMX(15)
380 CLS
390 PRINT"THIS REPORT WILL FACTOR THE SALESMAN'S COMMISSION AMOUNT
IF YOU WANT IT TO."
400 PRINT"OTHERWISE IT WILL ALLOW YOU TO INPUT THE SALEMAN'S COMMI
SSION AMOUNT YOURSELF."
410 PRINT:PRINT"IT WILL FIGURE THE COMMISSION ON A STRAIGHT PERCENT
TAGE OF SALES."
420 PRINT:LINEINPUT"DO YOU WANT IT TO FIGURE THE SALES COMMISSION
FOR YOU? (TYPE YES OR NO) " :CH$
430 IFCH$="N"THEN500
440 IFCH$="NO"THEN500
450 IFCH$=" "THEN500
460 PRINT:PRINT"ENTER THE PERCENTAGE OF SALES AMOUNT THE SALESMAN'
S COMMISSION IS TO BE FACTORED ON."
470 PRINT"(ENTER THIS NUMBER AS A DECIMAL: EX;.05 INSTEAD OF 5%, 0
R .1 INSTEAD OF 10%)"
480 F3=0
490 INPUT F3
500 CLS
510 PRINT:PRINT
520 INPUT"NUMBER OF SALESMEN/TERRITORIES REPORTS TO BE PRINTED IN
THIS BATCH";N1
530 PRINT
540 PRINT"ENTER DATES HERE AS YOU NORMALLY WOULD ON ANY REPORT."
550 PRINT"EX: JULY 19,1983"
560 PRINT
570 LINEINPUT"PERIOD COVERED BY REPORTS ";MN$
580 LINEINPUT"DATE REPORTS COMPILED ";M$
590 FORIA=1TON1:'MAIN LOOP SET TO NUMBER OF REPORTS
600 CLS:PRINT"STARTING # "IA" INDIVIDUAL REPORT NOW"
610 PRINT:PRINT"YOU WILL ENTER THE REPORT FOR ONE SALESMAN/TERRITO
RY AT A TIME AND IT WILL PRINT OUT BEFORE THE NEXT REPORT"
620 PRINT:PRINT"USE THIS TIME TO SITUATE THE PAPERWORK FOR THE NEX
T REPORT":PRINT
630 PRINT"ENTER THE NUMBER OF INDIVIDUAL SALES INCLUDED"
640 PRINT"IN THE PERIOD COVERED BY THIS # "IA "REPORT":INPUTVR
650 CLS
660 REM*****
670 REM***** START OF INPUT TO REPORT *****
680 REM*****
690 PRINT"THIS INFORMATION PRINTED AT TOP OF THIS REPORT":PRINT
700 LINEINPUT"TERRITORY/SALESMAN ";T$(IA)
710 PRINT"PREVIOUS COMMISSION BALANCE ";:INPUTX(IA)
720 PRINT"PREVIOUS YEAR TO DATE SALES ";:INPUTYTD
730 PRINT:PRINT
740 CLS
750 PRINT"THIS IS WHERE YOU ENTER SALES":PRINT
760 PRINT"BYPASS OK? WITH ENTER KEY IF DATA IS TYPED CORRECTLY"
770 PRINT"TYPE NO IF THERE IS A TYPING ERROR THAT YOU HAVE "
780 PRINT"ENTERED ALREADY AND CANNOT BACKSPACE TO CORRECT"
790 PRINT:PRINT"ENTER DATES HERE AS 03/07/83 OR 03JUL83"
800 PRINT:PRINT"PRINT"<<<<HIT ANY KEY TO BEGIN ENTERING SALES DAT
A>>>>"
810 IFINKEY$=" "THEN810
820 FORI=1TOVR 'SET TO NUMBER OF SALES PER REPORT
830 CLS
840 PRINT

```

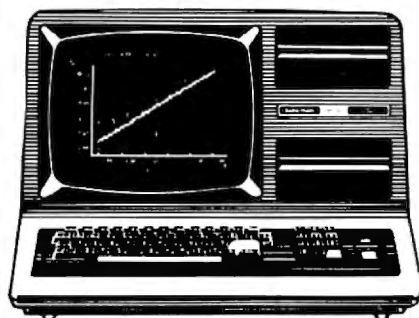
Listing continued



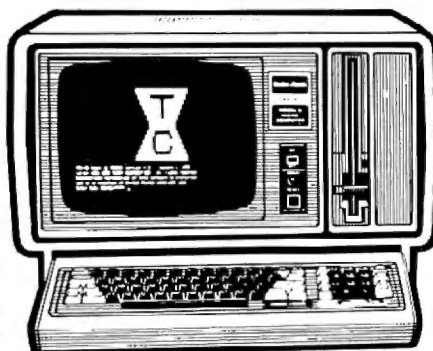
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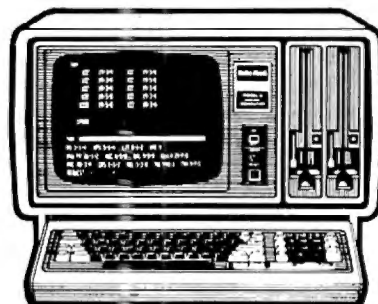
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✓ 232

Listing continued

```
850 PRINT"THIS IS REPORT NUMBER ";IA;PRINT"-";T$(IA)
860 PRINT
870 PRINTTAB(25);VR-I;"SALE(S) LEFT TO ENTER AFTER THIS ONE"
880 PRINT
890 PRINT"SALE # ";I
900 PRINT"DATE OF SALE ";:INPUTA$(I)
910 PRINT"CUSTOMER NAME? ";:LINEINPUTB$(I)
920 PRINT"PO #? ";:LINEINPUTC$(I)
930 LINEINPUT"PART CODE (PC)? ";D$(I)
940 PRINT"SALE AMOUNT ";:INPUTE(I)
950 IF CH$<>"YES"THEN 1010
960 IFCH$<>"YES"THEN1010
970 F(I)=(E(I)*F3)
980 U1$="####.##"
990 PRINT"SALESMAN'S COMM ";USING U1$;F(I)
1000 GOTOL020
1010 PRINT"SALEMAN'S COMM= ";:INPUTF(I)
1020 REM ** THIS IS COMM YTD **
1030 Y(I)=Y(I)+X(IA)
1040 IFI=1THENY(I)=F(I)+Y(I)ELSEY(I)=F(I)+Y(I-1)
1050 REM ** THIS IS A RUNNING TOTAL COMM AND SALES AMT**
1060 Z=F(I)+Z 'COMM AMT TOTAL
1070 W=E(I)+W 'SALE AMT TOTAL
1080 IFOK$="NO"THENPRINT"ANSWER YES IF DATA IS NOW OK":GOTOL100
1090 IFOK$=<>"NO"THENPRINT"IF DATA OK HIT ENTER KEY"
1100 PRINT"OK";:INPUTOK$:IFOK$="NO"THEME(I)=E(I)-E(I-1):F(I)=F(I)-
F(I-1):Y(I)=Y(I-1):I=I-1'STEPS BACK ADDITION OF TOTALS BY AMOUNT O
F LAST ENTRY
1110 NEXTI
1120 PRINT:PRINT"MAKE SURE PRINTER IS READY AND PAPER IS WHERE YOU
WANT IT"
1130 PRINT"HIT ANY KEY TO BEGIN PRINTOUT"
1140 IFINKEY$=" "THEN1140
1150 REM*****
1160 REM *** PRINTOUT OF REPORT ***
1170 REM*****
1180 CLS
1190 PRINT"----- DATA GOING TO PRINTER -----":PRINT:PRINT"DO N
OT WORRY IF PRINTER STOPS FOR A SECOND OR TWO":PRINT"IT IS WORKING
IN DOUBLE PRECISION MODE."
1200 PRINT:PRINT"USE THIS TIME TO ORGANIZE PAPERWORK"
1210 LPRINT STRING$(132,"")
1220 LPRINT"SALESMAN'S COMMISSION BOOK"
1230 LPRINT"DATE OF REPORT ";M$
1240 LPRINT:LPRINTTAB(5)"PERIOD COVERED: ";MN$;TAB(45);"TERRITORY
/SALESMAN: ";T$(IA)
1250 US$=" $$###,###,###.##"
1260 LPRINT:LPRINTTAB(5)"PREVIOUS COMM (YTD) BAL---";
1270 LPRINT USING US$;X(IA)
1280 LPRINTTAB(5)"PREVIOUS SALES (YTD) BAL---";
1290 LPRINT USING US$;YTD
1300 Y6=YTD+Y6' THIS IS SALESMEN'S PREVIOUS YTD SALES
1310 IFF3>0THENLPRINT"STRAIGHT COMMISSION RATE OF ";F3;" PERCENT"
1320 LPRINTSTRING$(132,"-")
1330 LPRINT:LPRINT"DATE";TAB(9);"CUSTOMER NAME";TAB(55);"PO#";TAB(
80);"PC";TAB(89);"SALE AMT";TAB(105);"COMM AMT";TAB(116);"YTD COMM
"
1340 LPRINT STRING$(132,"-")
1350 REM*****
1360 REM LOOP TO PRINT DATA
1370 REM*****
```

```
1380 FORI=1TOVR
1390 REM SPACES USED IN NN$ TO FILLED AREAS ARE 0 %7%,2%40%,2%19%,
3#3#,-REST IS EVIDENT
1400 NN$=" % % % % ###,###.## ###,###.## ###,###.##
% % % % ###,###.## ###,###.## ###,###.##
#"
1410 LPRINT USING NN$;A$(I),B$(I),C$(I),D$(I),E(I),F(I),Y(I)
1420 E(I)=0:F(I)=0 'RESET SALES AND COMM SO THEY WONT STACK
1430 Y(I)=0
1440 NEXTI
1450 REM*****
1460 REM*** TOTALS OF REPORT ***
1470 REM*****
1480 LPRINT STRING$(132,"=")
1490 LPRINT"GRAND TOTALS";
1500 Q$="
###,###,###.## ###,###.##"
1510 LPRINT USING Q$;W,Z
1520 LPRINT"NEW BALANCE SALES (YTD)";
1530 W1=W1+(YTD+W) ' YTD NEW BAL SALES TOTALED FOR ALL REPORTS
1540 LPRINT USING U$;YTD+W
1550 W5(IA)=W5(IA)+W 'THIS IS MONTHLY SALE AMT TOTALS FOR EACH REP
ORT
1560 LPRINTSTRING$(132,"")
1570 PRINT:PRINT
1580 PRINT"WHEN PRINTER STOPS MOVE PAPER FORWARD THE LENGTH YOU WA
NT REPORT TO BE"
1590 PRINT"HIT ANY KEY TO CONTINUE "
1600 IFINKEY$=" "THEN1600
1610 Y(I)=0:W=0:YTD=0:Z=0 'RESET TO ZERO SO THEY WONT STACK
1620 X=0
1630 NEXTIA
1640 REM*****
1650 REM** SALES GRAPH
1660 REM*****
1670 PRINT:PRINT"HIT ANY KEY TO CONTINUE TO SALES BAR GRAPH"
1680 IFINKEY$=" "THEN1680
1690 CLS:PRINT"-----DATA GOING TO PRINTER-----"
1700 PRINT"----SALES GRAPH NOW BEING PRINTED-----"
1710 LPRINTSTRING$(130,"")
1720 LPRINT"SALESMEN/TERRITORIES SALES BAR GRAPH"
1730 Z$=" $$###,###,###.##"
1740 REM *** START OF PRINTOUT ****
1750 LPRINT"DATE OF REPORT ";M$
1760 LPRINT"SALESMEN'S PREVIOUS YEAR TO DATE SALES "
1770 LPRINT USING Z$; Y6
1780 LPRINTSTRING$(120,"=")
1790 LPRINTTAB(14);"SALE'S IN THOUSANDS"
1800 LPRINTSTRING$(120,"-")
1810 REM----00 THRU 100 HEADING---
1820 GOSUB2370
1830 GOSUB2490
1840 REM*****
1850 REM---SALES DATA PRINTOUT---
1860 REM*****
1870 FORI=1TON1
1880 LPRINTT$(I);
1890 LPRINTUSING Z$;W5(I)
1900 REM*****
1910 REM---SETUP AND LPRINT OF GRAPH---
1920 REM - TURN SALES W5(I) INTO STRING
```

Listing continued

Listing continued

```

1930 REM *****
1940 K1$=STR$(W5(I))
1950 REM -FIND VALUE OF K1$ STRING
1960 K4=VAL(K1$)
1970 IFK4>99999.99THEN2030
1980 IFK4<10000THEN2150
1990 K$=LEFT$(K1$,3)
2000 K3=VAL(K$)
2010 K3=K3+1:LPRINTTAB(16);:LPRINTSTR$(K3,"$")
2020 GOTO2200
2030 REM -ROUTING FOR OVER 99999.99
2040 K6$=LEFT$(K1$,2)
2050 K$=MID$(K1$,3,2)
2060 J1=VAL(K6$)
2070 K3=VAL(K$)
2080 FORI1=1TOJ1
2090 LPRINTTAB(16);:LPRINTSTR$(100,"$")
2100 NEXTI1
2110 LPRINTTAB(16);
2120 K3=K3+1
2130 LPRINTSTR$(K3,"$")
2140 GOTO2200
2150 REM -ROUTING FOR UNDER 10000
2160 K$=LEFT$(K1$,2)
2170 K3=VAL(K$)
2180 K3=K3+1
2190 LPRINTTAB(16);:LPRINTSTR$(K3,"$")
2200 D5=D5+W5(I)'TOTAL SALES THIS MONTH
2210 NEXTI
2220 REM ---REPEAT GRAF POINTS AND NUMBERS
2230 GOSUB2490 :GOSUB2370
2240 LPRINTSTR$(120,"=")
2250 REM *****
2260 REM --TOTALS OF SALES MONTH/YEAR TO DATE
2270 LPRINT"TOTAL SALES THIS PERIOD "
2280 LPRINT"TOTAL SALES THIS PERIOD "
2290 LPRINTUSING 2$;D5
2300 LPRINT:LPRINT"NEW TOTAL SALES YEAR TO DATE"
2310 D6=W1
2320 LPRINT USING2$;D6
2330 LPRINTSTR$(120,"=")
2340 PRINT"YOUR REPORT IS IN THE PRINTER"
2350 PRINT"END OF PROGRAM":END
2360 REM-----
2370 REM SUBROUTINE TO PRINT GRAPH NUMBERS 0-100
2380 REM=====
2390 FOR I2=15TO15 STEP 10
2400 LPRINTTAB(12);
2410 READH1
2420 LPRINTH1;
2430 NEXTI2
2440 LPRINT
2450 RESTORE
2460 RETURN
2470 DATA 00,10,20,30,40,50,60,70,80,90,100
2480 REM=====
2490 REM SUBROUTINE TO PRINT DOTS AND EXCLAMATION POINTS
2500 LPRINTTAB(16);
2510 FORI3=1TO10
2520 LPRINT"!";
2530 LPRINTSTR$(9,"-");
2540 NEXTI3
2550 LPRINT"!";
2560 RETURN

```

# Tidbit #10

Here's a Basic utility that lets you list a Basic program (stored in ASCII format) on your printer without printing over the perforations between the pages of fan-fold paper stock. The program lists the file name at the top of the first page, checks printer status, indents line overflow, and offers an optional pause at the end of each page.

It prints 54 lines of listing, then advances the paper to the start of the next page. If the last line on the page is too long to print on one line, it continues on that same page.

This program right-justifies line numbers. If you use an apostrophe as the first character in a comment line, the program prints a blank line before it. You can use this feature to delineate

subroutines or other logical program blocks.

The program reads and prints a file one line at a time. I use the LINEIN-PUT# statement since it recognizes only carriage returns as delimiters and

ignores commas and other punctuation marks. Line 240 checks to see when the program reaches the end of the file.

David A. Williams  
Clearwater, FL

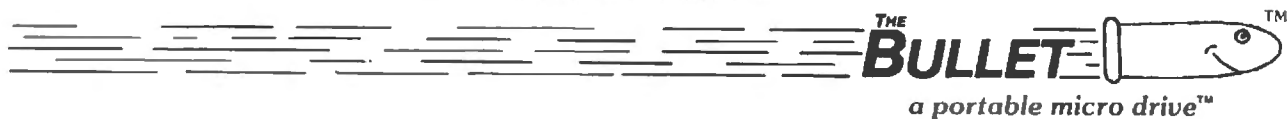
```

10 CLS ' FORMATTING LISTER FOR BASIC ASCII FILES
20 CLEAR 1000
30 IF (PEEK(14312) AND 240) = 48 THEN 50 ' CHECK PRINTER
40 INPUT "PRINTER NOT READY, <ENTER> TO CONTINUE":K$:GOTO 10
50 PRINT @ 140, "FORMATTING LISTER FOR BASIC ASCII FILES"
60 PRINT @ 272, "STOP AFTER EACH PAGE? Y OR N,"
70 I$=INKEY$: IF I$="Y" OR I$="N" THEN 80 ELSE 70
80 PRINT : PRINT
90 INPUT "FILENAME " :B$
100 LPRINT " LISTING FOR BASIC PROGRAM " : CHR$(34); B$; CHR$(34)
110 LPRINT : LPRINT : L=3
120 OPEN "I",1,B$
130 LINE INPUT#1, A$
140 A$ = STRING$(6-INSTR(A$," ")," ") + A$ ' ALIGN LINE NUMBERS
150 IF MID$(A$,7,1) = "" THEN LPRINT : L=L+1 ' BLANK LINE BEFORE CMN
TS
160 LPRINT " "; LEFT$(A$,72) : L=L+1
170 IF LEN(A$) > 72 THEN LPRINT " "; MID$(A$,73,64):L=L+1
INDENT LINE OVERFLOW
180 IF LEN(A$)>136THEN LPRINT " "; MID$(A$,137,64):L=L+1
190 IF LEN(A$)>200THEN LPRINT " "; MID$(A$,201,64):L=L+1
200 IF L>53 THEN LPRINT STRING$(65-L,13):L=0 ELSE 240
210 IF I$="Y" THEN PRINT @657, "<ENTER> TO CONTINUE PRINTING" ELSE 240
220 J$=INKEY$: IF J$=""THEN 220
230 PRINT @657, STRING$(30," ")
240 IF EOP(1) THEN CLOSE ELSE 130
250 END

```

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# Receiving Bytes With Your BBS

Nothing is as critical to the smooth operation of a computer bulletin board as its receiver. Writing the receiver in Basic is out, since a Basic program can't keep up with the speed of data exchange on a BBS. A receiver is the largest machine-code module in the program. We'll consider some of the problems it must handle.

## Transmitting and Receiving

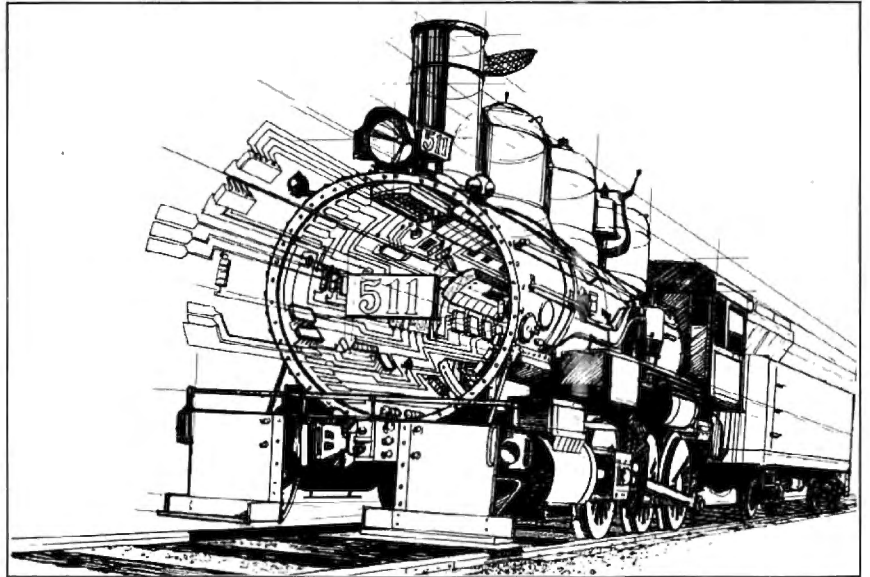
Compared to the task of receiving data, transmitting it from the TRS-80 is a piece of cake. All a transmitter must do is pump out bytes. The receiver must catch them and save them to disk. That takes time.

Periodically, the receiver sends a signal to the transmitter, telling it to stop transmission while it accesses a disk or does some other processing. Exchanging signals like this produces an effect called pipelining. (Pipelining also describes routing in a Xenix system, something unrelated to this article.)

Transmissions are electrical signals, and electricity moves so fast that it seems instantaneous. It's not. Imagine the transmitter as a baseball pitching machine, and the bytes as baseballs. The receiving machine is catching the baseballs, and periodically its receiving bin fills up. It must then signal the transmitter to stop. For this purpose the receiver is equipped with a red baseball.

When the receiver throws the red baseball to the transmitter, the transmitter must immediately stop throwing until the receiver throws a green baseball, or until a predetermined amount of time passes. If the time passes without a green baseball, the transmitter assumes that something is wrong, and terminates the transaction.

If the receiver waits until its bin is full before throwing the red ball, some of the baseballs are lost, because it takes time for the red ball to get to the transmitter and for the transmitter to react.



The transmitter continues to throw baseballs during this time, and baseballs in the air when the receiver throws the red ball are lost because the bin is full.

The receiver must therefore throw the red ball before its bin is full so that the bin can hold the balls in the pipeline.

In a telecommunications setup, the red ball is the XOFF signal, or DC3 (device control 3). You can send it from the keyboard by typing control-S. Its ASCII code is 19.

The green ball is a DC1, or XON. Send it by typing control-Q, or an ASCII 17. CompuServe and The Source subscribers will recognize these as the signals that freeze and unfreeze screen displays.

The BBS's receiver section must constantly monitor its buffer and send an XOFF signal (red ball) before the buffer fills. Immediately on receiving the XOFF, the transmitter stops sending data. When the receiver processes the received data, it sends an XON signal (green ball), and the transmitter picks up from where it left off.

The data in the BBS must be easily accessible to Basic, so Basic must have

access to the receiver buffer. A buffer is a contiguous area of memory where the program stores data, and it's the same as a Basic string. Our receiver stores characters received directly in a Basic string.

To use that string, Basic has to find the characters. A Basic program does so with the VARPTR command. VARPTR returns the address of a desired variable. In the case of a string, VARPTR returns the addresses of 3 bytes that define the string.

Basic can then pass this address to a USR call so the receiver can insert the received characters directly into the Basic string. The following is an example of how this works.

To see what VARPTR returns in the case of a string, see Program Listing 1. Line 10 defines Z\$ as a string literal. Line 20 sets V equal to VAR-

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*Program Listing 1. Demonstration program using the VARPTR command.*

```

1 REM          LISTING 1
2 REM          STRINGS AND BUFFERS
10 CLS: DEFINT A-Y: Z$="RECEIVER BUPFER"
20 V = VARPTR(Z$): B = PEEK(V)
30 PRINT"STRING LENGTH IS";B
40 HL = PEEK(V+1) + PEEK(V+2)*256
50 FOR I = 0 TO B-1: PRINT CHR$(PEEK(HL+I));:NEXT
60 ZI$="BUFFER FILLED "
70 FOR I = 0 TO B-1: POKE HL+I, ASC(MID$(ZI$,I+1,1)):NEXT:
PRINT
80 LIST
    
```

End

*Program Listing 2. The BBS Express receiver module.*

```

00100 ;          TITLE <TOWNE CRIER MODULE>
00110 ;          RECEIVER SECTION 3/23/84
00120 ;          RECEIVES CHARACTERS FROM THE RS232 LINK
00130 ;          OR THE KEYBOARD, AND STORES THEM
00140 ;          SEQUENTIALLY IN I$ UNTIL THE LENGTH OF I$
00150 ;          IS MET, OR A CARRIAGE RETURN IS ENTERED.
00160 ;          RECOGNIZES BACKSPACE, AND RETURNS ERROR CONDITION
00170 ;          ON LOSS OF USER CARRIER.
00180 ;
00190 ;
401D 00200 VBLK EQU 401DH ;VIDEO DCB
4015 00210 KBLK EQU 4015H ;KB DCB
00EB 00220 UDATA EQU 0EBH ;UART DATA PORT
00EA 00230 USTAT EQU 0EAH ;UART STATUS REGISTER
00EB 00240 MSTAT EQU 0EBH ;MODEM STATUS PORT
0033 00250 PRINT EQU 33H ;ROM PRINT ROUTINE
002B 00260 KEYBRD EQU 2BH ;ROM KEYBOARD SCAN
0A9A 00270 BASIC EQU 0A9AH ;PASS TO BASIC
402D 00280 TODOS EQU 402DH ;JUMP TO DOS
0001 00290 TRSDOS EQU 1 ;SET TO 0 FOR LDOS
00300 ;
00310 ;
FE00 00320 ORG 0FE00H
FE00 CD61FE 00330 RECV CALL PARAM ;GET STRING VALUES
FE03 06F5 00340 MN LD B,245
FE05 0E00 00350 LD C,0 ;ACCUMULATOR
FE07 3E11 00360 LD A,11H ;CONTROL-Q
FE09 CD3300 00370 CALL PRINT ;SEND IT
FE0C DHE8 00380 MAIN IN A,(MSTAT) ;CHECK MODEM STATUS
FE0E E620 00390 AND ;CHECK CARRIER DETECT
FE10 2049 00400 TN JR NZ,NOTONE ;LOST THE TONE
FE12 CD2B00 00410 CALL KEYBRD ;CHECK EVERYTHING ELSE
FE15 B7 00420 OR A
FE16 20F4 00430 JR Z,MAIN ;NOTHING
FE18 FE08 00440 CP 0 ;BKSPCE?
FE1A 2010 00450 JR NZ,NOTBKS ;NO
FE1C 79 00460 LD A,C
FE1D B7 00470 OR A ;AT FIRST CHAR?
FE1E 28BC 00480 JR Z,MAIN ;YES - IGNORE
FE20 04 00490 INC B
FE21 04 00500 INC B ;FOR THE DECREMENT
FE22 0D 00510 DEC C
FE23 0D 00520 DEC C ;FOR THE INCREMENT
FE24 2B 00530 DEC HL
FE25 3620 00540 LD (HL),20H
FE27 2B 00550 DEC HL
FE28 3E08 00560 LD A,8
FE2A 1801 00570 JR NP ;PERFORM BKSPCE
FE2C 77 00580 NOTBKS LD (HL),A ;STORE CHARACTER
FE2D CD3300 00590 NP CALL PRINT ;PRINT IT
FE30 23 00600 INC HL ;FOR NEXT CHARACTER
FE31 0C 00610 INC C
FE32 FE0D 00620 CP 0DH ;TERMINATOR ENTERED?
FE34 2802 00630 JR Z,EXIT ;TERMINATOR FOUND
FE36 10D4 00640 NOT010 DJNZ MAIN ;LOOP TIL DONE
FE38 3E13 00650 EXIT LD A,13H ;CONTROL-S
FE3A CD3300 00660 CALL PRINT ;SEND IT
FE3D 06FF 00670 LD B,255 ;DELAY
FE3F 1E0A 00680 LD E,10 ;MAX # OF CHAR.
FE41 DBE8 00690 EXI010 IN A,(MSTAT) ;CHECK MODEM STATUS
FE43 E620 00700 AND ;CARRIER DETECT
FE45 2014 00710 TT JR NZ,NOTONE ;LOST CARRIER
FE47 CD2B00 00720 CALL KEYBRD ;CHECK FOR INCOMING
FE4A B7 00730 OR A
FE4B 2806 00740 JR Z,EXI030 ;NONE - EXIT
FE4D 0C 00750 INC C ;COUNT CHARACTER
FE4E 77 00760 LD (HL),A ;STORE IT
FE4F 23 00780 INC HL ;BUMP POINTER
FE50 1D 00790 DEC E ;DECREMENT CHAR. COUNT
FE51 2802 00800 JR Z,EXI020 ;MAX # RECEIVED
FE53 10EC 00810 EXI030 DJNZ EXI010 ;DECREMENT TIMER
FE55 69 00820 EXI020 LD L,C
FE56 2600 00830 LD H,0 ;TO PASS TO BASIC
FE58 C39A0A 00840 JP BASIC
FE5B 21FFFF 00850 NOTONE LD HL,-1
FE5E C39A0A 00860 JP BASIC ;PASS ERROR TO BASIC
    
```

*Listing 2 continued*

PTR(Z\$). PEEKing in location V provides the length of the string, which the program set to B. Line 30 prints it. That tells how long the string is, but we still don't know what the string contains.

PEEKing around the VARPTR of a string won't divulge what's in it, but it does indicate the string location in the next 2 bytes. The following 2 bytes contain the actual address of the start of the string in Z80 least-significant byte/most-significant byte (LSB/MSB) format.

Line 40 sets HL equal to the address of the start of the string. It PEEKs HL for the first character in the string. Line 50 runs a For...Next loop from zero to N-1 and prints the ASCII representation of the contents of successive memory locations, starting at HL, demonstrating that it has found the string.

Run that same For...Next loop using PEEK instead of PEEK, and the program changes the string. Line 70 POKES the ASCII code of each letter from ZI\$ into the same memory addresses PEEKed in line 50.

List the program, and you can see that we've actually changed the definition of Z\$ in line 10 from receiver buffer to buffer filled. That's the same idea we use for the receiver, only in machine code.

Next month, when we get to the Basic code, we'll demonstrate how to pass a value from Basic to a machine-code subroutine. For now, we look at what happens from the Z80 perspective (see Program Listing 2).

Basic passes the VARPTR of the buffer string (I\$ in the Basic program, which Basic defines as 255 blank spaces, the maximum length of a Basic string) to the machine-code receiver, RECV.

In line 330, RECV calls subroutine PARAM. At line 1660, PARAM calls 0A7F hexadecimal (hex), a documented ROM call that picks up the value passed by Basic (in this case, VARPTR(I\$)), converts it to an integer, if necessary, and places it in the HL register pair. When the program returns from 0A7F hex, HL contains VARPTR(I\$), the address of the definition bytes in the buffer string.

PUSH HL, POP IX transfers VARPTR(I\$) to the IX register for doing indexed loading. The IX register is one of two indexed (or pointer) reg-



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*Listing 2 continued*

```

FE61 CD7F0A 01660 PARAM CALL 0A7PH ;GET VARPTR(STRING)
FE64 E5 01670 PUSH HL ;TO IX
FE65 DDE1 01680 POP IX ;LENGTH TO B
FE67 DD4600 01690 LD B,(IX+0)
FE6A DD6E01 01700 LD L,(IX+1)
FE6D DD6601 01710 LD H,(IX+1) ;ADDRESS TO HL
FE70 C9 01720 RET ;DONE
0000 01730 END
00000 Total Errors
    
```

*End*

*Sooner or later,  
somebody will call your  
BBS and the connection  
will break before the  
caller signs off.*

isters on the Z80 chip. Loading an address into the IX register is like placing a book mark. You can manipulate other memory addresses from the book mark by adding or subtracting a number, called an offset, from the position of the book mark. It's easier to understand by looking at lines 1690-1710.

Assume that VARPTR(I\$) equals E000 hex, so that IX contains E000 hex in line 1680. Line 1690 loads the B register with the contents of memory address E000 hex+0, or E000 hex. This is the same as PEEKing in VARPTR(I\$) and loading the B register with the length of I\$, as we did in line 20 of Listing 1. Remember that the LD instruction doesn't load B with E000 hex, but with the contents of the address pointed to by the IX register plus the offset, zero in this case.

You also need the start address of the string. As in line 40 with the Basic variable HL, load the HL register pair with this address, again using indexed addressing. Line 1700 loads the L register with the contents of E000 hex+1, or E001 hex, the LSB of the string's starting address.

After the LD L,(IX+1) command, the IX register still contains E000 hex, but the L register contains the contents of memory address E001 hex. LD H,(IX+2) loads the MSB of the string's starting address into the H register from the contents of memory address E000 hex+2, or E002 hex. HL now has the address of the first character in I\$, and B has a length of I\$. PARAM is finished, so the program returns.

After it calls PARAM, line 340 puts a 245 in the B register, destroying the value picked up from VARPTR(I\$). We do this because other routines call PARAM to get the length of the string, which can be different from 255. At RECV, the string is always 255 characters, so the value returned in B isn't needed.

If the string is 255 characters long, why set B to 245? In a word, pipelining. We want to send an XOFF while there's still space in the buffer to catch the characters in the pipeline.

We have allowed for a 10-character overflow. When the program receives 245 characters, it sends an XOFF, then monitors transmissions until they stop, saving the overflow characters in the last 10 spaces of the buffer.

When the program returns to Basic, it needs to know how many characters it received. We use the C register as an accumulator to count the characters. Line 350 sets the C register to zero. Line 360 loads an XON into the A register by setting it to 11 hex, or 17 decimal (the green baseball in our earlier example). A Print command sends an XON signal to the transmitter through the link between the video and the communications line. This is the start signal.

RECV has one other task. Sooner or later, somebody will call your BBS and the connection will break before the caller signs off. If this happens, the Towne Crier must detect it and bring the board to a normal close for the next caller. That's the purpose of lines 380-400, and the NOTONE section.

The modem status port, port E8 hex, returns the state of the carrier in bit 5. If the caller's modem is sending a carrier tone, bit 5 is a zero. If not, it's a 1. Line 390 masks out all but bit 5 by doing an AND with 32 (00100000 in binary), and line 400 checks for a non-zero condition. If the AND results in a non-zero number, control passes to NOTONE, which loads the HL register with a -1 and passes this back to Basic. Basic tests for a -1 from NOTONE and resets the board.

In some installations, the carrier detect line from the modem does not connect to the computer. That saves wire, but plays havoc with the remote installation. The BBS software must

have access to the carrier detect line from your modem.

Sometimes, you won't want to test for NOTONE. The Sysop will often run the board without a modem connected for file maintenance. Basic can POKE zeros, the Z80 NOP instruction, into locations TN, TN+1, TT, and TT+1 to eliminate the tests for no carrier, and the Sysop can go about his business with the modem off.

RECV's main job is to receive from the keyboard or the communications line. Last month, we linked the keyboard scanning routine to the communications line in such a way that every time the program scanned the keyboard, it scanned the communications line first. In this way, the program can check for data over the communications line or from the keyboard by a single call to the keyboard scanner, KEYBRD, in line 410.

Any character received from the communications line or the keyboard returns in the A register. If no character is available in either place, the A register contains a zero. Line 420 Ors A with itself. If A is zero, the Or sets the zero flag, and line 430 sends control back to Main to try again.

If A does not contain a zero, the Or won't disturb it, but processing falls through to line 440, which checks for the backspace key. If the character is a backspace, and if it is at the first position of the string, the program does nothing (it can't back out of the buffer). Lines 460-480 check for this, and jump back to Main if the program is at the first character in the buffer.

The remaining code in lines 490-570 backs everything up one character, reloads the backspace character into A, and jumps to NP to print it.

If the character isn't a backspace, the program jumps to NOTBKS. The HL register still contains the address of the first character in I\$, so the LD (HL),A instruction loads the character



*We've got two things  
to worry about:  
receiving too many  
characters, and timing.*

received from the A register to the address contained in the HL register.

The first character is in I\$, so the program invokes a Print command to put it on the screen. The screen links to the communications line, so the Call to Print also echoes the character over the communications line for full-duplex transmission.

The program stores the next character in the next consecutive memory location, and increments HL by an INC HL to point to the right address, bumps C by one to count the character, and checks for a carriage return.

A carriage return is the termination character. If the character is not a car-

riage return, the DJNZ in line 640 decrements the B register, tests for non-zero, and jumps back to Main if the program hasn't received 245 characters.

If Towne Crier counts B down to zero, or if it receives a carriage return, control goes to Exit. This is where the program takes care of pipelining. First, we send an XOFF by printing a DC3 or by typing a control-S.

We've got two things to worry about here—receiving too many characters, and timing. The program exits to Basic when it has received the remaining 10 characters, or when time is up. The B register keeps the time out, and the E register keeps the character count. The program loads E with 10, and B with 255, a purely arbitrary value.

The loop from EXI010 to EXI030 works like the main loop, and counts the characters in the C register. It falls through either when it receives 10 characters, or when the B register counts down to zero.

The program transfers the contents of the C register to the L register at EXI020, sets H to zero, and jumps to Basic by a JP 0A9A hex. This jump passes the value of the HL register to Basic, so the Basic program knows how many characters it has received.

Once control returns to Basic, I\$ contains the characters received. If the Basic call is something like CT = USR0(VARPTR(I\$)), the program sets CT to the number of characters received, or to -1 if the connection is broken.

In next month's BBS Express, we start looking at the BBS's Basic code. ■

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# Basic Beginnings: The Value of Variables

**W**hen I started using a computer, I learned to program in Basic. In fact, Basic is one of the first (and sometimes the only) computer language most people learn. But in my early months as a neophyte programmer, I wanted more information on Basic than I could easily find.

That's where this column comes in. I'll present it as a forum on Basic programming; each month, I'll discuss a different aspect of the language. One month I might cover data manipulation, the next month I'll look at graphics generation, then disk input/output, program debugging, and so on. Each month I'll include short sample programs and routines that you can type in and run as you read the column.

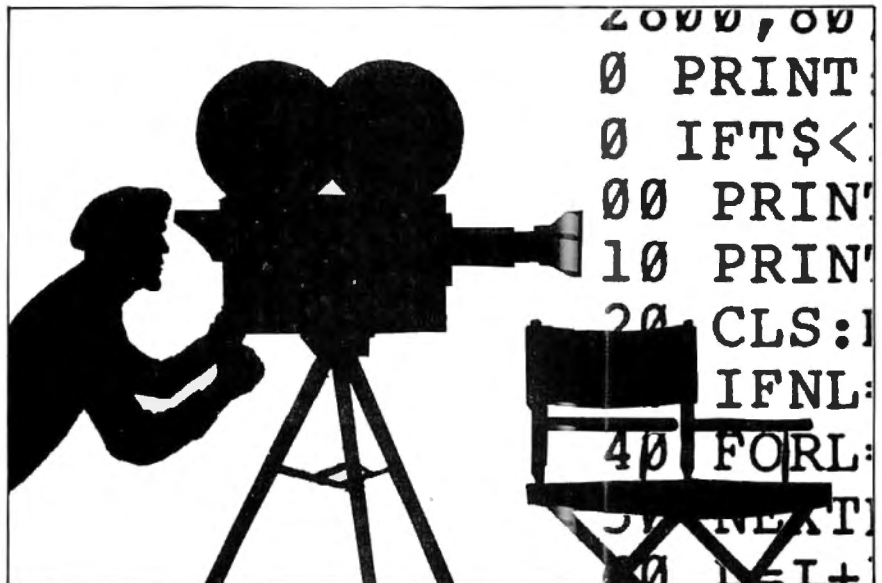
The programs in Basic Takes run on the Models I, III, 4, and 100, and will run on most other machines with minor changes, since the structure of all Basics is similar. All TRS-80s use versions of Microsoft Basic.

## Variables

This month, I'll consider the functions of the Basic variable. Boot up your system and get into Basic. Type in `A=494` and press the enter key. Now type in `PRINT A` and press the enter key again. The computer responds by printing 494. That's the value of variable A.

Now type in `A$="BASIC"` and press the enter key. Type in `PRINT A$` and press the enter key. The variable `A$` now equals the character string "Basic Takes", and this string appears on your display.

The "\$" part of `A$` tells the computer that variable A is an alphanumeric variable, meaning that the variable can contain letters or numbers. Alphanumeric variables are referred



to as string variables. The quotation marks around Basic identify the character string and are not part of the string.

A is a numeric variable. While string variables represent a character or a series of characters, numeric variables represent numbers only and are used in making calculations. Creatively combining the two types of variables is the secret to making your computer communicate.

Type in and run the Essay program in Program Listing 1. This program prints "This is a program", then prints "loop" 494 times. I won't fault anyone who presses the break key before the program ends.

Essay demonstrates the use of numeric and string variables. The numeric variable A contains the number of times the computer should print the `A$` loop. The string B keeps track of how many times the computer has printed `A$`. Here, the numeric values

are used with calculations, while the string value stores the characters you want to print.

## Numeric Variables

A numeric variable is a character or characters that represent(s) a positive or negative number. Basic lets you use the letters A-Z to represent numeric variables (`A=2`, `B=54.6667`, `Q=-22`).

You can also use double letters as numeric variables (`BZ=100`, `UU=12`, `UB=13.5`). But you can't use `IF`, `ON`, `OR`, `FN`, or `TO`, because they're Basic reserved words, or commands.

---

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---

# BASIC TAKES

## Program Listing 1. Essay program.

```
100 REM * LISTING 1 - ESSAY
110 CLS
120 A=494
130 A$="LOOP"
140 PRINT "THIS IS A PROGRAM LOOP, ";
150 FOR B=1 TO A
160 PRINT A$;
170 IF B<494 THEN PRINT ", "; ELSE PRINT "."
180 NEXT B
190 PRINT "THE END"
200 END
```

End

## Program Listing 2. Drive program.

```
100 REM * LISTING 2 - DRIVE
110 CLS
120 PRINT "THIS PROGRAM CALCULATES DRIVING COST."
130 PRINT "TYPE ANSWER TO EACH QUESTION AND PRESS ENTER."
140 PRINT
150 INPUT "HOW MANY GALLONS DID FILL-UP TAKE";GALS
160 INPUT "HOW MANY MILES DRIVEN SINCE LAST FILL-UP";MILES
170 INPUT "PRICE PER GALLON";PRICE
180 MPG=MILES/GALS
190 CST=GALS*PRICE
200 PERMILE=CST/MILES
210 CLS
250 PRINT "COST OF FILL-UP WAS $"CST
270 PRINT "YOU AVERAGED "MPG"MILES PER GALLON SINCE LAST FILL-UP"
"
280 PRINT "THE COST PER MILE WAS"PERMILE"CENTS."
290 END
```

End

## Program Listing 3. Round program.

```
100 REM * LISTING 3 - ROUND
110 CLS
120 INPUT "CATEGORY TOTAL";T
130 T%=T
140 CENTS=T-T%
150 IF CENTS<.50 THEN T=T% ELSE T=T%+1
160 PRINT "TOTAL IS" T
170 END
```

End

## Program Listing 4. Tempus program.

```
100 REM * LISTING 4 - TEMPUS
110 CLS
120 INPUT "TYPE A NUMBER REPRESENTING SECONDS AND PRESS ENTER";S
EC
130 MIN=SEC/60
140 MIN%=MIN
150 SEC=MIN-MIN%
160 PRINT "THAT'S"MIN%"MINUTES AND "SEC*60"SECONDS."
170 END
```

End

## Program Listing 5. Define program.

```
100 REM * LISTING 5 - DEFINE
110 CLS
120 A=16
130 PRINT "GOSH, I'M A SWEET LITTLE"A
140 DEFSTR A
150 A="WHAT TH-- I'M A STRING NOW"
160 PRINT A
170 END
```

End

## Program Listing 6. Alpha alphabetical ordering program.

```
100 REM * LISTING 6 - ALPHA
110 CLS
120 INPUT "TYPE A WORD AND PRESS ENTER";A$
130 INPUT "TYPE ANOTHER WORD AND PRESS";B$
140 IF A$<B$ THEN C$=A$ ELSE C$=B$
150 PRINT C$ COMES FIRST IN THE ALPHABET."
160 END
```

End

The computer reads these commands as Basic words, and finds them illogically presented as numeric variables. It stops the program and displays the message "?SN ERROR", meaning syntax error.

You can also use letter/number combinations for numeric variables, so long as the variable starts with a letter. The rest of the variable can consist of any number. A1, B0B6, and G92 are legal variables; 1P, 2G, and 11H are not.

The number of available two-character numeric variables totals nearly 1,000: 26 single letters, 672 double letters, and 260 letter/number combinations that range from A0-Z9.

Consider this: PI=3.14159. I used the numeric variable PI to represent the value of pi, the geometric formula for the circumference of a circle divided by its diameter.

Since a variable's value stands for something when you write a program, it's a good idea to use a variable that reminds you of its meaning. This is especially important when you write a program with many variables.

As an example, try typing in and running Program Listing 2, Drive. Drive shows it's possible to use words as numeric variables.

## Variables in Space

When your TRS-80 prints a numeric variable, it automatically inserts a blank space before and after the number. This is handy for combining character strings with numeric values.

It's a common mistake to forget this from time to time when you're trying to get a numeric value to print at a specific spot on the screen or on paper. Type in A=5:PRINT "X"A"X" and press the enter key. Notice the spaces between the X's and the 5.

## Reserved Words

In addition to IF, OR, ON, FN, and TO, you must avoid other Basic reserved words when you use numeric variables longer than two letters.

The computer recognizes only the first two letters in a numeric variable. These are called the significant letters. In the variable LIGHTYEAR, for example, the computer recognizes only LI.

If you set LIPID equal to another value later in the program, you'll

change the value of LI, changing your LIGHTYEAR value.

Programs filled with lengthy variable names require more computer memory to hold the extra characters. While the longer numeric variable is useful to jog your memory, it takes its toll on available memory.

When you use long variable names, be sure not to use any of the other Basic reserved words. On the Models I, III, and 4, there are 131 reserved words (see the Table). Model 100 Basic contains even more.

Look over the list of reserved words in the Table, but don't feel overwhelmed. Using one inadvertently results in a syntax error that you can easily fix. For a beginning programmer, this isn't too much of a problem, since the majority of variables in your programs will probably be single letters.

A reserved Basic word cannot appear anywhere within a variable, even if it's beyond the two significant letters. As an example, ROTOR=67 is illegal because it contains the reserved words TO and OR. RO=6 is acceptable. Other words to avoid include cost, reading, chloroform, and systemic.

### More Numerics

Numeric variables will get you through 97 percent of your programming, but sometimes you need extra

*Programs with lengthy  
variable names require  
more computer memory.*

*While the longer  
numeric variable is  
useful to jog  
your memory,  
it takes its toll  
on computer memory.*

precision. To store a value as an integer, type a percent symbol after the variable.

This is called an integer numeric variable. When you add the percent symbol, Basic uses the lowest whole number for the value given. The integer of 3.5 is 3; the integer of 100.9999 is 100.

Basic also has an Integer command, INT. To try it, type in A=2.5 and press the enter key. Then type in B=INT(A) and press the enter key, and type PRINT B and press the enter key. The computer responds by printing a 2.

You can also do this with an integer numeric value. Type in A=2.5 and hit the enter key, type in A%=A, hit the

enter key, and type in PRINT A,A% and hit the enter key. The numeric integer only works with numbers between -32769 and 32768, however.

The Integer function is essential in some applications. For example, when figuring your taxes, you're allowed to round out to dollar amounts, down from 49 cents and up from 50 cents.

You have a program that adds hundreds of measly amounts. The result is a numeric value that I'll call T for total. The Round routine in Program Listing 3 illustrates rounding the total up and down. Try this program using fractional dollar amounts for input.

Here's another example: Program Listing 4 illustrates how to approach a situation that doesn't adhere to the decimal system—time. The program, Tempus, deals with the problem of converting seconds to minutes and seconds by using an integer numeric variable.

Some totals put into Tempus yield slight rounding errors, but you get the idea. Line 130 makes the minutes worth the seconds divided by 60. Line 140 figures the whole number of minutes.

Line 150 gets the number of seconds by subtracting the integer of minutes from its full total. The result multiplied by 60 gives the remaining seconds.

These examples are a bit fancy, but demonstrate that there are hundreds of occasions when you'll want to round down a number to a whole-number value.

### Single-Precision And Double-Precision

Ending a numeric variable with an exclamation point gives you results accurate up to six significant figures; such a variable is called single-precision. For example, type in A=1.1234567 and press the enter key, then type in A!=1.1234567 and press the enter key. Now type in PRINT A,A% and see the difference.

Double-precision variables end with a number sign (#), and are accurate to 16 significant figures on the Models I, III, and 4 (14 significant figures on the Model 100). Try typing in A=12 24 and pressing the enter key. Then type in B#=12 24 and press the enter key. Next type in PRINT A;B# and press the enter key to see how the results differ.

@	DEFUSR	INP	New	RSET
ABS	DEFSTR	Input	Next	Run
AND	Delete	INSTR	Not	Save
ASC	DIM	INT	On	Set
ATN	Edit	Kill	Open	SGN
Auto	Else	LEFT\$	Or	SIN
CDBL	END	Let	Out	SQR
CINT	EOF	LSET	PEEK	Step
Clear	ERL	LEN	Point	Stop
Clock	ERR	Line	POKE	STRING\$
Close	Error	List	POS	STR\$
CLS	EXP	LLIST	POSN	System
CMD	Field	LPRINT	Print	Tab
CONT	Fix	Load	PUT	TAN
COS	FN	LOC	RANDOM	Then
CSNG	FOR	LOF	Read	TIMES
CVD	FIRMAT	LOG	Rem	TO
CVI	FRE	MEM	Rename	TROFF
CVS	Free	Merge	Reset	TRON
DATA	Get	MID\$	Restore	Using
DEFDBL	GOSUB	MKD\$	Resume	USR
DEFFN	GOTO	MKIS	Return	VAL
DEFINT	IF	MKS\$	RIGHT\$	VARPTR
DEFSNG	INKEY\$	Name	RND	Verify

Table. The 131 Basic reserved words for the Models I, III, and 4.

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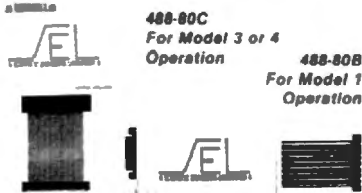
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## MODEL I/III\* BEATS OUT

Model 2000  
Apple Mac  
IBM PC

```
10 * generate prime nu
20 *
30 DEFINT A-Z
40 PRINT TIMES
50 S=7000
60 DIM F(7001)
70 C=0
80 FOR I=1 TO S
90 F(I)=1
100 NEXT I
110 FOR I=0 TO S
120 IF F(I)=0 THEN 200
130 P=I-I*3
140 K=I-P
150 IF K>S THEN 190
160 F(K)=0
170 K=K+P
180 GOTO 150
190 C=C+1
200 NEXT I
210 PRINT C, *pri
220 PRINT TIMES
230 END
```

8  
2000 (58) 5  
Mac (109) 4  
PC (177) 4  
II (183) 3  
4 (183) 1  
16B (191) 1  
Ile (211) 11

Mod III (17)  
Mod I (20)

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I don't use double-precision numbers or numerics very often, but if I were a banker figuring interest on a home mortgage, I'd use them to squeeze out every cent of interest possible.

Even if you don't need them to study stellar gases or the number of grains of sand on a beach, it's nice to know that the computer can be so precise. You never know when you're going to need a number that's 16 digits long.

Of the more than 900 acceptable numeric variables, I use only a few simple ones to run my programs.

### String Variables

As I mentioned earlier, a string variable is a character or group of characters stored in a variable that end(s) with a dollar sign (\$). Think of the dollar sign as standing for string.

A\$="MOM" B\$="23" V4\$="SAMURAI" IL\$="ILLINOIS". Did B\$="23" confuse you for a moment? Any character you can type can be part of a string, even if it's a number. The computer treats it as a character string, however, so you can't use it as a number.

A string variable can contain up to 255 characters, but in a string literal, such as PRINT "YOU CAN'T HAVE MORE THAN 255 CHARACTERS...", the string can't use all 255 characters because the Print command uses five of the available character spaces.

Type in the test line: 310 A\$="XXXXXXXXXXXXX..." and keep typing X's until no more appear. Then press the left-arrow key to erase the last X, end the line with a quotation mark, and press the enter key. Then type in PRINT LEN(A\$) to discover the character length of the string variable. It's always 255 or less.

You can squeeze 255 characters into a variable, but since the average word has 5.5 characters, you can get plenty of information into one string. If you run out of space, you can always assign the rest of the characters to a second string, then print both when needed. To do this, type in PRINT A\$;B\$.

When Basic encounters a string of more than 255 characters, a "?LS ERROR" message appears. You can create strings that are too long by concatenating (adding) two strings whose total length exceeds 255 characters.

*You can squeeze  
255 characters into  
a variable, but since  
the average word  
has 5.5 characters,  
you can get  
plenty of information  
into one string.*

Sometimes it's more convenient to make a character a string variable without using the \$ notation. You can do this by defining the letter as a string using the DEFSTR command.

Try running Define in Program Listing 5. Normally, you would not transform the character used as a numeric variable into a string variable halfway through the program.

It's usually simpler to retain the \$ on string variables as a reminder of what kind of variables they are. However, in a program with many variables, or one that repeats the same string variables many times, it saves computer memory and typing time to define letters as string variables.

Consider Z\$=A\$+B\$+A\$+B\$+A\$+B\$. Using the DEFSTR command, you can shorten this to Z\$=A+B+A+B+A+B. The savings in memory space are significant in even listings of moderate length.

You can define alphabetical groups as strings by typing DEFSTR H-Z, or you can assign specific letters by typing DEFSTR B,K,L,M. Or you can combine these methods: DEFSTR A-C, G,J,L-P.

Many of the rules governing numeric variables also apply to string variables. They cannot contain Basic reserved words, for example.

Also, the same single- and double-letter combinations are available to numeric variables as to string variables. In fact, you can use the same letters in the same program for a numeric variable and a string variable, unless you have defined the letter or letters as strings. The numeric variable BX=34, and the string variable BX\$="I AM UNIQUE", for example, are quite different.

With numeric variables, you can perform all manner of mathematical functions. With strings, you can't. You can, however, do a simple mathematical trick with strings: You can add them together, or concatenate them.

Type in X\$="JOHN" and press the enter key. Type in Y\$="SON" and press the enter key. Then type in

## Take 2

Past issues of *80 Micro* are a repository of useful information on Basic. If you have access to back issues, consider the following:

- Study the short Basic listings in the magazine. Authors who define variables in a group at the top of the program deserve your attention, since they know that such a practice makes the program more efficient.

- Look for examples of word-like mnemonic variables such as AC-TRESS\$="MERYL STREEP" or GALLON = QUART\*4. When studying published programs, choose a variable with a beginning value and trace it through the program to see where, how, and why the variable's value changes and how it affects other values.

- Read John Corbani's "Basic, Faster and Readable—Part IV"

in the December 1983 issue, pp. 174-176. Corbani covers variables and shows ways that they can speed program execution.

- Hardin Brothers' "The Next Step" in the November 1983 issue, pp. 26-34, contains a machine-language program for displaying variables with active values. This program requires an editor/assembler, and is not for beginners, but the topic of Basic variables presages knowledge that you might wish to have as you become more adept at programming.

- Mark Paxton's "Lost in Basic" in the January 1982 issue (pp. 304-306) includes a machine-language listing that you can use to display all Basic program lines containing a variable for which you are searching. It requires an editor/assembler. □

## BASIC TAKES

PRINT X\$,Y\$ and press the enter key to see the result: JOHNSON. Type in PRINT X\$ + Y\$ to get the same result.

Now type in Z\$ = X\$ + Y\$ and print Z\$. This is another way to print Johnson. You can't concatenate strings with a statement such as M\$ = X\$,Y\$, however. It won't add up.

You can add two or more strings, as in D\$ = A\$ + B\$ + C\$, or you can obtain new string variables by adding combinations of string variables and literals. But do X\$ and Y\$ still equal John and Son? Type Z\$ = "I AM THE " + Y\$ + " OF " + X\$ and press the enter key, and print Z\$ to find the answer.

Basic prints numeric variables on the screen separated by blank spaces. This is not the case for string values.

Type A\$ = "SAM":B\$ = "HILL": PRINT A\$;B\$ and hit the enter key. The computer prints SAMHILL. To put a space between the two words, type PRINT A\$ " " B\$ and hit the enter key.

Here is a routine that you see in

*String variables are better because they require a plain-language answer.*

many programs that does the same thing:

```
500 INPUT "WANT TO CONTINUE 1-YES
2-NO":B
510 IF B=2 THEN END ELSE IF B<>1
THEN 500.
520 REM ***AND ON WITH THE
PROGRAM***
```

This is an effective way to get an acceptable answer, but string variables are better because they require a plain-language answer, as in the following routine:

```
500 INPUT "WANT TO CONTINUE—YES
OR NO":B$
510 IF B$="NO" THEN END ELSE IF
B$<>"YES" THEN CLS: PRINT "AHEM,
```

I SAID...":GOTO 500  
520 REM \*\*\*AND ON WITH THE  
PROGRAM\*\*\*

This routine requires a yes or no answer. A yes answer continues the program and a no answer ends the program. Any other answer produces a polite, but persistent, repetition of the question.

### Coming Attractions

Although I spent more time on numeric variables than on string variables this month, in my next column you'll learn a few more tricks using strings.

Until then, try running Alpha in Program Listing 6. This program determines exactly which of two words comes first alphabetically. It's the essence of an alphabetical sort routine—just the start of what you'll be seeing next month. ■

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1. ATN, EXP, COS, SIN, LOG, TAN, and exponentiation. (However, subroutines are included in the manual for these functions.)
2. ERROR, ON ERROR GOTO, ERL, ERR RESUME.
3. No direct commands like AUTO, EDIT, LIST, LLIST ETC, although these commands may be used when writing programs.
4. Others NOT supported: CDBL, CINT, CSNG, DEFFN, FIX, FRE.
5. Normal CASSETTE I/O. (ZBASIC supports it's own SPECIAL CASSETTE I/O statements.)
6. SOME BASIC COMMANDS MAY DIFFER IN ZBASIC. For instance, END jumps to DOS READY, STOP jumps to BASIC READY etc.
7. MEMORY REQUIREMENTS: to approximate the largest BASIC program that can be compiled in your machine (at one time), enter BASIC and type: PRINT [MEM-6500]/2. Remember, you can merge compiled programs together to fill memory.

## ZBASIC 2.2 SPEED COMPARISON DEMO

To help give you an idea how fast compiled programs are, we have included this demo program:

### ZBASIC 2.2 DEMO PROGRAM

Time to compile and run complete program	: 0 MIN. 2 SEC.
BASIC Execution speed MOD I, LEVEL II	: 7 MIN. 34 SEC.
ZBASIC Execution speed MOD I, LEVEL II	: 0 MIN. 18 SEC.
BASIC Program size (WITHOUT VARIABLES)	: 895 BYTES
ZBASIC Program size (WITHOUT VARIABLES)	: 2733 BYTES

(Remember that the ZBASIC program includes an 1879 byte sub-routine package.) Program shown exactly as compiled and run in BASIC and ZBASIC.

```

10 '===== ZBASIC 2.2 EXAMPLE PROGRAM AND TIME TEST=====
20 CLS: CLEAR 100: DEFINT A-X: DEFSTR Z: DIM AA(64, 24), Z(50): RANDOM
30 AA=100: BB=-1000: CC=3: DD=-3: EE=-9999: ST$="START TIME "+TIME#
40 FOR I=1 TO 127 STEP 2: FOR J=47 TO 1 STEP -3: XX=POINT(I, J): SET(I, J)
50 XX=(I-J)/CC*(7+I+J): IX=ABS(INT(RND(I*J)-AA)+7): RESET(I, J)
60 XX=PEEK(I+J): POKE 15360+I+J, J: OUT 255, J AND (3*J): XX=INP(I)
70 AB$=STR$(I+J): BA$=LEFT$(AB$, 2): AA(I/2, J/2)=VAL(BA$)+AA*3
80 BA$=BA$+RIGHT$(BA$, RND(3)): XX=INSTR(1, BA$, "9"): XX=GOR(I*J)
90 BA$=MID$(BA$, 2, 2): MID$(BA$, 1, 1)=Z: IF XX THEN 100 ELSE CLS
100 IF LEN(BA$) > 3 OR SGN(XX)=1 AND ASC(BA$)=32 THEN PRINT "+++"
110 IF POS(0) < 62 THEN TRON: TROFF: PRINT ELSE XX=NOT(RND(99))+100
120 AS=INKEY$: IF AS="Y" OR AS="y" AND I < 120 THEN PRINT "TRUE.."
130 RESTORE: READ A, C, Z (J), D: GOSUB 170: GOSUB 170: GOSUB 170: GOTO 210
140 NEXT J: PRINT "A": NEXT I: CLS: PRINT @512, ST$, "STOP TIME "+TIME#
150 STOP'===== END OF MAIN TEST LOOP =====
160 DATA 12345, -1, "TEST", -9999
170 ON RND(6) GOTO 180, 190, 200, 180, 190, 200
180 RETURN
190 RETURN
200 RETURN
210 ON RND(9) GOSUB 180, 190, 200, 180, 190, 200, 180, 190, 200
220 GOTO 140
    
```

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# Modular Programming Makes Pascal Powerful

**T**his month we'll explore one of Pascal's biggest advantages over Basic: its modular programming structure. Pascal lets you break down complicated programming jobs into simpler, smaller parts of the whole. The computer executes these sub-tasks as modules called subprograms. Pascal has two kinds of subprograms: procedures and functions. A procedure performs a specific task; a function returns a value.

You've been using subprograms all along. The WRITELN statement is a predefined procedure that receives values (arguments) and does something with them (in this case, outputs them). Another predefined Pascal subprogram is the SIN statement, a function that returns the sine of its argument.

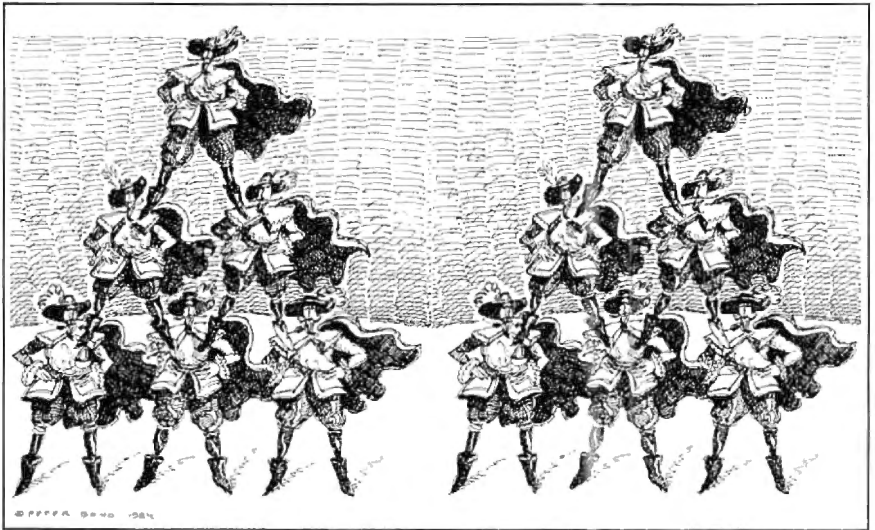
You can also define your own procedures and functions, which means you have unlimited ability to extend the Pascal language.

## Defining Your Own Procedures

Pascal works from the bottom up. You have to define program components before you use them. You've already seen how this works with variables. The VAR key word appears before the Begin key word that starts the program, as shown below:

```
program;
var
  i: integer;
begin
  for i:= 1 to 10 do
    writeln(i);
end.
```

You also have to define subprograms before you use them. They appear in the declaration section of a program, between the VAR statement and the Begin key word. A procedure definition looks just like a program



definition except that it begins with the key word Procedure instead of Program, and the last End statement includes a semicolon instead of a period.

Program Listing 1 does pretty much the same thing as the example above, but it uses a procedure. The text between the key word Procedure and the End key word defines the procedure, named SUB1 in this program. The Begin and End key words define the body of the procedure. The Begin key word following the procedure definition starts the program. Note that we've only defined things; we haven't executed any statements yet.

The program assigns the variable *i* the value of 1, then it invokes the procedure SUB1, which writes out a list of numbers between one and 10. The procedure ends, and the body of the program resumes with the next statement.

The Table shows the output from Listing 1. What's going on? The variable *i* in the procedure has the value 10, but the last WRITELN statement prints it out as 1. We've just encoun-

tered a powerful feature of Pascal's procedures: the local variable.

## Local Variables

Any variable declared within a procedure is local to that procedure, and changing its value has no effect on any variable outside the procedure. In Program Listing 2, the procedure changes the value of the variable *i*, but only within the procedure. The variable *j* isn't declared within the procedure, so the value of *j* changes

1
2
3
4
5
6
7
8
9
10
i=1

Table. Program Listing 1's output.

throughout the program. The output from the program is:

```
i=0 j=0
i=0 j=2
```

When a procedure declares a variable, Pascal stores it separately, even if the main program uses a variable of the same name. If a procedure uses a variable not declared within the procedure, Pascal uses the storage location declared by the VAR section of the main program, changing the global value of this variable. In Listing 2, j is a global variable.

Basic has only global variables, making modular programming difficult; if a subroutine is called within the loop FOR I=1 TO 10, and this subroutine alters the value of I, then the behavior of the loop changes, too. This is called a side effect, and it can be hard to debug. Because Pascal's procedures can have their own unique variables, we can eliminate the problems created by these side effects.

### Passing Parameters

If you're familiar with Basic's DEF FN key word, you're familiar with passing parameters. Passing parameters is a way of getting specific values to a procedure. You do it by listing the names of the parameters with their corresponding types.

For example, Program Listing 3 whites out a section of the display screen between the points (X1, Y1) and (X2, Y2) using the SetPoint procedure we discussed last month. You enter the values for the X and Y coordinates for

*If you're familiar  
with Basic's DEF FN  
key word,  
you're familiar with  
passing parameters.*

the two points in the main program and then pass them to the WhiteOut procedure. You could use them as global variables, but what if the procedure had to receive values from different sources, i one time, j the next? Passing parameters lets you write general-purpose procedures. You can use

```
whiteOut(a,b,c,d);
```

one time to white out part of the screen, and

```
whiteOut(g,h,i,j);
```

another time. The variables in the parameter list of whiteOut (X1, Y1, X2, and Y2) work just like local variables, but they're initialized to the values you pass them.

Procedures are most useful when you can make them general-purpose by passing parameters. That way, they're independent of the outer program.

You can pass virtually any number of parameters to a procedure, and you can use procedures to perform many interesting tasks from different places

in a program. Suppose you want to flash a message on the screen until you hit a key. You can pass the message (type string) and the position on the screen at which you want the message displayed (Program Listing 4).

For now, don't worry about the external declarations in this procedure. They tell the compiler that these procedures and functions are defined elsewhere. (In this case, they're defined in the TRSLIB and STRING libraries that come with Alcor Pascal. You can find descriptions of them in the System section of the manual.) The INKEY procedure has values returned into the variables ch and ready. The Flash procedure prints the message on the screen, pauses, prints some blanks (removing the message from the screen), pauses, prints the message, and so on, until you press a key.

Notice that the Wait procedure is nested within the Flash procedure. The Wait procedure pauses the program, and occurs twice within the Flash procedure.

Program Listing 5 shows a complete program using the Flash procedure. The program uses the Flash procedure initially, then lets you enter a string that will flash on the screen.

You can pass parameters to procedures in two ways, by value or by reference. So far, we've only passed parameters by value. Pascal takes the parameter, whether it's a constant or a variable, makes a copy of it, and assigns it the appropriate variable in the procedure's parameter list. For example, if the first line of a procedure declaration is:

```
procedure Sample(a:integer;b:real);
```

then the procedure invocation:

```
Sample(15,percentile);
```

passes the value 15 to the procedure variable a, and passes the value of the variable percentile into the procedure variable b. The Sample procedure works with copies of the values in the procedure invocation, so altering the values of the variables in the procedure body can't affect the values outside of it. If the Sample procedure contains the statement:

```
b := 14.36;
```

the value of the variable percentile doesn't change.

*Program Listing 1. Illustration of a procedure.*

```
program 1;
var
  i: integer;
procedure sub1;
var
  i: integer;
begin
  for i:= 1 to 10 do
    writeln(i);
end;

begin
  i:= 1;
  sub1;
  writeln('i=' ,i:1);
end.
```

*End*

*Program Listing 2. Illustration of local and global variables.*

```
program 2;
var
  i,j,k: integer;
procedure sub2
var
  i : integer;
begin
  i:= 1;
  j:= 2;
end;
begin
  i:= 0;
  j:= 0;
  writeln('i=' ,i:1, ' j=' , j:1);
  sub2;
  writeln('i=' ,i:1, ' j=' , j:1);
end.
```

*End*

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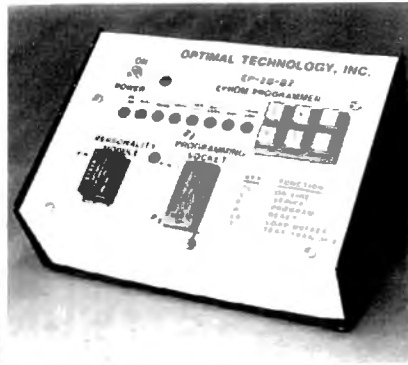
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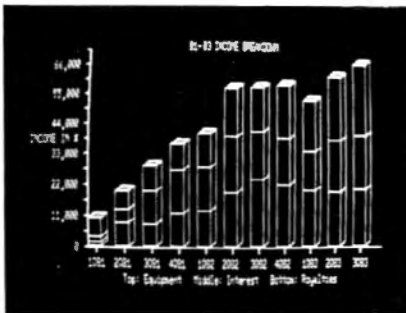
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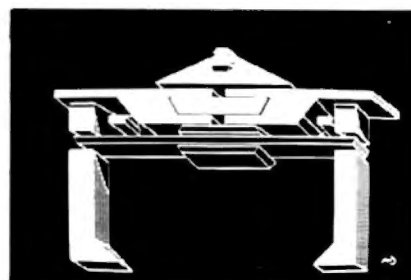
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The other way to pass a parameter is by reference. In this method, the procedure uses the original variable, not a copy. So, if the procedure alters the value of a parameter, then the value of the passed variable changes outside the procedure as well.

We've already seen a procedure that passes parameters by reference, the Read procedure. Remember, the syntax for the Read statement is `Read1(<variable>);` where <variable> is some variable name. Read and READLN are procedures that alter (by getting values from the keyboard or elsewhere) the values of variables. For example, `readln(message)`, where message is a string-type, reads in a string of characters and assigns them to the variable message. If you pass the parameter by value, then altering the value of the variable within the READLN procedure has no effect outside that procedure.

You pass parameters by reference for two major reasons: to change the values of the parameters outside the procedure, or to save space. New vari-

ables require memory, but if you refer to an already existing variable, you use no extra memory. When you start using complex data types, saving memory will become important.

To indicate a parameter passed by value, use the key word VAR before the variable name in the procedure parameter list. The procedure parameter list:

```
Procedure sample1(a:integer; VAR b:real; c:
string);
```

passes the procedure variables a and c by value and passes the variable b by reference.

In Program Listing 6, the program passes the variable answer by reference when it invokes the procedure with `getData(message,r1)`; so the program variable r1 and the procedure variable answer are really the same variable—change one and you change the other. When the procedure invocation uses the program variable r2, the procedure variable answer and the program variable r2 refer to the same variable.

## Functions

Functions are like procedures; the main difference is that functions return a value. You've seen functions before, such as the predeclared function Sqrt, which returns the square root of its argument. The general form of a function declaration is similar to a procedure declaration:

```
function <name> (<parameter list>): <type>;
<declarations>
begin
  <body>
end;
```

But notice the <type> after the parameter list. Because all functions return values, a Pascal program must know what variable type the function returns. You can return any simple type by a function, including Boolean, integer, real, or string. Somewhere in the function body, you must use a statement like:

```
<name> := <value>;
```

where <name> is the name of the function, and <value> is the value the function returns.

*Program Listing 3. Illustration of passed parameters.*

```
program 3;
var
  point1_x,point1_y,point2_x,point2_y : integer;

procedure setPoint(x,y: integer); external;
procedure clearGraphics; external;

procedure whiteOut(x1,y1,x2,y2: integer);
var i,j: integer;
begin
  for j:= x1 to x2 do
    for j:= y1 to y2 do
      setPoint(i,j);
end;
begin
  write('Enter first x coordinate: ');
  readln(point1_x);
  write('Enter first y coordinate: ');
  readln(point1_y);
  write('Enter second x coordinate: ');
  readln(point2_x);
  write('Enter second y coordinate: ');
  readln(point2_y);
  clearGraphics;
  whiteOut(point1_x,point1_y,point2_x,point2_y);
end.
```

End

*Program Listing 4. Flash procedure.*

```
procedure flash(message: string; x,y: integer);
var
  i: integer; c: char; keyPressed: boolean;
  blanks: string;
{ procedures and functions from Alcor library }
procedure inkey var ch: char; var ready: boolean; external;
function len(s: string): integer; external;
function str$(length: integer; ch: char); external;

{ nested procedure declaration }
procedure wait;
var
  i: integer;
begin
  for i:= 1 to 100 do
    begin
      { do nothing }
    end;
end;

begin { procedure flash }
  blanks := str$(len(message), ' ');
  repeat
    gotoXY(x,y); { position the cursor }
    write(message);
    wait;
    gotoXY(x,y);
    write(blanks);
    wait;
    inkey(c,keyPressed);
  until keyPressed;
end; { procedure flash }
```

End

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# PASCALCULATIONS

For example, it's easy to write a function that returns the greater of two values:

```
function greater(a,b: real): real;
begin
  if a>b then greater:=a
  else greater:=b;
end;
```

The Greater function has two parameters, both real-type, and it returns a value of type real as well. The assignment statements `greater:=a;` and `greater:=b;` define the values that the function returns. If `a` is 20 and `b` is 17.3, then the program statement `c:=greater(a,b);` sets the variable `c` to the value of 20 (the greater of the two).

Functions can be more complicated. Program Listing 7 finds the distance between two points. The last assignment statement in the function declaration:

```
distance := SQRT(xSqrDistance + ySqr
Distance);
```

assigns the value the function returns. Programmers familiar with Basic's DEF FN can see that Pascal functions are similar but much more powerful, because they can have many lines, loops, conditional statements, and so on. In Basic, you're stuck with single line functions.

You can use functions to make up for Pascal's lack of exponentiation.

Define a function Power that computes  $a^b$ :

```
function power(base,exponent: real): real;
begin
  if base>0 then power :=exp(exponent*ln
(base))
  else if exponent = 0 then power := 1
  else begin { illegal values for parameters }
    power := 0
    writeln('ERROR IN PARAMETERS');
  end;
end;
```

A program that has this function declared can compute  $a^b$ . For example, the program line

```
write(power(10,3):5);
```

would print out 1000.

In standard Pascal, you pass all of a function's parameters by value. This is a serious limitation. Alcor Pascal lets you pass parameters by reference and by value both to procedures and functions.

## Applications

There are many uses for procedures and functions. In the example below, the function `upperCase` converts a lowercase letter into uppercase:

```
function upperCase(ch: char): char;
var
  ordCh: integer;
begin
  ordCh:=ord(ch);
  upperCase:=ch; { if not lower case, then re-
```

```
turn as is }
  if ordCh >= ord('a') and ordCh <= ord('z')
  then { must be a lower case letter }
    upperCase:=chr(ordCh-32);
end;
```

The `upperCase` function uses a predefined Pascal function, `ORD`. `ORD` returns the ASCII value of a character. For example, `Ord('A')` returns 65. If this value is within the range of the lowercase letters, then the character returned is the ASCII character of that value minus 32.

Now for a more complicated and interesting problem: a program for drawing graphics screens on the display. Many games use the arrow keys to move around on the screen, and we'll follow that convention in our program.

Program Listing 8 tests the `DrawScreen` procedure, the workhorse of the program. `DrawScreen` uses the Alcor Pascal `INKEY` procedure to scan the keyboard for commands to draw or erase lines. To enter the draw mode, press D. To enter the erase mode, press E. The arrow keys move the cursor in the direction indicated by the arrow. The cursor continues in the last direction chosen until you press another key. The T key terminates the procedure (and program). Any other key changes the direction to unknown, making the cursor stop and flash until you press an arrow key.

The program may seem long, but Pascal is a wordy language. That's the

*Program Listing 5. Program using the Flash procedure.*

```
program 5; var s: string; x,y: integer; procedure
flash(message: string; x,y: integer); var i: integer; c: char;
keyPressed: boolean; blanks: string; { procedures and functions
from Alcor library } procedure inkey(var ch: char; var ready:
boolean); external; function len(s: string): integer; external;
function str$(length: integer; ch: char); external;
```

```
{ nested procedure declaration } procedure wait; var
i: integer; begin for i:=1 to 100 do begin
{ do nothing } end; end;
```

```
begin { procedure flash } blanks := str$(len(message), ' ');
repeat gotoXY(x,y); { position the cursor } write(message);
wait; gotoXY(x,y); write(blanks); wait;
inkey(c,keyPressed); until keyPressed; end; { procedure flash }
begin { main program } flash(bldstr('Press any key',25,0));
write('Enter your message: '); readln(s); write('Enter the x and
y coordinates of the message: '); readln(x); readln(y);
flash(s,x,y); end.
```

End

*Program Listing 6. Illustration of passing parameters.*

```
program 6;
var
  message: string; r1,r2: real;

  procedure getData(s: string; VAR answer: real);
  begin
    write(s, ' ');
    readln(answer);
  end;
begin { main program }
  writeln('Enter a prompt message for a real value: ');
  readln(message);
  getData(message,r1);
  writeln('The value you entered was ',r1:10:4);

  writeln('Enter a prompt message for a real value: ');
  readln(message);
  getData(message,r2);
  writeln('The value you entered was ',r2:10:4);
end.
```

End

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price you pay for readability. Conceptually, the program is simple. Each subprogram is self-documenting. The program breaks down the drawing procedure into simpler tasks, such as "Is key pressed?", and "If a key is pressed, then change directions". The program shell that demonstrates DrawScreen could hardly be simpler. You can easily create other modules in this program to draw more sophisticated figures (such as creating a B command for drawing boxes, or a C command for drawing circles), and you can save the drawn screens to a disk file.

Note two differences in this procedure for the Model 4 running in the Model 4 mode. The range of coordinates is slightly greater, so the Clip procedure can extend the permitted values. Also, the INKEY procedure returns an ASCII 91 for the up arrow key on the Model I or III, but it returns an 11 on the Model 4. You have to modify the getDirection procedure to account for the difference.

We haven't yet used the Type key word found in the program. It lets you declare your own (i.e. user-defined) data types. When you declare direction to be a variable of type north-

South, it can take on any of the values left, right, up, down, or unknown. These values have nothing to do with numeric quantities, but in Basic, you'd have to use numbers to perform the same task efficiently. The user-defined type northSouth improves the readability of the program. I'll discuss user-defined types in greater detail in the next column. ■

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NH 03458.*

*Program Listing 7. Illustration of functions.*

```

program 7;
var
  a,b,c,d: integer;
  howFar: real;

  function distance(x1,y1,x2,y2: integer): real;
  var
    xSqrDistance, ySqrDistance: integer;
  begin
    xSqrDistance := SQR(x1 - x2);
    ySqrDistance := SQR(y1 - y2);
    distance := SQRT(xSqrDistance + ySqrDistance);
  end;
begin { main program }
  writeln('Enter x,y for the first point: ');
  readln(a);
  readln(b);
  writeln('Enter x,y values for the second point: ');
  readln(c);
  readln(d);
  howFar := distance(a,b,c,d);
  writeln('The distance is ',howFar:10:4);
end.
```

*End*

*Program Listing 8. Testing the DrawScreen procedure.*

```

program 8;
procedure inkey(var ch: char; var ready: boolean); external;
procedure setPoint(x,y: integer); external;
procedure rsetPoint(x,y: integer); external;
function testPoint(x,y: integer): boolean; external;
procedure clearGraphics; external;

procedure drawScreen;
{ new data types are declared below }
type
  northSouth = (up, down, left, right, unknown);
  commandMode = (draw, erase);
var
  x,y: integer;
  key: char;
  pressed: boolean;
  direction: northSouth;
  mode: commandMode;
```

```

procedure wait;
var i: integer;
begin
  for i := 1 to 200 do
    begin end;
end;

{ limit x,y to legal screen coordinates }
{ change if using Model 4 Alcor Pascal in Model 4 mode
  x range is 0..159
  y range is 0..71 }
procedure clip(var x,y: integer);
begin
  if x > 127 then x := 127
  else if x < 0 then x := 0;
  if y > 47 then y := 47
  else if y < 0 then y := 0;
end;

{ procedure to flash cursor }
procedure flashCursor(x,y: integer);
var
  on : boolean;
begin
  on := testPoint(x,y);
  if on then
    begin
      rsetPoint(x,y);
      wait;
      setPoint(x,y);
    end
  else
    begin
      setPoint(x,y);
      wait;
      rsetPoint(x,y);
    end;
end; { procedure flashCursor }

procedure upDate(var x,y: integer; direction: northSouth);
begin
  case direction of
    left:  x := x - 1;
    right: x := x + 1;
    up:    y := y - 1;
    down:  y := y + 1;
```

*Listing 8 continued*



# PASCALCULATIONS

Listing 8 continued

```

end; { end for case statement }
clip(x,y); { keep it on the screen }
end; { end for upDate procedure }

{ note use of global variables direction and mode below }
procedure getDirection(Key: char);
begin
  case ORD(key) of
    8: direction := left;
    9: direction := right;
    10: direction := down;
    91: direction := up; { use 11 for Model 4 }
  otherwise
    if key = 'E' or key = 'e' then mode := erase
    else if key = 'D' or key = 'd' then mode := draw
    else direction := unknown;
  end; { end for case statement }
end; { getDirection }

procedure setReset(x,y: integer; mode: commandMode);
begin
  if mode = draw then setPoint(x,y)
  else if mode = erase then rsetPoint(x,y);
end;

function done(key: char): boolean;
begin

```

```

if key = 'T' or key = 't' then done := true
else done := false;
end;

begin { procedure body for drawScreen }
clearGraphics; { clear screen }
x := 64; y := 24; { center of screen to start }
mode := draw;
direction := unknown; { no direction home }
setPoint(x,y); { turn on first point }
key := ' ';
pressed := false;
  { main loop }
while not done(key) do
  begin
  if pressed then getDirection(key);
  update(x,y,direction); { move the cursor }
  setReset(x,y,mode); { set or reset point }
  inkey(key, pressed); { get new command }
  flashCursor(x,y);
  end; { end for while }
end; { end for drawScreen procedure }

begin { test program shell }
drawScreen;
writeln('Done!');
end.

```

End

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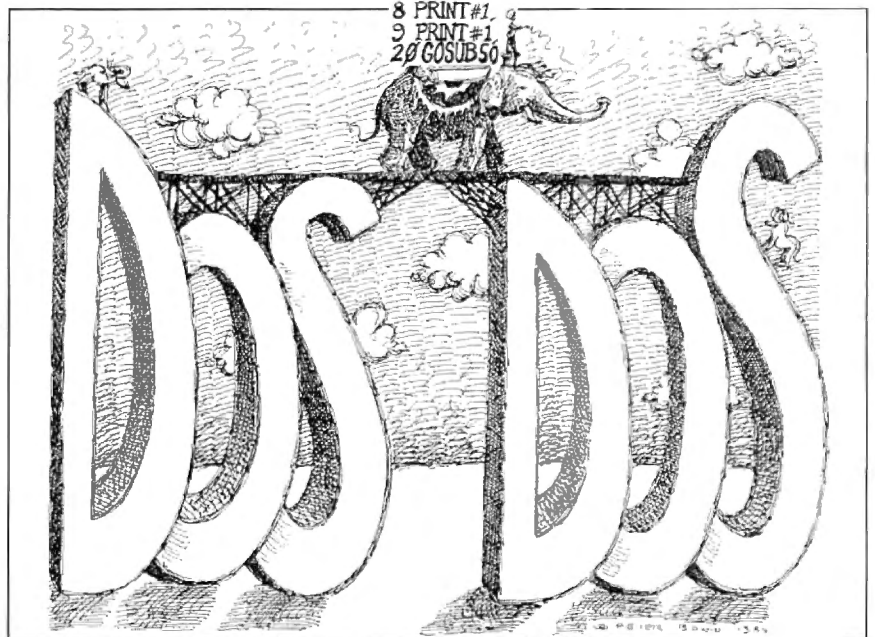
# A Handy Reference To DOS Addresses

**T**RS-80 programmers face a dilemma unknown to most of the Z80 world. We have the option of using several disk operating systems (DOSes), so we often face the frustration of transferring a program from one DOS to another. Most Z80 computers have one standard DOS: CP/M. Programmers using CP/M-based machines never have to worry about transferring programs.

The Models I and III can't use CP/M because of their internal architecture and 64-character by 16-line display. Instead, these machines use the more powerful TRSDOS and "TRS-DOS-compatible" operating systems. This variety of operating systems exists for several reasons, including a host of bugs in the original Model I TRSDOS, outside support of various Model I double-density boards, and the fundamental differences between Model I and Model III TRSDOS disk structures.

The glut of DOSes isn't the problem, however. The dilemma derives from different DOS entry addresses to important routines. For machine-language programmers, knowing the DOS entry points is more important than knowing the addresses of ROM routines. ROM routines can save you the trouble of recoding some standard input/output (I/O) and arithmetic procedures, but the DOS routines are absolutely vital if your programs need to access disk files.

If you're programming for your own use, you need only be concerned about the entry points for your favorite DOS. But if you're writing a program you hope to sell, or if you're trying to transfer a program from one DOS to another, you need to know the DOS differences. For example, if you're using DOSPLUS 3.5, a call to 4470 hexadecimal (hex) returns the current date in ASCII format. With Model III LDOS 5.1.4, however, that same address is the beginning of a routine that calculates the end-of-file record number for a disk file.



But all is not hopeless. The TRSDOS 2.3 (Model I) manual documents eight "fundamental" file-handling entry points, and those are standard in all the popular DOSes. The routines at 402D hex (return to DOS Ready) and 4409 hex (display DOS error message) are also standard. (The two other routines defined in the Model I TRSDOS manual, which get the date and time in ASCII format, are standard in all operating systems except Model III LDOS, TRSDOS, and MULTIDOS.)

If you limit yourself to these fundamental routines, you can be sure that your program will work with any "TRSDOS-compatible" DOS. However, you'll be giving up much of your DOS's power. The other alternatives are to either restrict your program to a single DOS or write a separate version for each DOS you want to support.

To make such decisions easier, I've devised a list of most documented entry points for the latest versions of the most popular Model I/III operating systems: DOSPLUS 3.5, LDOS 5.1.4, MULTIDOS, NEWDOS80 2.0, TRSDOS 2.3, and TRSDOS 1.3 (see the

Table). You can use the chart in several ways. If you're writing software, refer to the chart to find out which routine calls are standard and which are not. If you're trying to alter a program written for one DOS so it works on another, using the table and a disassembly might help you find the critical parts of the program you need to change.

Not all DOS documentation provides equal amounts of information. The TRSDOS 2.3 manual documents only 16 system addresses. The LDOS manual, on the other hand, explains over 100 routine calls and storage addresses. The amount of information about each DOS in the table is in direct proportion to the thoroughness of its documentation.

One word of warning. A few DOS calls work slightly differently on different DOSes. For example, many programs jump to 4030 hex, the abnormal return to DOS, when they encounter an error they can't handle. However, each DOS takes slightly different actions during this routine. NEWDOS80 2.0 drops down one DOS call level and aborts any do-file

## THE NEXT STEP

it's running, LDOS aborts any current job control language (JCL) program, and DOSPLUS enters Debug if it's active when an error occurred. My table doesn't reflect those differences (it would fill the entire magazine if it did), so use some caution.

Please don't write to ask me how to use the table to transport program A to DOS B. The process of transporting incompatible programs from one DOS to another usually involves lots of time, a thorough disassembly, and some good detective work. For some programs, the process is straightforward and easy; others are so depen-

dent on a particular DOS that it's almost impossible to do. Sometimes it's easier and cheaper to buy a new DOS for a particular program than to do the work yourself.

As the list shows, an amazing variety of routines are available to machine-language programmers on a DOS level. If you aren't using them in your program, you're probably making life more difficult for yourself. And if you've been considering buying a new DOS, you may want to use the list as one guide to the features and power available with different systems. ■

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*Table. Here's a list of DOS entry addresses, the DOSes to which they apply, and their definitions.*

**Abbreviations:**

1 = Model I  
 3 = Model III  
 T = TRSDOS (T1 = 2.3; T3 = 1.3)  
 N = NEWDOS80 2.0  
 (Models I and III)  
 L = LDOS 5.1.3 or 5.1.4  
 M = MULTIDOS  
 D = DOSPLUS 3.5  
 (Models I and III)  
 All = All DOSes above  
 All 1 = All Model I DOSes  
 All 3 = All Model III DOSes  
 ml = machine language

0013 hex—All  
 Get byte from file or device

001B hex—All  
 Send byte to file or device

0023 hex—All (documented only in L1 & L3)  
 Send control byte to file or device

3033 hex—T3, L3, M3  
 Get date in ASCII format

3036 hex—T3, L3, M3  
 Get time in ASCII format

400F hex—M1, M3  
 Jump to DEBUG entrance

402D hex—All  
 Normal return to DOS Ready

4030 hex—L1, L3, D1, D3, N1, N3, M1, M3  
 Return to DOS Ready—abnormal program termination

403D hex—L3  
 Add task to interrupt chain

403E hex—D1  
 Holds DOS version in DCB format

4040 hex—L1, M1  
 25ms heartbeat counter

4040 hex—L3  
 Remove task from interrupt chain

4041 hex—L1, D1, M1  
 Time of day in binary format

4043 hex—L3  
 Change address of interrupt task

4044 hex—L1, D1, M1  
 Contains date in binary format

4046 hex—L3  
 Remove task from interrupt chain

4047 hex—L1  
 Current day in coded form

4049 hex—All 1  
 Contains address of highest unused byte of memory

404B hex—L1  
 Contains an image of the interrupt latch

4209 hex—L3  
 Checks drive and mounted disk

4217 hex—All 3  
 Contains time of day in binary format

421A hex—All 3  
 Contains date in binary format

4225 hex—T3, L3, D3  
 DOS command buffer

4288 hex—L3  
 33.33ms heartbeat counter

428A hex—L3  
 Send message to Job Log and CRT

428D hex—T3, D3  
 Find drive and file number for open file

428D hex—L3  
 Send message to Job Log

4290 hex—T3, L3, D3  
 Copy directory to RAM buffer

4293 hex—L3  
 Get file name from directory

4296 hex—L3  
 Same as 402D hex: return to DOS Ready

4299 hex—T3, L3  
 Do a DOS command and return to DOS Ready

429C hex—T3  
 Do a DOS command and return to program

42AD hex—D3  
 Contains address of break key routine

4312 hex—D1  
 Contains address of break key routine

4318 hex—T1, L1, D1  
 DOS command buffer

4396 hex—L1  
 Read directory into memory

4400 hex—L1, D1, D3, N1, N3, M1, M3  
 Same as 402D hex: return to DOS Ready

4402 hex—L3  
 Send text to file or device

4405 hex—L1, D1, D3, N1, N3, M1, M3  
 Do a DOS command and return to DOS Ready

4409 hex—All  
 Display error message on CRT

440D hex—L1, L3, D1, D3, N1, N3, M1, M3  
 Enter Debug

*Table continued*

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## THE NEXT STEP

Table continued

<p>4410 hex—L1, D1, N1, M1 Add task to interrupt chain</p> <p>4411 hex—All 3 Address of highest available memory location</p> <p>4413 hex—L1, D1, N1, N3, M1 Remove task from interrupt chain</p> <p>4413 hex—D3 Add task to interrupt chain</p> <p>4415 hex—T3 (undocumented) Second copy of high memory address. Copied to 4411 hex in case of I/O error during DO processing</p> <p>4416 hex—L1, M1 Change entry address of task in interrupt chain</p> <p>4416 hex—D3 Remove task from interrupt chain</p> <p>4416 hex—N1, N3 Keep drives rotating and reselect the current drive</p> <p>4417 hex—L3 Contains the current day in coded format</p> <p>4419 hex—T3, L3 Write disk directory to screen or buffer</p> <p>4419 hex—L1, M3 Remove task from interrupt chain</p> <p>4419 hex—N1, N3 Execute DOS command and return to calling program</p> <p>441C hex—T3, L1, L3, D1, D3, N1, N3, M1, M3 Move filespec to FCB</p> <p>4420 hex—All Open or create a file</p> <p>4424 hex—All Open existing file</p> <p>4428 hex—All Close a file</p> <p>442C hex—All Remove file from directory</p> <p>4430 hex—All (undocumented in T1) Load file (ml program) into memory</p> <p>4433 hex—All (undocumented in T1) Load and run ml program</p> <p>4436 hex—All Read logical record into memory</p> <p>4439 hex—All Write logical record to disk</p> <p>443C hex—All Write record and verify</p> <p>443F hex—T3, L1, L3, D1, D3, N1, N3, M1, M3 Point to first record in file</p>	<p>4442 hex—All Position file to specific record</p> <p>4445 hex—T3, L1, L3, D1, D3, N1, N3, M1, M3 Backspace file one record</p> <p>4448 hex—T3, L1, L3, D1, D3, N1, N3, M1, M3 Position to end of file</p> <p>444B hex—T3, L3, D3, M3 Add extension to filespec in FCB</p> <p>444B hex—L1 Check for end of file</p> <p>444B hex—D1 Multiply 16-bit by 8-bit integer</p> <p>444B hex—N1, N3 Allocate disk space to file</p> <p>444E hex—T3, L3, D3 Multiply 16-bit by 8-bit integer</p> <p>444E hex—L1 Update directory with current record as end-of-file</p> <p>444E hex—D1 Divide 16-bit by 8-bit integer</p> <p>444E hex—N1, N3 Position file to specified byte record</p> <p>4451 hex—T3, L3, D3 Divide 16-bit by 8-bit integer</p> <p>4451 hex—D1 Check for end-of-file</p> <p>4451 hex—N1, N3 Update directory with current record as end-of-file</p> <p>4454 hex—L1 Reread current sector</p> <p>4454 hex—L3, D3, M3 Parse parameters in command line</p> <p>4454 hex—D1 Find drive and file number of a file</p> <p>4457 hex—L1 Rewrite current sector</p> <p>4457 hex—D3 Check for end-of-file</p> <p>4457 hex—D1 Read directory to user buffer</p> <p>4458 hex—L3 Check for end-of-file</p> <p>445A hex—L1 Calculate current logical record number</p> <p>445A hex—D1, D3 Display directory on CRT</p> <p>445B hex—L3 Update directory with current record as end-of-file</p>	<p>445B hex—N1, N3 Select and power up specified drive</p> <p>445D hex—L1 Calculate EOF record number</p> <p>445E hex—L3 Reread current sector</p> <p>445E hex—N1, N3 Test drive and disk</p> <p>4460 hex—L1 Skip next logical record</p> <p>4461 hex—L3 Rewrite current sector</p> <p>4461 hex—N1, N3 Add user routine to DOS Library chain</p> <p>4462 hex—D1, D3 Send text to printer</p> <p>4463 hex—L1 Read directory to buffer or CRT</p> <p>4464 hex—L3 Skip next logical record</p> <p>4464 hex—N1, N3 Remove user routine from DOS Library chain</p> <p>4467 hex—L1, L3, D1, D3, N1, N3, M1, M3 Display text on CRT</p> <p>446A hex—L1, L3, N1, N3, M1, M3 Send text to printer</p> <p>446D hex—T1, L1, D1, D3, N1, N3, M1 Get time in ASCII format</p> <p>446D hex—L3 Calculate current logical record number</p> <p>4470 hex—T1, L1, D1, D3, N1, N3, M1 Get date in ASCII format</p> <p>4470 hex—L3 Calculate end-of-file record number</p> <p>4473 hex—L3 Holds image of interrupt latch</p> <p>4473 hex—T1, L1, D1, D3, N1, N3, M1, M3 Add default extension to filespec in FCB</p> <p>4476 hex—L1, D1, M1, M3 Parse parameters in command line</p> <p>4479 hex—L1 Send text to file or device</p> <p>4479 hex—D1, D3 Scan and evaluate command line</p> <p>447B hex—L1 Send text to job log and CRT</p>
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*Table continued*

# THE NEXT STEP

Table continued

447B hex—N3  
Add task to interrupt chain

447C hex—D1, D3  
Compare filespec to wildcard mask

447E hex—L1  
Send text to job log

447F hex—D1, D3  
Get device number for file or I/O device

4482 hex—D1, D3  
Sort block of memory

4485 hex—D1  
10 disk I/O functions depending on value in A

4488 hex—D3  
10 disk I/O functions depending on value in A

4488 hex—D1  
Locate device control block for any device

448B hex—D1  
Locate drive control table for any drive

44A0 hex—D3  
Locate device control block for any device

44A3 hex—D3  
Locate drive control table for any drive

44B8 hex—L1  
Check drive and disk

44BB hex—L1  
Get file name from directory

44C1 hex—L1  
Multiply 16-bit by 8-bit integer

44C4 hex—L1  
Divide 16-bit by 8-bit integer

44D2 hex—M3  
Add task to interrupt chain

44D5 hex—M3  
Remove task from interrupt chain

44D8 hex—M3  
Change execution address of task in interrupt chain

44DB hex—M3  
Set task pointer to default of RET

44DE hex—M1, M3  
Verify a sector without reading to RAM

44E1 hex—M1, M3  
Read sector

44E4 hex—M1, M3  
Write sector

44E8 hex—M1, M3  
Read directory sector

44EB hex—M1, M3  
Write directory sector

44EE hex—M1, M3  
Read directory

44F1 hex—M1, M3  
Write directory

44F4 hex—M1, M3  
User function

44F7 hex—M1, M3  
Get directory track number

4754 hex—L1, L3  
Select drive

4759 hex—L1, L3  
Continually reselect drive until it is ready

475E hex—L1, L3  
Seek specified cylinder (track)

4763 hex—L1, L3  
Write sector to disk

4768 hex—L1, L3  
Write system (directory) sector

476D hex—L1, L3  
Write track to disk (used for formatting)

4772 hex—L1, L3  
Verify sector without transferring data to memory

4777 hex—L1, L3  
Read sector to buffer

478F hex—L1, L3  
Get address of drive code table for specified drive

479C hex—L1, L3  
Get byte field from drive code table

4B10 hex—L1, L3  
Read directory sector with specified entry code

4B1F hex—L1, L3  
Write system buffer to specified directory sector

4B45 hex—L1, L3  
Read directory sector to user buffer

4B64 hex—L3  
Get cylinder (track) number of directory

4B65 hex—L1  
Get cylinder (track) number of directory

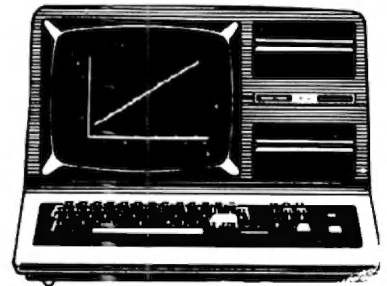
4B6B hex—L3  
Multiply 8-bit by 8-bit integers

4B6C hex—L1  
Multiply 8-bit by 8-bit integers

4B7A hex—L3  
Divide 8-bit by 8-bit integers

4B7B hex—L1  
Divide 8-bit by 8-bit integers

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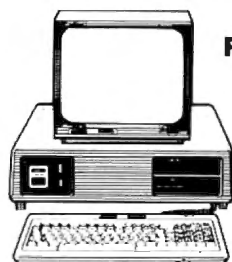
End

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# Mighty Management: The Model 2000 and dBase II

**T**andy introduced the 80186-based Model 2000 in November 1983. Since then, not much has been published to help 2000 owners exploit the features of their machine. I'll attempt to rectify that through this column. I'll take a close look at the Model 2000 and its operating system, MS-DOS. I'll pass along my experiences with commercial software and provide technical information on the machine. I'll cover topics like converting MS-DOS programs to run on the Model 2000, transferring data from other Tandy machines, using color graphics, reviewing hardware peripherals, and more.

But first, a description of my system.

I currently have a Model 2000 with 256K of RAM, high-resolution graphics, and a color monitor. I do recommend that you buy the memory necessary to bring the machine to a 256K RAM configuration. Most of the interesting applications software requires this amount of memory. Color is a nice option, but it isn't always necessary; many users will find it hard to justify the additional \$1,500 for this option.

## dBase II in the Lead

When you look at software for the Model 2000, your first impression is the whopping price tag of each package. Welcome to the world of 16-bit software. Actually, many of these packages were first available in 8-bit versions that carried big price tags.

The foremost package in this category is Ashton-Tate's dBase II, now marketed by Radio Shack (see the Table). dBase II is powerful and capable of accomplishing the most comprehensive data-management tasks.

dBase II is a relational data base management system (DBMS) that can manipulate up to two data bases simultaneously. It's also a programming language with a built-in interpreter, text editor, and other features.



Even if you're not interested in programming, dBase II isn't fearsome; its programs are actually structures of commands written in plain English that manipulate the data base.

It's easy to create a powerful manipulation facility that formats any screen for data entry using the fill-in-the-blanks method and full menu prompting. You can change any part of the command structure or the data base at any time.

Probably a lot of Profile users aren't convinced yet. OK, take the simple example of a mailing list for a company and establish a DBMS for it. You need the company name, point of contact, address, city, state, zip code, telephone number, and identifying code. Don't forget the projected field sizes.

With Profile, you have to decide how to segment the information; you can sort and index only on the information contained in the first segment. dBase II limits fields in the data base to 254 characters, with each record limited to 32 fields or a maximum of 1,000 characters. You can sort and index any field in the data base.

Creating the data base structure in dBase II is easy. You type in the field name, type of entry, and size of the field. After entering the appropriate data structure definition, you can immediately append information to the data base; with Profile, you must next define the format screen for data entry. dBase II builds the data entry screen automatically unless you redefine it.

Now that you've entered your mailing list of hundreds of names and addresses, you find one more entry—it's your most valued client and the name doesn't fit the field size. If you used Profile, you can't increase the size of the data base fields without reconstructing the data base. Moreover, if you haven't allowed for the proper fields in the first segment, you can't sort or index the data base as you want.

dBase II has features that let you overcome many of these deficiencies and let you use commands similar to everyday thoughts. Suppose you want to search the data base and list all the companies whose names start with the

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letter N, who reside in Texas, and whose area code is 214.

The following dBase II command accomplishes the task:

LIST ALL company FOR company = "N"  
.AND. state = "TX" .AND. phone = "(214)"

Imagine what you must go through to accomplish this using Profile. dBase II's best feature is its ability to save repetitive sequences of commands as a "program" and execute these commands at any time.

Since I've used the word "program," I'll provide an example. The Figure includes an actual routine from an operational mailing list data base manager and illustrates many features of dBase II. This routine checks the data base for duplicate entries after the program sorts it into alphabetical order.

The first command, Save, stores the dBase II local memory variables to a temporary disk file. dBase II lets any program or command use local memory variables, but must preserve the original configuration for return to the calling program. GOTO TOP positions the data base to the first entry. The next command stores a true value to a local variable used for loop control.

The Do...While looping construction is one of the most powerful dBase II features. This loop reads the data base while the variable "more" is true, provided it doesn't encounter an end-of-file marker in the data base.

Erase and ? are video commands for printing information to the screen. The function !(...) forces all alphabetical characters in the string variable mentioned into uppercase form so the string comparison in the If statement can detect a duplicate entry.

The Skip command positions the data base to the next sequentially appearing record. You can modify this sequential appearance with the Sort command, which can sort on any field in the data base in ascending or descending order. You can also modify the sequential order by creating and using an index with the data base.

One of dBase II's outstanding file indexing features concerns future additions to the data base. In Profile, when you add to the data base, you must re-create all selection indexes.

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## 2000 PLUS

Once you index the data base in dBase II, all you do to maintain the proper order is inform dBase II that the file is indexed when you manipulate it. The program takes care of the rest.

As in Basic, dBase II allows full If...Then...Else constructions nested to any depth. The single If statement in the Figure contains only the Else part, which calls the routine to take action if the program discovers a duplicate record. Note that the command language allows nesting, calling one procedure from within another.

This barely touches the surface of this system. The key question is: can you use this package? I have to answer with a yes. A relational data base manager has so many applications that I'm sure everyone has some use for dBase II.

But how difficult is dBase II to use? I feel that you'll be right at home after using dBase II for a short while. The superior documentation and excellent on-line Help facility ease any difficulties that you encounter.

Also, some excellent books are available that explain dBase II in simple terms and have numerous examples. The one I've found most useful is the *dBase II User's Guide* by Adam B. Green (SoftwareBanc, Arlington, MA 02174).

The distribution disks also contain some fine examples of data base manipulation. Complete packages such as tickle file management, checkbook management, inventory management, and personnel management let you use dBase II files and develop a feel for this program's power while exploring the command code.

### Current Software

On the subject of data base managers, Radio Shack's PFS:File file manager is a possible alternative. I haven't used this package yet, but I've heard it's a good file manager that lets you easily create and organize a personal filing system.

In fact, I've heard positive comments about all the PFS software, both for the Model 2000 and for the Model 4. This is a much less expensive option than purchasing dBase II; however, remember that PFS:File is only a file manager and dBase II is a full relational data base management system.

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-John Griffen  
Lompoc, CA.

**It's too bad the makers of Scripsit can't make comments like this. They can't because SoftWriter picks up where Scripsit leaves off.**

**With features such as a spelling checker, variable margin widths, right justification, line centering, word wraparound, tab settings, block copying, underlining, emphasizing, variable character sizes, form feed, page numbering, and split screen viewing, no wonder SoftWriter is fast becoming the word processor for Radio Shack computers.**

**But SoftWriter doesn't stop there. It automatically counts the number of letters, words and sentences. In addition SoftWriter can globally find and replace, merge two or more files, display the disk directory without returning to DOS, and support all printers now on the market.**

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The first non-Radio Shack software I tried is from Chuck Tesler at Prosoft. Both packages (Tallymaster and Video Tape Tracker) have been around for some time in Model I/III versions. Both were compiled using GW-Basic on an IBM PC and both are excellent.

This was my first experience with software distributed on media compatible with the IBM PC and, much to my surprise, the Tandy 2000 didn't even slow down when copying files from these disks. What a difference those 720K disk drives make.

Tallymaster is a curious cross between a spreadsheet program, a data base manager, and pen and paper. I wouldn't expect you to attempt double-entry bookkeeping using it; however, it's exceptional for the routine budget maintenance required in a home or small business. Coupled with excellent documentation and a comprehensive Help facility, this is an outstanding acquisition for your software library.

Video Tape Tracker is a true data base manager with a limited application—maintaining your tape collection. Again, this package has Prosoft's usual good documentation and faultless execution.

Tracker has the capacity to store up to 1,300 movies indexed by tape identification and/or by title. You can

search through the data base for a particular identification, title, or performer. Most importantly, Tracker can produce a detailed list or print movie labels.

My initial reaction to Tracker was that it's an unnecessary package. Then I realized that I own two video recorders and have about 100 tapes with two or three movies on each. I spent endless hours writing a program supposed to do exactly what Tracker does, but it wasn't as complete. Attempting to perform the same functions with Profile only frustrated me further. Tracker is just what I need.

**Wrap-up**

I'm looking forward to receiving your comments and suggestions for this column. Some of my ideas for future topics include an overview of word processing packages, and a broad comparison and description of the various compiler language translators available for the 2000.

I will also use this column as a forum to pass on interesting tidbits I discover concerning the Model 2000's functioning. Particular software quirks and hardware features will predominate here. I already have a pet peeve to pursue in this category and will report on my progress next month. ■

*Write to John B. Harrell III c/o this column, 80 Micro, 80 Pine St., Peterborough, NH 03458 or via Compu-Serve at 73016,1326.*

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Catalog #26-5352  
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\$595

PFS:File Personalized Filing System  
Tandy/Radio Shack  
Catalog #26-5305  
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Tallymaster 1.2  
Prosoft Inc.  
Box 560  
North Hollywood, CA 91603  
\$99.95

Video Tape Tracker  
Prosoft Inc.  
Box 560  
North Hollywood, CA 91603  
\$39.95

*Table. Model 2000 software product listing.*

```
* DUPCHECK.PRG
* JBH 4/1/84
*
SAVE TO temp
GOTO TOP
STORE t TO more
DO WHILE more .AND. (.NOT. EOF)
  ERASE
  ?
  ?
  ?
  ? "
STORE !(last:name) TO oldlast
SKIP
IF oldlast = !(last:name) .AND. (.NOT. EOF)
  DO duprem
ENDIF
ENDDO
RESTORE FROM temp
```

*Figure. Sample dBase II routine.*

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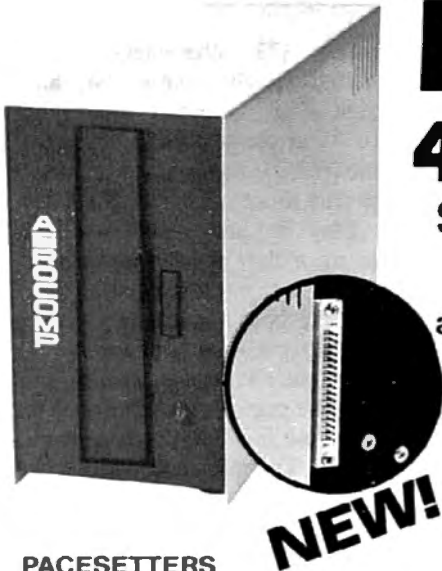
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Continued from p. 41

variant); and other neat tricks like binary file editing.

**Binary File Editing**

All disk information is stored as long strings of bytes. With A-B-SEE's binary file driver you can load exact copies of any file just as it is written on the disk. You can then format, edit, change, or otherwise "play around."

I know almost nothing about binary files, but with the superb documentation on A-B-SEE and the step-by-step examples, I looked at and doctored several files I would otherwise be loath to touch. The author even shows you how to use this capability to encrypt machine-language binary files so that only you can run or obtain access to them.

Finally, if you have random-access fixed record files (data bases, for example) that you want to edit or change without crashing the program, A-B-SEE can, with a little care, do it for you.

**Conclusion**

Just as Super Utility or NEWDOS aren't for every Model III owner, neither is A-B-SEE. If you like your programs simple, if you want a menu for every decision, if you haven't the slightest curiosity about how your machine, your programs, or your files work, then save your money. But for this reviewer—and I'm a user, not a programmer—A-B-SEE is the most fascinating program I have worked with in a long, long time. ■

**Word Processing For Model 4 Pros**

by Terry Kepner

SuperScripsit for the Model 4 isn't merely a converted version of Tandy's popular Model III word processor; rather, it's a powerful word processing system for the business person or professional writer that takes full advantage of the Model 4's capabilities, including its larger screen display and faster processing speed, enabling faster text transfer from computer to printer. SuperScripsit is more complex to use than Scripsit, but it compensates for that by giving you more control over your document.

**Using SuperScripsit**

Before running SuperScripsit, you have to do a little housekeeping: Back up your disk and delete unnecessary printer files on the back-up. SuperScripsit comes with a host of printer drivers for all Tandy printers; to make room for document files, you must remove all but the printer driver you require. If you don't own a Tandy printer, you'll have to experiment with the various printer drivers to find the appropriate one.

Alternatively, you can write your own driver in machine code with help from a brief chapter in the reference manual. A chart of printer features supported by SuperScripsit cross-references your printer with the proper driver.

Besides the reference manual for the expert, the SuperScripsit package also includes an eight-hour cassette course and SuperScripsit training manual for the word-processing novice. Several demonstration files on disk—Catalog, Demo, Demo100, and Paper—provide additional help.

When you boot up SuperScripsit, the main menu presents these options: open a document, display a disk directory, set up a system, proofread a document, compress a document, or exit to TRSDOS.

The first command takes you to the Open Document Options menu, which tracks the document name (eight characters; three more for an extension); author, operator, and

comments (33 characters each); printer type (eight characters); lines per page (four to 99); printer pitch (one to 20, or proportional); line spacing (one to 3½); first page to include a header and footer. All but document name have default values you can change to match your own requirements.

After selecting a document name, you can either edit or print the file. In the edit mode, the screen displays your file, with the cursor at top left and an alignment/tab line and a status line at the bottom. The tab line functions like a typewriter carriage, with markings to indicate right and left margins, your current position on the line, current indentation tab, and tab positions. The status line tells you the document name, current page, cursor line, and horizontal position (in inches!), printer pitch, and line spacing for the paragraph the cursor occupies.

**Special Features**

Editing in SuperScripsit is easy: use the arrow keys, together with the shift keys, to maneuver the cursor around your text. A distinct advantage of Model 4 SuperScripsit is that it uses the 4's 80-column screen to display text as it will appear on a printout. You can center lines, paragraphs, and pages horizontally and vertically, knowing that what appears on screen represents precisely what will be printed out.

SuperScripsit's text block moves further facilitate text manipulation. You define the beginning and end of each block, then select from nine options to reformat the block to match a previously defined model, search and/or replace text in a block, freeze or unfreeze a block, hyphenate or change line spacing within a block, and move or print out a block.

As with other versions of SuperScripsit, the 10 user keys help you streamline editing when you store commands or text in them for instant recall; 10 printer codes access special printer features.

When you press control-P to print, the Print Text Option menu appears. It lets you select paper size (one to 99 lines), beginning page number, type of print justification (proportional, mono, or none), and number of copies; you can also set a pause between

**Model 4 SuperScripsit**



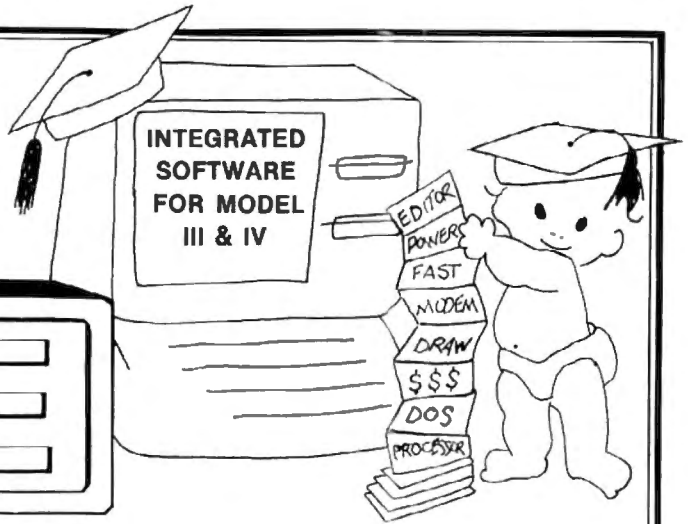
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# A B

# S E E



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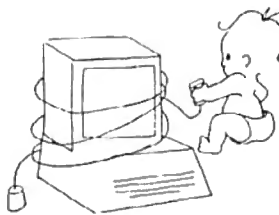
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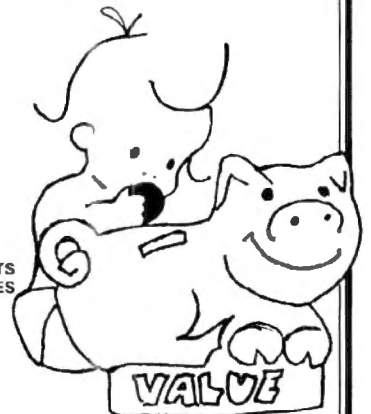
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pages, display control codes, suppress widow lines, and format columns to start printing.

Displaying a disk directory from within SuperScripsit is a handy feature, though to determine file size or free space left for file expansion, you have to return to the disk operating system (DOS), as you would to copy, erase, or rename a file. For the writer who needs to know a document's exact word count, this is a major drawback since counting grams (in DOS) and converting them doesn't result in an accurate word count.

The System Setup routine lets you change default parameters for the Open Documents option, Print Text options, and Search and Replace option. You can alter the align character (indicating tab alignment) and verify block deletion. Finally, you can define up to 10 user keys with command sequences, words, or phrases (of up to 127 characters per key), and customize the 10 user print codes to match any of your printer's special abilities.

The file-compressing feature rewrites the file you select as a new, compressed file, eliminating some of the SuperScripsit markers and editing buffer information stored there. To compress a file, you must have enough room on the disk for both the original and the compressed file.

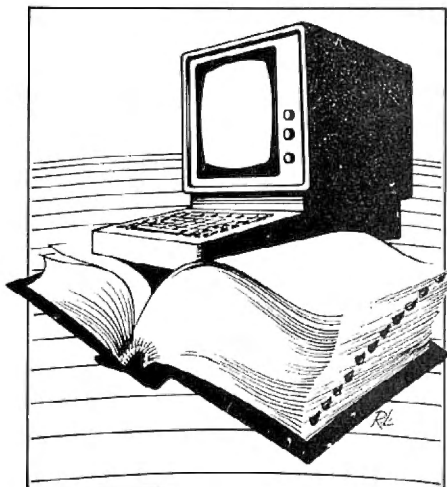
If you use other word processors as well, a particularly useful feature of SuperScripsit is its ASCII conversion utility that lets you convert standard ASCII files into SuperScripsit file format and vice versa.

### Drawbacks

SuperScripsit's document length, as pointed out earlier, is limited only by the amount of room on your disk rather than by your computer's random-access memory size. This feature sounds like an advantage until you consider the problems a fluctuating power supply can create. Losing electricity while printing or editing could destroy all your work and wreak havoc on your disk directory.

Exceeding SuperScripsit's 12K RAM buffer for your file sends the buffer to disk for storage. To stop editing you must exit SuperScripsit via the main menu. Pressing the reset button will cause problems later when you try to access that file again.

This also means you have no backup file. When you're working with Scripsit, you can always save the file under a new name, preserving the previous version. With SuperScripsit, you're always editing your current file: make a mistake, and it's permanent. You can't go back and reload the file to recover your error, as you can with Scripsit. ■



## Putting the Spell On SuperScripsit Files

by Terry Kepner

**S**uperScripsit Dictionary, designed exclusively for the new Model 4 SuperScripsit program (see previous review) provides a fast, efficient, somewhat convenient way to proofread your documents. Its major flaw is the limited storage space allowed for data files.

### Using the SuperScripsit Dictionary

The dictionary program is simple to use: Put your SuperScripsit disk into drive zero, the dictionary program into drive 1, and boot up SuperScripsit. From the main menu, select the P (Proofread) option. SuperScripsit prompts you for the name of the file you want checked, then immediately goes to work, scanning your document and checking spelling against the dictionary's list of 73,000 words.

SuperScripsit Dictionary has such a massive word list for several reasons: First, it uses almost the entire disk to store the words; second, it uses a modified "root word" approach wherein the program stores each word as a root

word, with a bit indicating whether you can form a plural with the letter "s"; third, each word occupies as little space as possible. On the average, SuperScripsit Dictionary compresses every six ASCII letters down to only 3 bytes.

Normally, root-word spelling checkers also make assumptions about the prefixes and suffixes added to root words to make new words (for example, adolescence versus preadolescence). The SuperScripsit Dictionary doesn't do this; instead, it treats the prefixed or suffixed word as a different word, and stores the most common root variations. So, if you use a word with a prefix or suffix and the word isn't in the dictionary with that prefix or suffix, then the dictionary flags it as an unknown.

The program assumes all words to be in lowercase so it doesn't detect mistakes in capitalization—compressing the words into so few bytes requires giving up such distinctions. It also can't pick up errors in word usage (affect versus effect, for example), and treats compound words like "able-bodied" or "laid-back" as separate words. Finally, while the program treats most words containing numerals as possible errors, ordinals like 5th or 12th are in the dictionary and are passed as correct.

### Making Corrections

While the program scans your document, it displays running counts of the number of words checked and the "unknowns" discovered so far. Once the dictionary program has proofread the entire document, it returns to the beginning of the file and displays each unknown word on the screen in context. The entire document appears on your screen, with suspected errors delineated in reverse video. At each word you can skip the word (it's someone's name, for example); correct it, delete it, or insert something else; or add the corrected word to the SuperScripsit Dictionary User Word List.

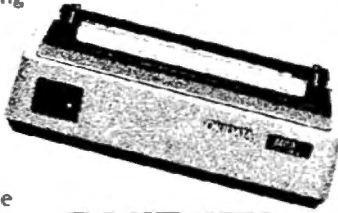
You can add up to 2,045 words to the dictionary, customizing it to your specific business or personal vocabulary requirements. But for professions with extensive lexicons (law or medicine, for example), this list won't be adequate.

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After you examine all the suspect words, the program returns you to SuperScripsit edit mode. Control-Q takes you back to the main menu, and then to DOS.

**Space Limitation**

The program's most significant drawback is that you must have both SuperScripsit and the Dictionary disk in drives zero and 1, respectively, the entire time your document is being checked. This requirement presents no problem if you have a three-drive system, since you can use the third drive for your data disk. But most Model 4 owners have only two disk drives, and Model 4P owners can't add a third drive. So you can't use a data disk to store your word processor files but are limited to a SuperScripsit disk, with only 54 free grams of space (TRSDOS and SuperScripsit itself use the other 110 grams).

This isn't a minor problem, since a single SuperScripsit file can occupy an entire disk. You could, by accident, create a file on a data disk too large to fit on drive zero with TRSDOS and SuperScripsit, and then be unable to use the dictionary program to proofread that file. The only alternative—copying the file piecemeal to a disk in drive 1 through Block moves in order to proofread it—would be time-consuming.

If you can live with such a major flaw (I can't), get SuperScripsit Dictionary and turn out documents that are perfectly spelled. ■

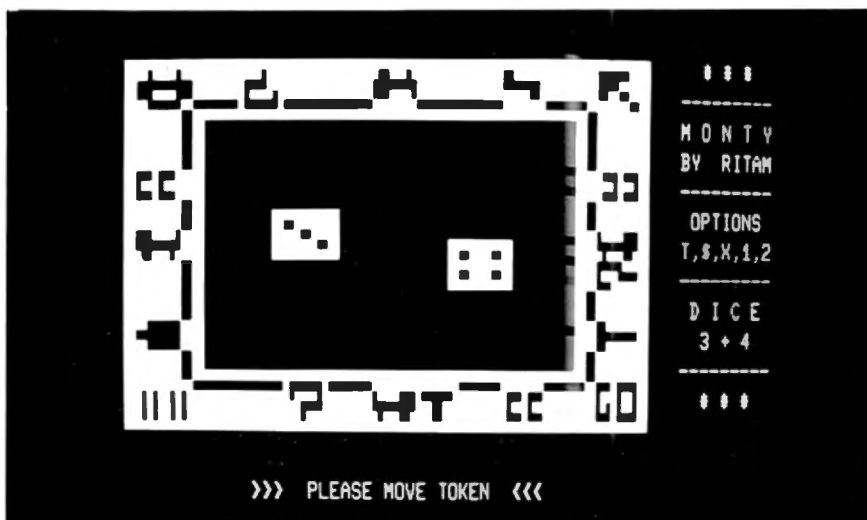


Photo 1. Monty's screen graphics display a dice-roll.

**Monopolizing Your Computer**

by Michael E. Nadeau

It was only a matter of time before someone came out with a computerized version of Parker Brothers' Monopoly. Of the two versions now available for the TRS-80, Radio Shack's Monty Plays Monopoly and Dynacomp's Compu-Opoly, only the latter is a complete and challenging rendition of the classic board game.

**Monty's Monopoly**

Monty Plays Monopoly doesn't quite bring Monopoly to your screen.

Rather, it's a program that casts your computer as a surrogate for a human player and expects you to use the conventional playing board.

Like all good surrogates, Monty is a competent player who never complains about rules, nor does he challenge you about counting the correct number of spaces during your turn. This version is also consistent with the original: The only variation on standard Monopoly rules is an option to put cash on the Free Parking space.

Monty makes his own decisions about buying property and is aggressive when bidding on real estate. But Monty depends on human players for all the mundane chores like drawing Chance and Community Chest cards

**SuperScripsit Dictionary**



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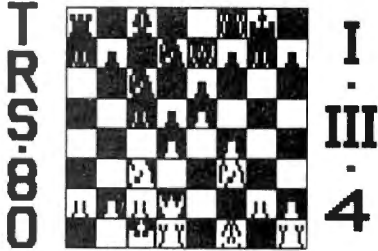
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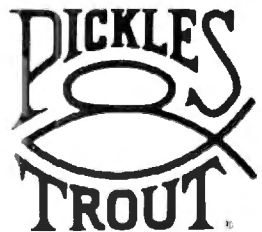
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## REVIEWS

or keeping track of his game piece on the playing board.

Monty displays fairly good graphics for the various properties, especially for railroads and utilities (see Photo 1). But you only see one property at a time, depending on where a player's piece lands. You can implement the game's sound feature if you have audio output.

The available commands (see Table 3) and information about whose turn it is are all that the screen displays consistently.

Monty knows very little about the course of the game itself. The program keeps track of which properties are owned—but not by whom. Monty is also unaware of rents, and it's up to the human players to declare what Monty owes. If you're bored with Monty at mid-game, you can easily fool him into bankruptcy.

Though fast, Monty still slows down the human players. Monty might be interesting as a child's novelty or as a partner for a lonely Monopoly player, but adds nothing to the

original game, and might even prove a nuisance to seasoned players.

### Compu-Opoly

While Monty merely sits in for a human player, Compu-Opoly reproduces the entire Monopoly game on your screen, with minor variations in the rules.

Command	Function
T	Trades with Monty
\$	Displays Monty's cash
X	Declares bankruptcy
1	Lets players throw dice
2	Lets Monty throw dice

*Table 3. Commands available when you play Monopoly with Monty.*

Compu-Opoly accommodates up to eight players; the computer can control all or none of them. The screen displays the entire board throughout play, with abbreviations for properties and players' names. There are no

flashy graphics, but the video playing board works well.

Unlike Monty, Compu-Opoly keeps track of everything that happens in the game. For instance, if you land on Park Place, the program tells you who owns the property and what you owe the landlord. Players' cash holdings appear on the screen during their turns, and you can query the program about another player's worth.

On screen, each player's initial indicates ownership of a property. Property groups are numbered; Mediterranean and Baltic Aves., for example, make up group 1. If you erect a house on a property, a dot replaces the number. When you build a hotel, an arch-like figure appears on the site.

Compu-Opoly varies from standard Monopoly rules in the following ways: you must be out of debt to make a trade or sale proposal; when you acquire a mortgaged property you need not pay the additional 10 percent to unmortgage it; and there are no building shortages.

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## REVIEWS

Though a complete Monopoly game, Compu-Opoly has some minor faults. First, it's terribly slow, even for a Basic program. If the game's author intended this lag as a safeguard against a player's missing some vital information, he's overdone it.

Second, the computer opponents are not wise bargainers. It's not uncommon for a computer player to offer to trade low-rent Baltic Ave. and \$200 for a prime location like Boardwalk—several turns in a row. Such wild propositioning only aggravates the game's slowness.

The computer players will also accept trades not in their best interests. Though not in a desperate situation, they'll sometimes give a player with a lot of cash a monopoly on a property group and get relatively little in return. This unwise trading makes for short games because one or two players can quickly gain dominance via a give-away trade.

Faults aside though, Compu-Opoly makes a much better buy for Monopoly fans than Monty does. ■

## Personal Finance: A Delicate Balance

by Carl Oppedahl

**P**ersonal Finance lets you fulfill the two most common rationales for buying a home computer: balancing a checkbook and setting up and monitoring a household budget. While it's limited in its capabilities, inflexible, and difficult to use, the package's weaknesses are offset by its reasonable price and the fact that it does the job within the Model 100's limited RAM capacity.

You can set up as many as 50 budget categories with spending limits for each. When you enter a checking or savings transaction, you can get current account balances with the touch of a button, then print a table at the end of the month designating in which categories you overspent. You can also print out a register (see Fig. 3) to reconcile your checkbook record-keeping with the bank's, though to

substitute for the traditional checkbook register the printout should designate payees as well.

### Limitations

The package discards the record of each cleared check and deposit after

### Personal Finance



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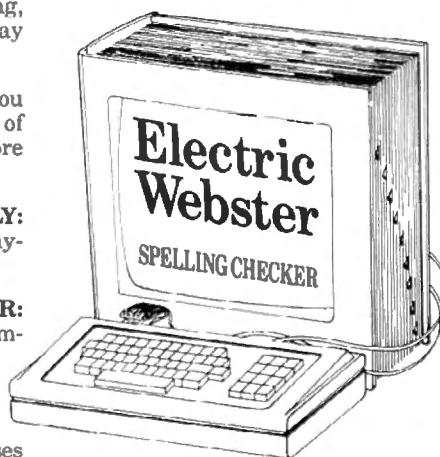
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## REVIEWS

you've reconciled your account with the bank's records, so, for example, you can't list all payments to the phone company within the last year nor search a year's records for tax-deductible expenses. Further, the package makes no provision for recording cash or credit-card transactions—a serious drawback to keeping a meaningful budget.

Another serious limitation of the package is its memory requirement: When you run the six Basic programs comprising Personal Finance, they create two .DO files, each in simple sequential ASCII format. If you kept all of them in RAM constantly you'd be left with a mere 2K free in a 24K machine.

Unlike the Model 100's built-in applications, Personal Finance is full of inconsistencies. For example, while

pressing the F8 key returns control to the next menu, it won't store results in progress. After losing data this way, you learn to press the F4 key (write to RAM) before pressing F8. The package's implementation of the cursor control keys is similarly annoying, as is the menu design.

To reconcile your account once you've received the bank's statement, you don't simply press the function key labeled RECON; instead, you have to press REGSTR to edit the register file to reflect the checks and deposits that have cleared, then REGRPT to get a trial balance, and then return to REGSTR, assuming the trial balance doesn't match the bank's figures. Only when the account has in fact been balanced can you push RECON (purging from memory the cleared checks and other transactions).

Checking Account Register						
Date Wrtn	Trans Number	Outstand Wthd Amnt	Cleared Wthd Amnt	Outstand Dep Amnt	Cleared Dep Amnt	Register Balance
Beginning balance						1164.63
01/02	4630WC		19.96			1144.67
01/04	DC				494.78	1639.45
01/05	4631WC	14.34				1625.11
01/05	DC				34.20	1659.31
01/06	4632WC	9.50				1649.81
01/06	DC				115.00	1764.81
01/07	4633WC		18.84			1745.97
01/08	4634WC	4.20				1741.77
01/08	4635WC		4.20			1737.57
01/11	DC				494.78	2232.35
01/12	4636WC	3.67				2228.68
01/12	4638WC		40.00			2188.68
01/12	4637WC	20.00				2168.68
01/16	4639WC	79.27				2089.41
01/16	4640WC	12.00				2077.41
01/17	4641WC	37.55				2039.86
01/18	4642WC	4.87				2034.99
01/18	DC			485.40		2520.39
01/29	4643WC	51.59				2468.80
11/22	4599WC		46.68			2422.12
12/05	4611WC		10.00			2412.12
12/12	4615WC		5.00			2407.12
12/13	4616WC		148.67			2258.45
12/14	4617WC		19.94			2238.51
12/14	4618WC		10.00			2228.51
12/14	DC				552.76	2781.27
12/15	4619WC		41.00			2740.27
12/15	4620WC		117.38			2622.89
12/15	4621WC		6.00			2616.89
12/18	4622WC		22.49			2594.40
12/21	4623WC		50.00			2544.40
12/21	DC				552.76	3097.16
12/23	DC				3.50	3100.66
12/28	4624WC		50.00			3050.66
12/28	DC				552.76	3603.42
12/29	4625WC		781.00			2822.42
12/29	4626WC		174.00			2648.42
12/29	4627WC		48.00			2600.42
12/29	4628WC		46.92			2553.50
12/30	4629WC		376.07			2177.43
Totals		236.99	2036.15	485.40	2800.54	2177.43
Reconciled Bank Balance						
Beginning Bank Balance :						1164.63
Cleared Withdrawals :						2036.15
Cleared Deposits :						2800.54
Reconciled Bank Balance						1929.02

Figure 3. Printout of Personal Finance's check register.



The right-hand column of the computer's register printout won't match the bank's—where they're posted in a different sequence—nor your own manual record, which reflects all transactions, not just those that have cleared the bank.

Keyboard entry defaults aren't handy, either. Each time you enter another check you must type in check number, date, dollar amount, and expense category. As a friend who watched me run Personal Finance remarked, "If the computer is so smart, why doesn't it know that if I just wrote check number 101, I will next write check number 102?"

User messages are unclear. When the message "Ready cassette, then press 'ENTER'" appears, the program gives no clue as to which tape to ready, nor does it make clear whether the tape recorder should be in the Play or Record mode. If you're just learning to use Personal Finance you could easily erase a tape, losing a month's checkbook data.

Experienced programmers, on the other hand, should have little difficulty modifying the Basic programs in Personal Finance to suit their needs.

#### Other Grips

The program doesn't check the plausibility of dates you enter: You can type in 13/01 instead of 01/13. And you won't be able to enter a year. As a result, since 01/01 precedes 12/31 numerically but follows it chronologically, the computer-generated register presents a sequence as in Figure 3—not a fatal flaw when all that matters is the final balance.

Though you can print checking and savings registers, you can't display them; all you see on the screen is the current balance.

The manual gives no clue about how to handle an OM (out-of-memory) error—presumably kill some files, but which ones in order to let Personal Finance continue? The program's own error messages disappear from the screen too quickly.

#### Documentation

The documentation is far from perfect: not only does it lack an index, its most glaring deficiency is its limited, one-sentence advice about making program back-ups. (Fortunately, the software isn't copy-protected.)

Getting started with Personal Finance you'd expect to enter information from your checkbook register and from old bank statements into the computer. Incredibly enough, the manual has no instructions on how to do this: It simply states that the right time to start is *after* you've successfully balanced your account!

#### Conclusion

Personal Finance is utterly incapable of printing out, either all at once or piecemeal, a replica of a year's checkbook register. Nonetheless, if you're diligent about entering all transactions into the Model 100 and careful about making back-ups, you could stop keeping a conventional register by hand—a prospect frightening to this writer. ■

### USS: Tried and True Basic Subroutines

by Charles R. Perelman

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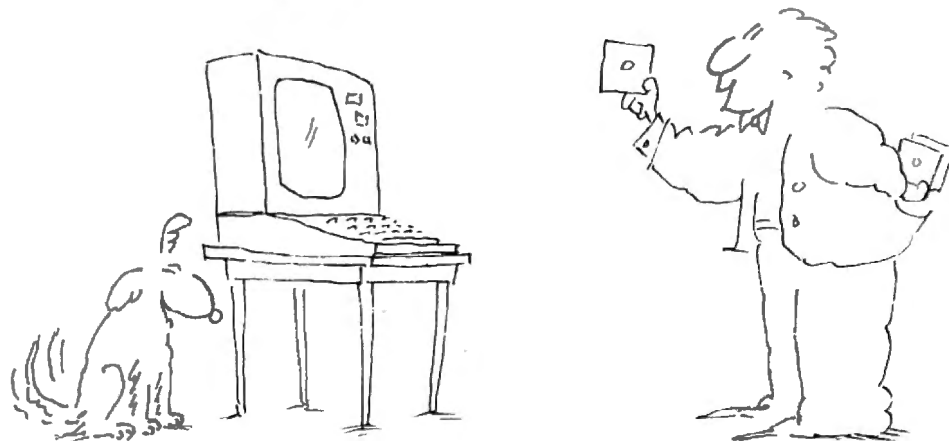
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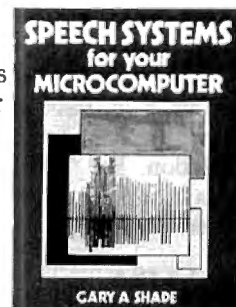
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gram disk and automatically build an ASCII file of chosen routines, including any others those routines call without your listing them specifically. You append the newly created file of subroutines to your program using the Merge command, then save the expanded program in either ASCII or compressed format. Although the complete USS system is written for TRSDOS Basic, most of the subroutine code is compatible and can be run with MBasic.

## Using USS

An option with USS is printing a numerical index of subroutines you select. As your program progresses, you merge additional subroutines the same way you added the first ASCII file. USS is programmed in tightly coded Basic using a minimum number of variables, all beginning with an S, so as not to interfere with variables in the balance of your program. You initialize needed variables locally before calling a subroutine, so you can use the same variables repeatedly.

Specification sheets cover the name, function, operation, and description of each routine, as well as the variables you need to define. You can understand some of the more cryptic descriptions by examining the code or making a trial run of the subroutine. Studying the subroutines can teach you concise coding but you must have experience in Basic programming to follow the logic and variables manipulation. See Table 4 for a list of the subroutines' wide-ranging subject matter.

## Docs on Disk

Now for the bad news: USS's "200-page manual" is a file on the distribution disk. You have to print it out yourself on fanfold paper with a torturously slow Basic program—and there are no page-break stops.

Documentation, all on disk, comes in three sections: an explanatory manual, alphabetic and numeric listings of subroutines, and individual specification sheets. You can consider each subroutine's remarks (REM) statements as documentation as well. Unfortunately, subroutine calls refer to the initial line. If you remove all REM lines in order to reduce file size and speed up operation, you must reinsert

*You have to print out  
the "200-page manual"  
on fanfold paper with  
a torturously slow  
Basic program—without  
page-break stops.*

the initial lines with a REM keyword or apostrophe (unless your compression utility is an intelligent program that retains lines referenced by calls).

The main USS control program consists largely of subroutines from USS itself. A clever print program reproduces the remarks in a standardized format on the specification sheets.

Each spec sheet starts with a USS block logo and copyright information, dragging out printing for hours *ad nauseam*. Take the manufacturer's advice and do something else while printing documentation.

When you construct a file of subroutines to add to a program, USS can print the spec sheets for those subroutines as part of your program documentation. But since it's such a slow process, photocopy the sheets from your original printout instead. Apparently, you get a copy of the spec sheet for a single routine only by placing just that routine in a file and printing the relevant specification. Alternatively, you can LLIST the beginning of the subroutine, avoiding the logo printout, and print the rest of the remarks faster than the regular printing program can, though the printout isn't formatted or labeled and contains extraneous line numbers and coding.

An enlightening discussion of errors and Basic error messages (with suggested solutions to typical problems) accompanies the warning that USS itself has no error-trapping. You have to trap for particular errors, though you can display customized messages with the USS error message routine.

For a \$25 licensing fee, Ramona Enterprises lets you include USS subroutines in your own commercial soft-

ware. Files are not protected, so you can readily copy them.

## Conclusion

While many of the subroutines are unexceptional, USS organizes them into an expeditious programming utility, valuable to the programmer who uses such routines repeatedly. With USS, you can standardize coding to save time creating and debugging programs and to facilitate using graphics effectively. ■

### Screen Displays

- Centering
- Boxes
- Inverse video
- Error messages
- Flashing displays
- Double or triple spacing characters
- Borders
- Graphing
- Cursor positioning
- Horizontal and vertical lines

### Input

- Menus
- Validation of characters, numbers, and dates
- Yes/no construct

### Math

- Inverse trig functions
- Log and antilog with any base
- Number and time conversions
- Correlation and regression
- Straight line depreciation
- Optimum order points
- Integration
- Moving average
- Statistical functions
- Combinations and permutations
- Factorials
- Triangulation
- Compound interest formulas
- Measurement conversions
- Area under curves

### Formatting

- Width of copy
- Stripping blanks
- Filling strings
- Upper- and lowercase conversion
- Justification
- Date and time manipulation

### File and String Management

- Compression
- String coding and decoding
- String and numerical sorts
- Appending random and sequential files
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- String comparison

Table 4. Examples of the range of subject matter of the Universal Subroutine System.

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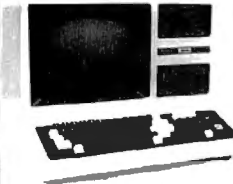
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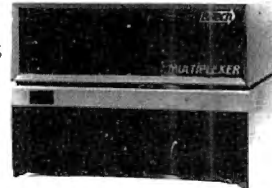
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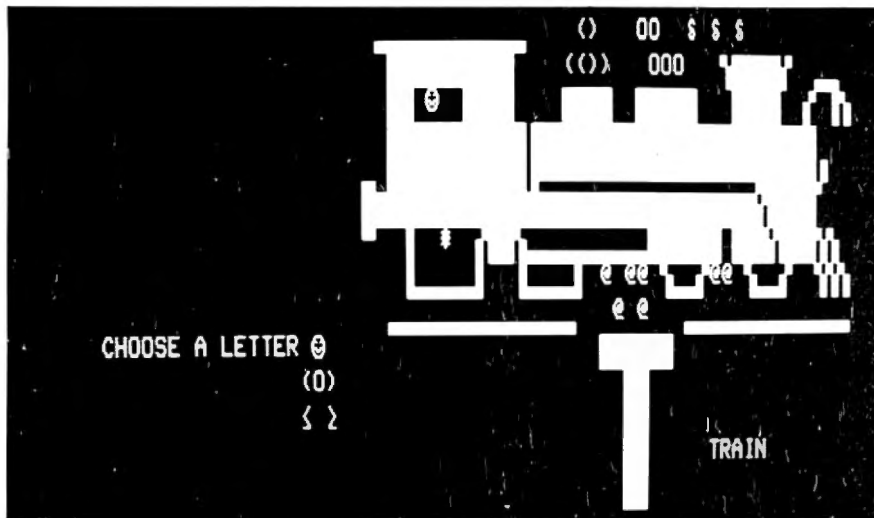


Photo 2. Child's Play uses TRS-80 graphics to teach children letters and words.

Child's Play



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- Easy to use? ★★★★★
- Good docs? ★★★★★
- Bug free? ★★★★★
- Does the job? ★★★★★

Child's Play:  
Move Over, Big Bird

by Mare-Anne Jarvela  
80 Micro Technical Editor

Child's Play is an entertaining and educational program that effectively teaches your child letters, numbers, shapes, and words.

Children can use Child's Play for hours without getting bored. My three-year-old son enjoyed testing this whimsical educational program on the Model 4P. The program, for children aged two through seven, comprises

various levels of difficulty. After mastering one level, the child can move on to the next.

Child's Play makes good use of the TRS-80's limited graphics and sound capability (you need a speech synthesizer or speaker amplifier for computer-generated sound, though). And, while the program does run without sound, the little melody accompanying the menu and the pattering footsteps of the prompting stick figure, for example, keep children entertained while they're learning.

A Child of Letters (and Numbers)

When the program's main menu appears, you press the space bar to

choose from among Child's Play's four options: Letters, Numbers, Shapes, and Words.

If you choose Letters, for example, a submenu prompts your child to select a letter at random, match the letter, or identify the next letter in the alphabet.

If the child selects the first option, he presses one letter on the keyboard. That letter appears enlarged on the screen. The child has to press the key corresponding to that letter again. If he's successful, an image whose first letter is the same as the one pressed—from an apple for the letter "A" to a zebra for the letter "Z"—



CHILD'S PLAY



AN EDUCATIONAL PROGRAM FOR CHILDREN AGES 2 TO 7 YEARS

This machine language program contains fast animation, sound effects, tunes, and speech. The speech has two options: it can be generated by computer or by a VS100 speech synthesizer (speech options described later). The program is easily controlled by a friendly menu-man who points to the options that may be chosen. The main menu contains four sections • Learn the Alphabet • Learn to Count • Learn Shapes • Learn Words. Each section contains three subsections which can easily be manipulated, giving twelve games in all. The menu selection is accompanied by a different nursery rhyme tune for each menu.

LETTERS

This option allows the child to select letters at random, match the current letter displayed, or type in the next letter. When a correct response is given, an animation associated with the letter moves across the screen, e.g. Z for Zebra. The computer says the letters also.

NUMBERS

This option allows the child to select the numbers zero to nine at random, match the current number displayed, or type in the next number. Men walk out on the screen equal to the number chosen. This section also contains speech.

SHAPES

This section allows the child to control the menu-man, moving shapes from the left hand of the screen to the right hand of the screen. The first level allows the child to pick up shapes using the spacebar. The second level, in addition, allows the child to control the menu-man with the arrow keys. The third level puts a small 'Bee' on the screen which the child must avoid while manipulating the menu-man and shapes.

WORDS

This final section allows the child to type in letters to form words. The first level asks for a word to be typed in, then to be repeated before another word can be tried. The second level

prompts the child with a word which must be matched before an animation will appear on the screen. The last level shows the animation on the screen. Then the child must type in the correct word before the next animation is shown. This section contains speech also.

SPEECH

The program can be bought as a stand-alone program with computer-generated speech, which uses 'your' speaker amplifier. However, we have also made the program compatible with an 'Alpha Products VS100' speech synthesizer for improved speech quality. (This can be purchased from 'Alpha Products' subject to availability). The speech is not available for a 16K machine.

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## REVIEWS

moves slowly across the screen. My son's favorite was "T" for train. (See Photo 2.)

The second option, to match the letter, teaches your child the alphabet in much the same way. The letters appear on the screen in alphabetical order one at a time and the child has to find the matching letter on the keyboard. When he does so, an appropriate picture appears on the screen.

The third option in the Letters menu is the hardest to master because it requires that the child identify and type in the next letter in alphabetical order, with the same results as described above for a successful answer.

My only complaint about the program's graphics is that they're limited to one picture for each letter; after a few tries, the repeating images become predictable and less exciting.

The Numbers submenu works in much the same way as Letters. When the child selects a number, it appears on the screen, followed by the corresponding number of stick figures walking on. When the child is ready

for the next number, a street sweeper appears and sweeps the old number away.

### All Shapes and Sizes

The Shapes section of the program, which also has three levels of play, teaches shapes, coordination, and timing. The child's goal is to match four shapes on the left side of the screen with four identical shapes on the right side. Again, the first option is the easiest. A small stick figure floats up and down on the left side of the screen. When the child hits the space bar, the figure picks up the nearby shape and travels to the right-hand side. When the figure is next to the matching shape, the child can press the space bar to deposit it. The stick figure moves back to the left and repeats these actions until the child matches all shapes.

Level 2 lets the child use arrow keys to manipulate the figure. In level 3, a small bee moves around the screen. The child has to avoid bumping into the bee while moving the figure

around on the screen. If the figure collides with the bee, it explodes, and the child loses the shape he carries.

Of all the options in Child's Play, my son enjoyed Shapes the most. He was very proud once he had mastered the arrow keys.

Words, the last option, lets you or your child type in a word up to seven letters long. The program forms the word on the top half of the screen and the child then has to match its spelling. The next-difficult level lets the child match preprogrammed words and, when the answer is correct, the appropriate image appears on the screen. The last level displays the image and prompts him to type in the correct word.

### Recess

The difficult menus in Child's Play require that you help your child with the first stages of the game. Once past the menu selection, though, the child can handle the rest. My son enjoyed the program and learned a lot in the process—and isn't that what educational programs are all about? ■

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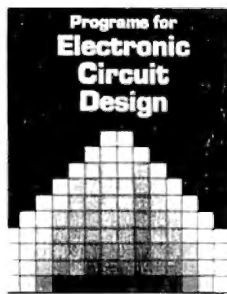


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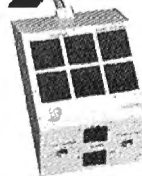
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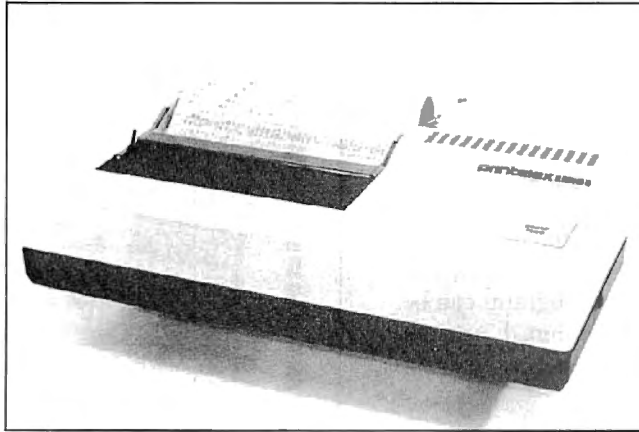
For more information, contact Computer Peripherals Inc., 6400 Canoga Ave., Suite 305, Woodland Hills, CA 91367, 818-710-1717.

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### The Electric Cube

The Wire Cube from Networkx is nothing to puzzle over; it's a noise filter and voltage surge suppressor that keeps your TRS-80 from burning out. This small, cube-shaped device plugs into your wall outlet between your computer and hostile household currents.

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The Printex thermal printer runs at 160 cps, but it's small enough to fit in your hand.

7555 for more information.  
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### Briefcase Bullet

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The Networkx Wire Cube solves power surge and line noise problems at the power outlet.

Contact Holmes Engineering Inc., 5175 Green Pine Drive, Murray, UT 84123, 801-261-5652.

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User Access to Additional 64K RAM	<b>YES</b>	NO
Time to Load WordStar	<b>4 sec.</b>	9 sec.
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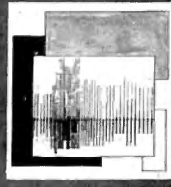
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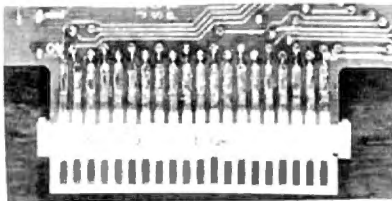
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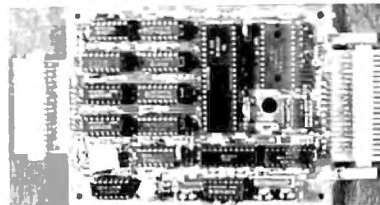


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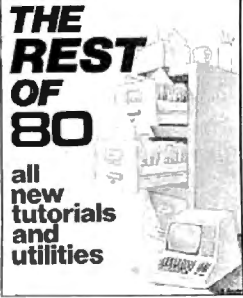
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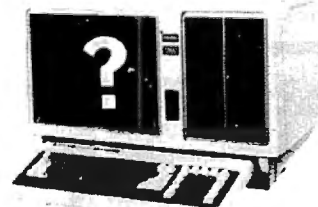
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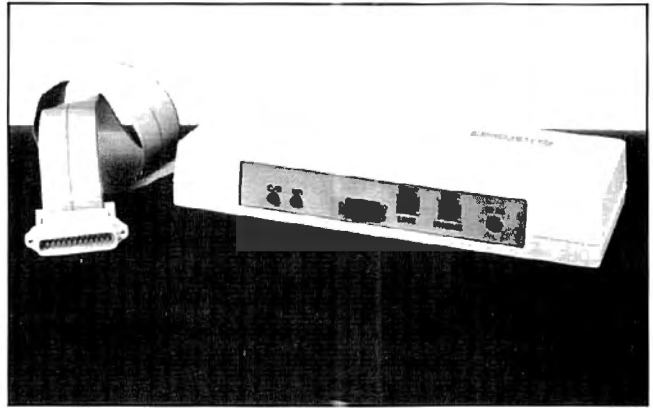
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The universal product code/European article numbering code (UPC/EAN)

decoder uses 1K RAM and reads long and short extensions for solving up to 12 code variations. It has internal error-checking and automatically expands short codes to long representation.

The other programs read Code 39 (3 of 9), Codabar, 2 of 5, interleaved 2 of 5, and Plessey bar code. For more information, see your local Radio Shack dealer or contact Portable Computer Support Group at 11035 Harry Hines Blvd. #207, Dallas, TX 75229, 214-351-0564.

Reader Service ✓ 556

### CP/M Program Development System

ZDS, a CP/M program development system available from Elliam Associates, includes a full screen editor, macro assembler, linker, library manager, macro library, 8080-to-Z80 translator, and dynamic debugger.

The editor has automatic file buffering, and the macro assembler produces Intel hexadecimal (hex) or Microsoft REL object files. It also cross-references symbols, op codes, and macros.

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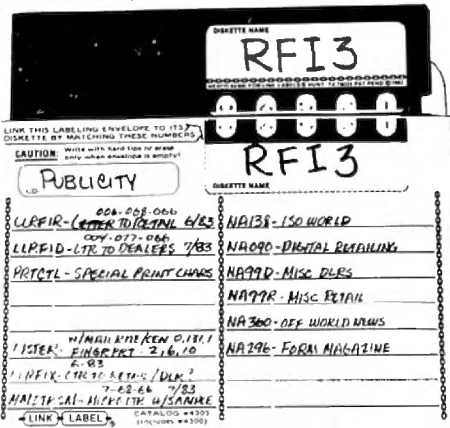


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## NEW PRODUCTS



*Blast forges computer-to-computer communications between desks or across the world.*

disk drive. ZDS comes with example programs, including a hex/ASCII file display/list program and an ASCII list program.

The ZDS Program Development System is available from Elliam Associates for \$129.50 plus \$1.50 postage and handling. Contact them at 24000 Bessemer St., Woodland Hills, CA 91367, 818-348-4278.

Reader Service ✓ 558

## Making Communications A Blast

Communications Research Group's new asynchronous communications software is a sure way to be heard: Blast (Blocked Asynchronous Transmission) assaults the barriers of computer-to-computer communications.

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The package runs on the Model 2000 under MS-DOS and on the Models II and 4 under CP/M. It operates through an RS-232 port and an asynchronous modem, over dial-up lines, or from port-to-port through a direct connection.

Communications Research Group Inc., 8939 Jefferson Highway, Baton Rouge, LA 70809, 504-923-0888.

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## Do You Read Me, Scotty?

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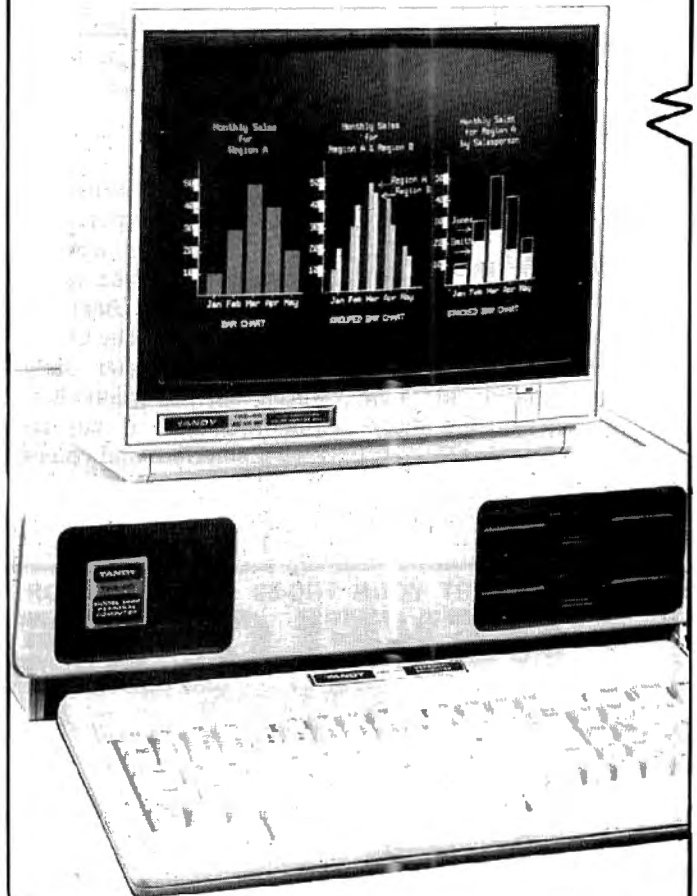
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## NEW PRODUCTS

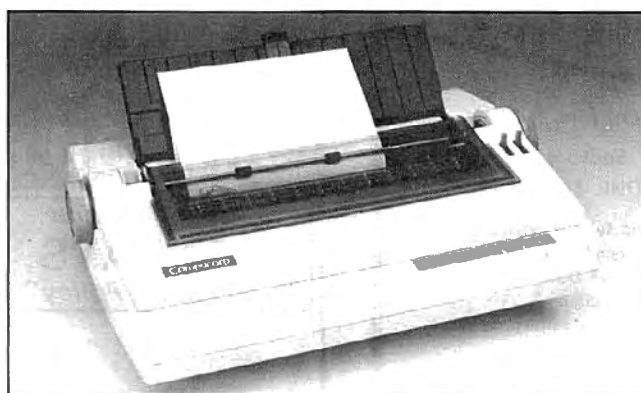
Starship Captain puts children ages 8-15 on the bridge of a starship in this Select-a-Story interactive fiction game. Children take an active role in the story, and see the results of their decisions as they read along. The story has 25 possible endings.

Starship Captain includes a floppy disk and instructions for \$19.95. For more details, contact Tuvella Software, P.O. Box 3002, Santa Clara, CA 95055, 408-985-8285.

Reader Service ✓ 559

### Daisy Wheeling

CompuCorp (2211 Michigan Ave., Santa Monica, CA 90404, 213-829-7453) has announced its new CC-20 letter-quality daisy-wheel printer (\$1,099).



The CC-20 letter-quality printer from CompuCorp comes with tractor feed or an optional sheet feed.

Printer features include proportional character spacing, fractional line spacing, and shadow boldface, and a print speed of 25 characters per second (cps). The CC-20 uses a 128-character daisy wheel, with 15 print-wheel fonts available. It has an RS-232 interface and comes

with a tractor feed. A sheet feeder is optional.

Reader Service ✓ 574

### Disk Drive Dry-Cleaner

Many disk drive head cleaners leave a residue or

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For more information, contact Vikor Co. Inc., 55 Lake St., P.O. Box 3123, Nashua, NH 03061, 603-889-8530.

Reader Service ✓ 562

CONVERT YOUR TRS-80 MODEL I, III, OR 4 INTO A

# DEVELOPMENT SYSTEM



Now you can develop Z-80 based, stand-alone devices such as games, robots, instruments and peripheral controllers, by using your TRS-80 as a development system. The DEVELOPMATE plugs into the expansion connector of your TRS-80 and adds PROM PROGRAMMING and IN-CIRCUIT-EMULATION capabilities to your system (with or without expansion interface).

Complete instructions and sample schematics are included to help you design your own simple stand-alone microcomputer systems. THESE SYSTEMS CAN BE AS SIMPLE AS FOUR ICs: one TTL circuit for clock and reset, a Z-80, an EPROM, and one peripheral interface chip.

When the In-Circuit-Emulation cable is plugged into the Z-80 socket of your stand-alone system, the system becomes a part of your TRS-80: You can use the full power of your editor/assembler's debug and trace program to check out both the hardware and the software. Simple test loops can be used to check out the hardware, then the system program can be run to debug the logic of your stand-alone device.

Since the program is kept in TRS-80 RAM, changes can be made quickly and easily. When your stand-alone device works as desired, you use the Developmate's PROM PROGRAMMER to copy the program into a PROM. With this PROM, and a Z-80 in place of the emulation cable, your stand-alone device will work by itself.

The DEVELOPMATE is extremely compact: Both the PROM programmer and the In-Circuit-Emulator are in one small plastic box only 3.2" x 5.4". A line-plug mounted power supply is included. The PROM programmer has a "personality module" which defines the voltages and connections of the PROM so that future devices can be accommodated. However, the system comes with a "universal" personality module which handles 2758, 2508 (8K), 2716, 2516 (16K), 2532 (32K), as well as the new electrically alterable 2816 and 48016 (16K EEPROMs).

The COMPLETE DEVELOPMATE 81, for Model I, with software, power supply, emulation cable, TRS-80 cable, and "universal" personality module . . . . . \$329

DEVELOPMATE 83, Model III/4 version, same as above . . . . . \$329  
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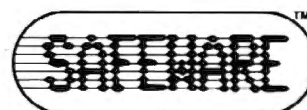
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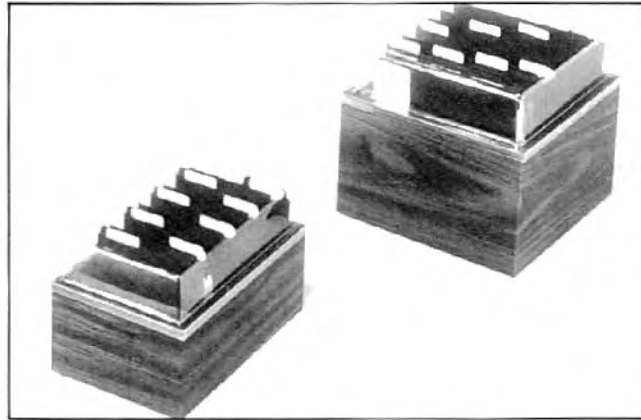
### Taking Stock in Inventory

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This Basic program has Assembly-language sorting for rapid execution, writes and discounts invoices, accounts for sales tax, posts sales, prints a sales register for up to nine sales persons, and orders stock at predetermined levels.

It searches, edits, recovers memory space from terminated stock numbers, and prints complete stock listings or entries by number or prefix. The program also prints out-of-stock items, items due for reorder, and inventory by vendor.

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These laminated walnut grain disk files from Hedges Manufacturing Co. blend with office decor.

ty and dollar amount of inventory, and holds a maximum of 1,200 entries on single-density disk systems; 2,300 items on double-density systems. The program is \$148 from Freeman Software, 334 Fieldside Drive, Garland, TX 75043.

Reader Service ✓ 565

### Disk File Furniture

A disk file, says Hedges Manufacturing Co., should offer more than nonmagnetic, nonconductive protection for your disks—it should complement your office.

The Hedges disk file is

constructed of a vinyl laminated wood base with a walnut grain finish that adds richness to any desktop. Divider tabs separate eight compartments for storing 72 disks and help identify and organize your disks.

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Hedges Manufacturing Co., 3729 N. Ravenswood, Chicago, IL 60613, 312-477-3825.

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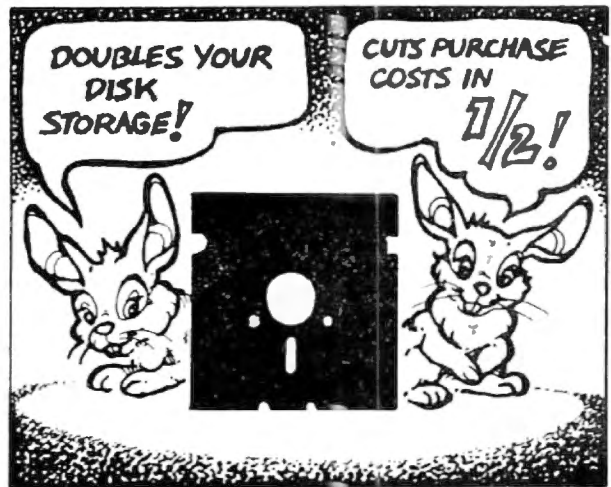
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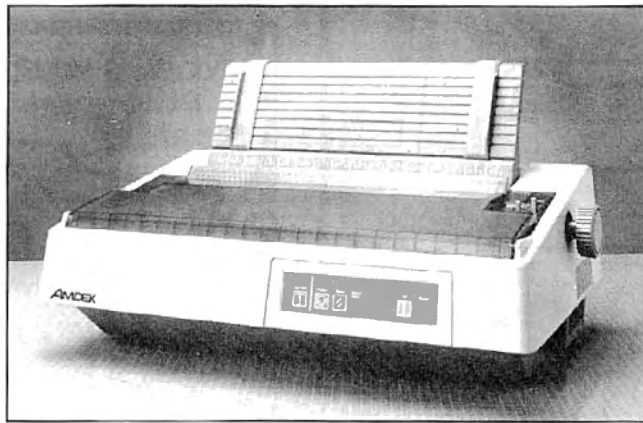
## NEW PRODUCTS

for industrial and higher education uses. Information management program runs under Xenix on the Model 16.

You can use Cast to construct training programs for new products, employee training programs, or for training distributors or dealers. The program uses English commands to structure courses complete with tests and computation of scores.

Cast also has windowing and animation capability and limited graphics capability. Its Computer-Managed Instruction feature tracks student progress, and handles testing and other administrative functions.

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*Amdek's 5000 series of letter-quality printers feature a transportable, and a 55-cps desktop model.*

Blvd., Rome, NY 13440,  
315-337-1000.

Reader Service ✓ 575

### New Amdek Printers

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(Printer Products, 2201 Lively Blvd., Elk Grove Village, IL 60007, 312-364-1180) offers three models that operate at a low 50-dB noise level.

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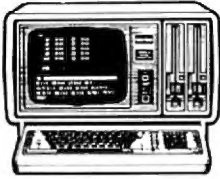
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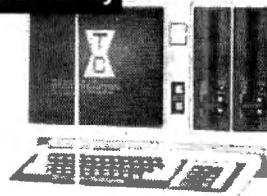
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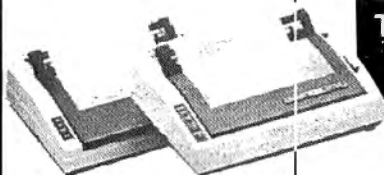
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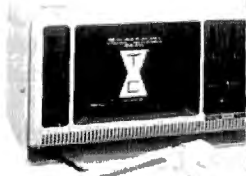


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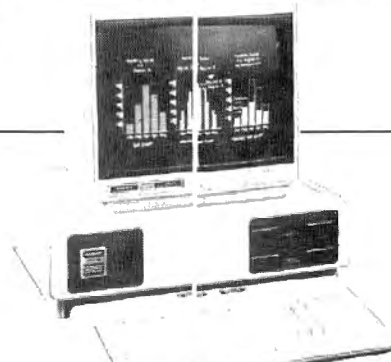
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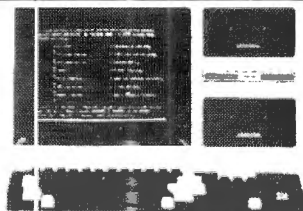
MODEL 100



MODEL 4-P



MODEL 2000



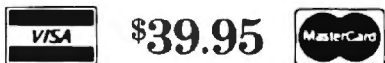
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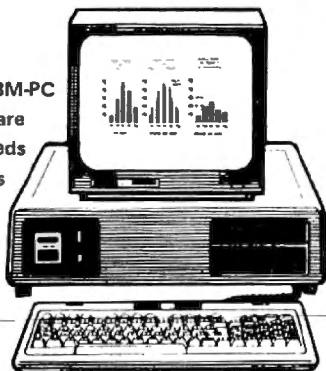
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Reader Service ✓ 561

**Spell It in Spanish**

El Ortografico might sound like a program that collects celebrity signatures, but it's the first-ever spelling checker for Spanish text.

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El Ortografico is \$99.95 from Ibersoft, P.O. Box 3343, Trenton, NJ 08619, 609-890-1496.

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The program requires a Model I, III, or 4 with 48K RAM, two disk drives, and a printer. Business Check Ledger+ is \$99.95 from James Russell, 110 Beechmont Drive, Carmel, IN 46032, 317-846-8553.

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**Math Mysteries**

Gamco Industries Inc. wants to keep kids from grades 1-8 learning with its Math Mystery programs, available for the Models III and 4 in 48K disk and 16K cassette versions.

The programs feature drills in addition, subtraction, multiplication, and division, and 50 difficulty levels. Answers are provided after three incorrect responses, and correct answers are rewarded with a chance to play an arcade game.

Math Mystery tracks the progress of 200 students by difficulty level, raw score, and percent correct. The multiplication and long division program and the addition and subtraction program are \$34.95 each on disk. An abbreviated version is available on cassette for \$49.95.

Gamco Industries Inc., Box 1911, Big Spring, TX 79720-0211, 800-351-1404.

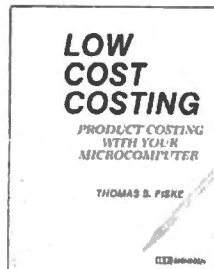
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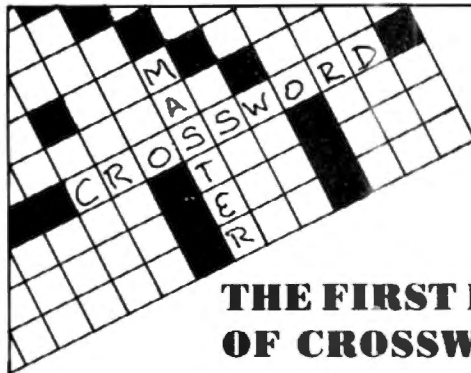
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## NEW PRODUCTS

### Introduction to Adventure

Adventure games sound interesting, but getting through one is cumbersome and often frustrating for the uninitiated. In response, Dynacomp is announcing five low-cost mini adventures designed for the first time adventure player.

Monastery of Gwydion, Medusa's Revenge, King Rex III's Tomb, Missile Submarine Warfare, and Pits of Hemlock are challenging adventure games that are not so difficult as to be frustrating.

The programs include a list of verb and noun commands, and the rest is up to you. Cassette versions are \$9.95; disk versions are \$13.95.

For more information, contact Dynacomp, 1427 Monroe Ave., Rochester, NY 14618, 716-442-8960.

Reader Service ✓ 567

count, and trip reporting functions.

Autopen complements the Model 100's Text program with changeable formats and printer control features. Book is a single-entry bookkeeping system with 52 accounts based on reporting requirements in schedule C of the Federal Income Tax Form 1040. Travel and Entertainment accounts are larger to accommodate expenses for meals, lodging, transportation, and so on.

Trip keeps detailed records of business or recreational trips. Its format and review feature is suitable for appointments, trip reminders, and trip reports.

The programs are \$29.50 each plus \$2 postage and handling. For more information, contact Chattanooga Systems Associates, P.O. Box 22261, Chattanooga, TN 37422, 615-892-2339.

Reader Service ✓ 569

### WordPerfect For the 2000

Satellite Software International (288 W. Center St., Orem, UT 84057, 800-321-5906) announces the WordPerfect word processor for the Model 2000.

It includes a spelling dictionary, merge, macros, math, footnotes, and text columns. It is available at your local Radio Shack store for \$495.

Reader Service ✓ 568

### Radio Shack RM/Fortran 77

Radio Shack's RM/Fortran 77 for the Model 16B (cat. #26-6451, \$699) lets software developers, engineers, and other programmers write and execute mainframe-level Fortran applications with the Model 16B's TRS-Xenix operating system.

RM/Fortran 77 is certified by the U.S. General Services Administration, and incorporates popular extensions like Hollerith and hexadecimal constants, symbols of up to 31 characters, and an Include statement.

The program is designed by Ryan-McFarland Corp. of Rolling Hills Estates, CA, and is available at your

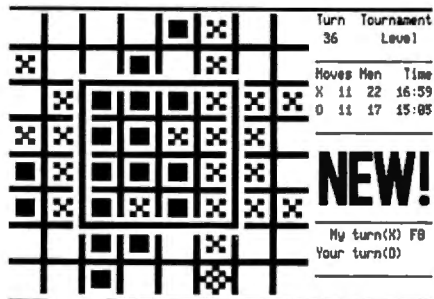
### Model 100 Programs

Chattanooga Systems Associates (CSA) has introduced three new programs for the Model 100. Autopen, Book, and Trip provide word processing, bookkeeping, expense ac-

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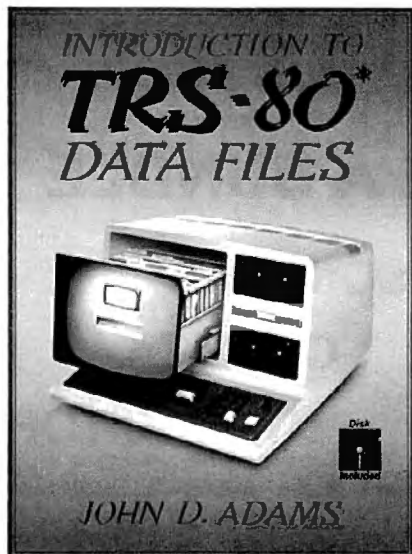
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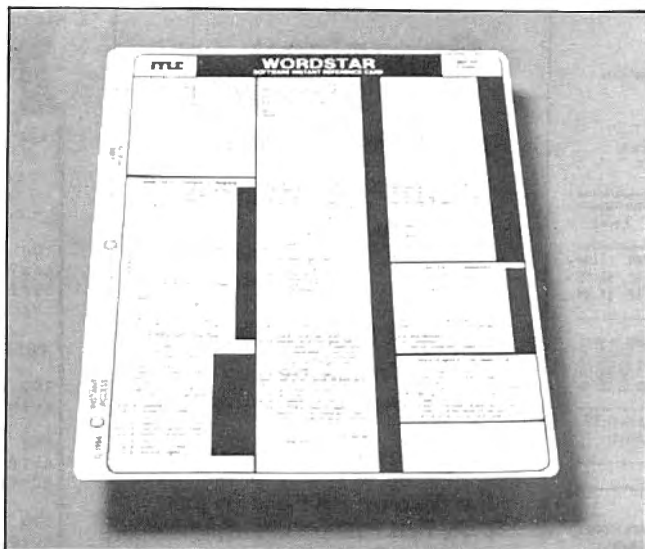
local Radio Shack store. For further information, contact Tandy Corporation/Radio Shack, 1800 One Tandy Center, Fort Worth, TX 76102, 817-390-3700.

Reader Service ✓ 571

### WordStar at a Glance

When you're using WordStar and forget a control code, the last thing you want to do is flip back through the documentation and lose your concentration. What you need is Micro Chart #9, a plastic quick-reference card that contains a comprehensive summary of WordStar for \$5.95 (plus \$1 postage).

At half the price of a keyboard overlay, the WordStar Micro Chart has three



Micro Logic's Micro Chart #9 puts all of WordStar's commands at your fingertips.

times as much information and organizes the commands logically. It also allows a larger text window, and lets you work in the no-

menu mode to eliminate sub-menu hopping.

The Chart includes explanations for normal commands, dot commands,

reforming paragraphs, moving text, moving columns, invisible returns, print-control commands, place markers, the ruler line, col-80 flags, hyphenation, headers, footers, bidirectional printing, micro space justification, MailMerge, and ASCII to decimal conversions.

Micro Chart #9 for WordStar, and Charts for other software are available from Micro Logic Corp., P.O. Box 174, 100 2nd St., Hackensack, NJ 07602, 201-342-6518.

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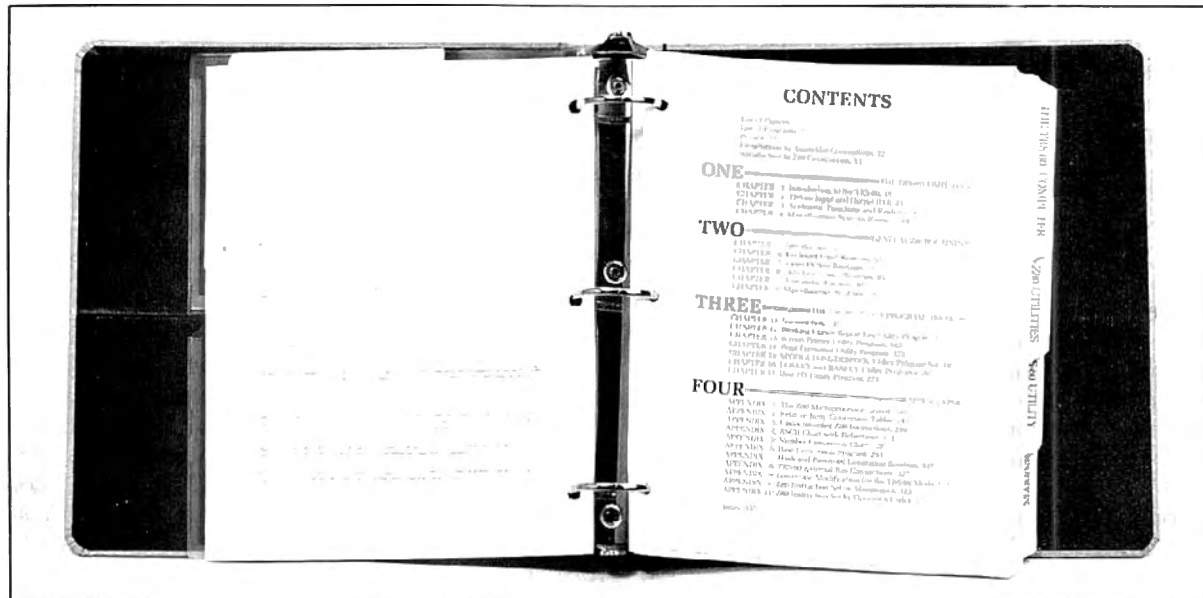
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# Every Z80 assembly-language programmer needs this book.



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\*Disks do not contain a disk operating system; two disk drives or a disk copy utility are required to transfer the files.

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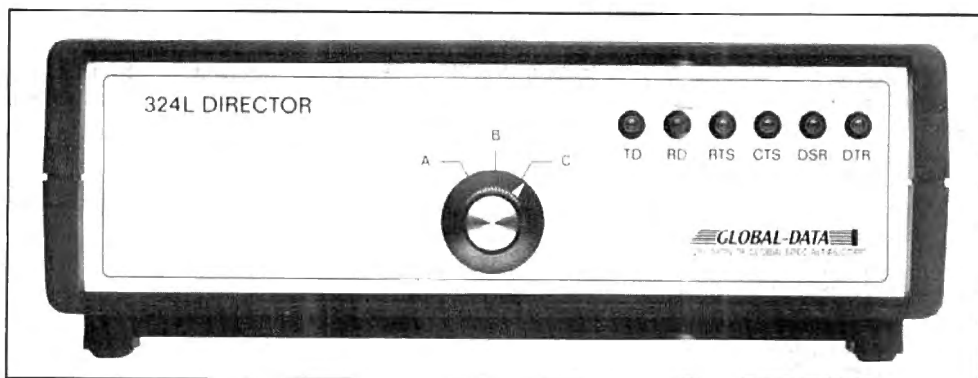
large documents, FinalWord (\$300) has the powerful features that you might need.

FinalWord takes advantage of the speed and flexibility of the Model 2000, and features automatic formatting of footnotes, tables of contents, and indexes. It also has windowing and system crash-recovery capabilities that let you restore text lost in a system crash.

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For more information, contact Mark of the Unicorn Inc., 222 Third St., Cambridge, MA 02142, 617-576-2760.

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Global Data's Director series multiport data switches let you connect three peripherals to one computer.

### Getting Your Port's Worth

Switching peripherals in and out of one port creates a mess of wires and wastes time connecting and reconnecting peripherals. The Directors, Global-Data's (70 Fulton Terrace, New Haven, CT 06512-1819, 203-522-3101) multiport data

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The Director Model 308 switches the eight most commonly used lines: pins 2, 3, 4, 5, 6, 7, 8, and 20. The Model 308L features six LEDs that monitor signals on the lines. You can switch all 24 lines on the Model 324, which includes six signal monitoring LEDs. Prices for the Directors range from \$120 to \$170.

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CP/M-68K, CBASIC trademark of Digital Research. CBASIC, PASCAL, FORTRAN-77 require 256 kbytes. CP/M-68K requires CP/M-2.2.



✓ 227



# The only way to WIN is to ENTER:

## 80 Micro's Young Programmers' Contest 1984-1985

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(These prizes are in addition to our regular article price.)

If you're an aspiring programmer, 18 years or younger, enter **80 Micro's** 3rd Annual Young Programmers' Contest. Your entry must be for the TRS-80 Models III, 4, or 4P only. Programs will be judged on originality, documentation (more on this below), and program elegance. The age categories are 11 and under, 12 through 14, and 15 through 18. All entries will be judged by the **80 Micro** staff.

### Rules

1. Final entries must be received by October 1, 1984.
2. All entries must be submitted in a 10 x 13" envelope and must include: typewritten, double-spaced documentation; a printed copy of the program listing; a magnetic disk or cassette containing the program listing, the documentation, and any figures or tables; and a completed entry blank.
3. Documentation should consist of an explanation of the program, its purpose, how to use it, and the necessary software and hardware needed to use it, including disk operating system (DOS) and memory requirements. (If your entry requires unusual hardware configurations, query us before submitting.) Good documentation also points out the interesting algorithms and program techniques used without giving a line-by-line account.
4. Entries must be original and unpublished.
5. All winning entries become the property of **80 Micro**.
6. Your age as of October 1, 1984 will determine the category in which you will be judged. You must not have turned 19 by that date.
7. You may submit as many entries as you like; however, each one must be submitted separately and must include all of the information and materials described above.

### The 80 Micro Young Programmers' Contest

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Age \_\_\_\_\_ Date of Birth \_\_\_\_\_

Street \_\_\_\_\_

City \_\_\_\_\_

State \_\_\_\_\_ Zip \_\_\_\_\_

Phone \_\_\_\_\_

Machine  
(circle one)

- Model III
- Model 4
- Model 4 P

Include this  
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## NEW PRODUCTS

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### Model 2000 Pascal

The SBB Pascal Compiler Package for the Model 2000 (\$95) is a full standard Pascal implementation designed for general purpose programming.

It features variable-length strings, direct file access, procedural parameters, conformant arrays, chaining, functions returning structured values, external routines, include files, symbolic Input/Output (I/O) of enumeration types, Else and Otherwise clauses for the Case statement, a library of external routines, and English error messages.

SBB also includes an SBBDebug interactive debugger, an SBBEdit screen editor, and a one year sub-

scription to SBBNews. For more information, contact Software Building Blocks Inc., P.O. Box 119, Ithaca, NY 14851-0119, 607-272-2807.

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*New Products listings are based on information supplied in manufacturers' press releases. 80 Micro has not tested or reviewed these products and cannot guarantee any claims.*

## DIFFERENT TRACK

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**D**OTWRITER lets you create spectacular, eye-catching letterheads, catalogs, invitations, or even books. It is just what you need to turn your dot-matrix printer into a versatile typesetting machine. And it's available for the Model 4 (yes, in native mode) as well as for the Models I and III.

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DOTWRITER includes the printing program, complete documentation, and fourteen useful sets of typefaces (60 to 90 characters in each set). We will also give you the 105 page Letterset Reference Catalog free with your order.

To use DOTWRITER, just write your text with any popular TRS-80 Word Processor, add the necessary formatting commands, and DOTWRITER will do the rest.

20 more disks are available separately. Each has 3-12 complete typefaces (60 to 95 characters in each set). These disks cost less than \$25 each, and may be purchased at any time.

If you want to create your own logos, modify our typefaces, or even design entirely new typefaces, then you will also want to order the "Letter-set Design System" (LDS). We offer LDS at half price when you order it along with DOTWRITER.

Versions are available for Epson MX-80 with Graftrax, MX-100 with Graftrax-Plus, RX-80, FX-80, C. ITOH 8510/1550, Microline 84/92/93; and Radio Shack's DMP series 200 2100. Please specify printer and computer!

Our print samples were done on an Epson, sizes vary on other printers.

Two disk drives and at least 48K of memory are required. LDS is not available in native Model 4 mode.

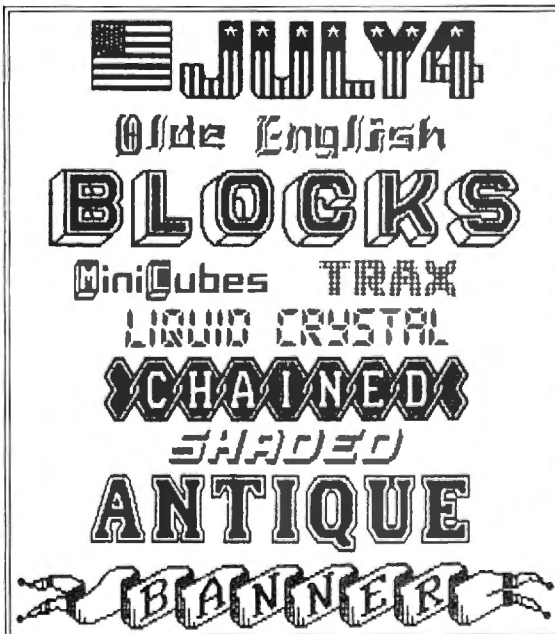
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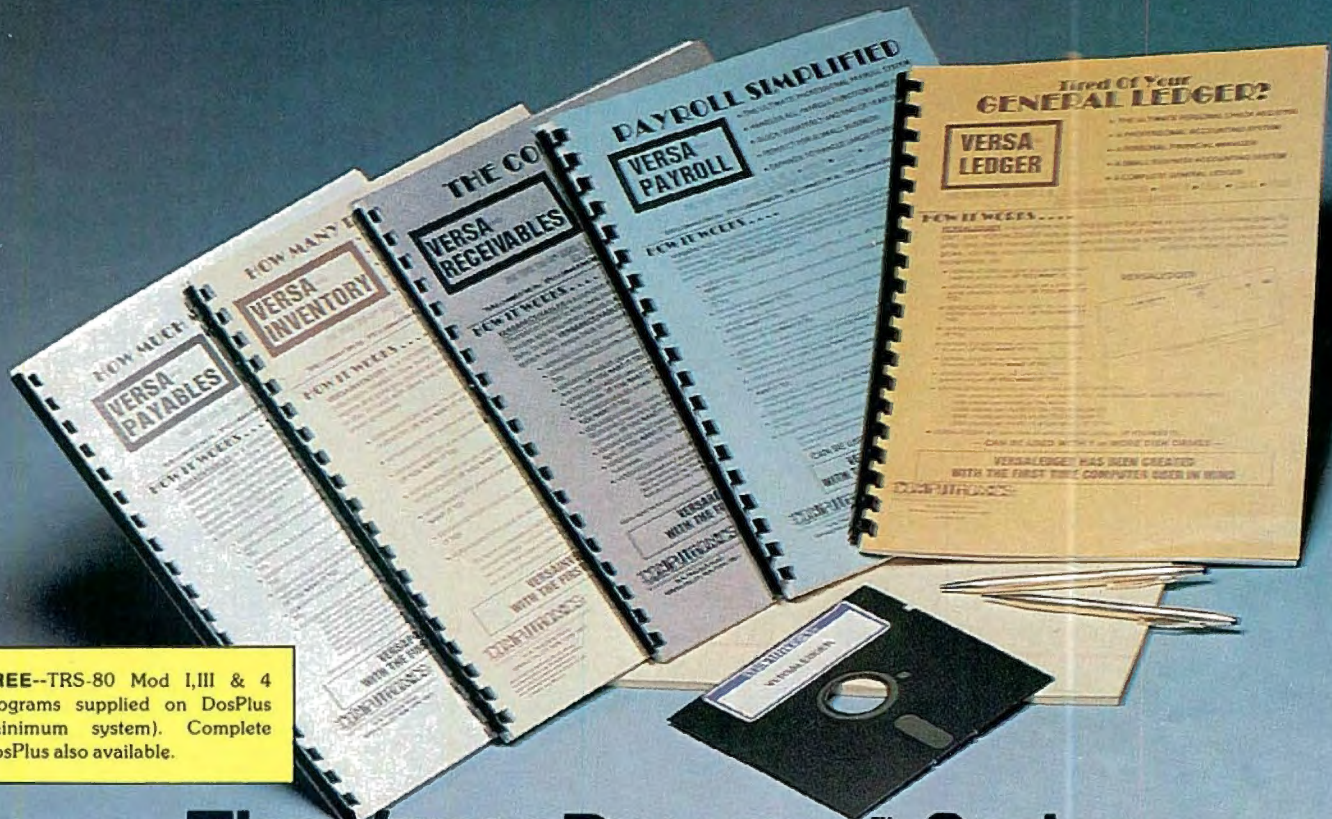
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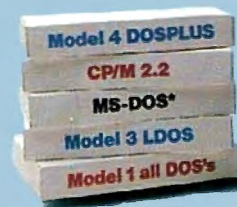
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