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June 1984
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# 80micro

T.M.

A CWC/I PUBLICATION

*the magazine for TRS-80* users*


## Going Up With the 80186

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## File Transfer The Easy Way

**Review:**
## Beyond VisiCalc With Multiplan

**The Model 4:**
## Getting the Most From JCL Files

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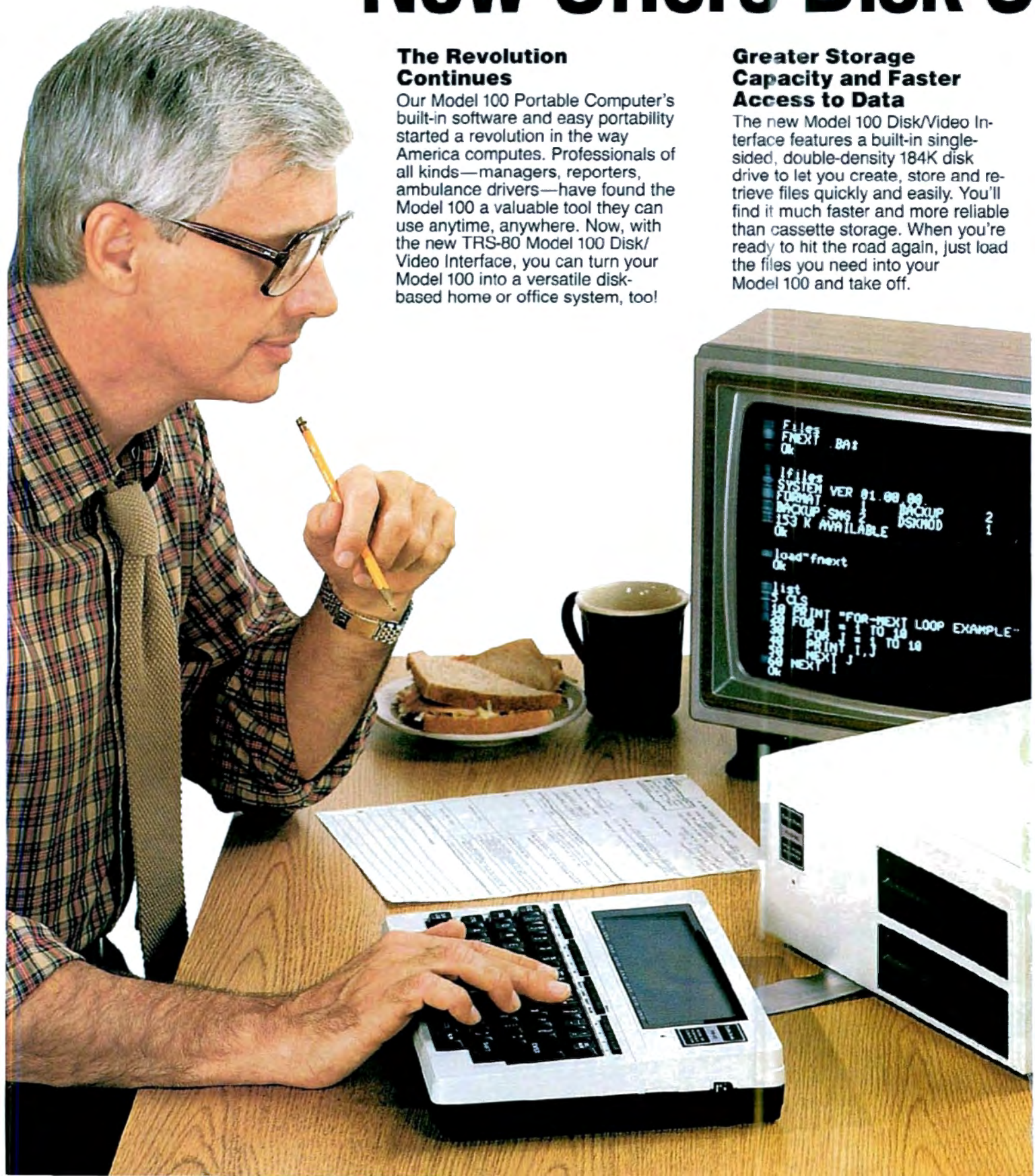

# ® Model 100 Computer torage and Video!

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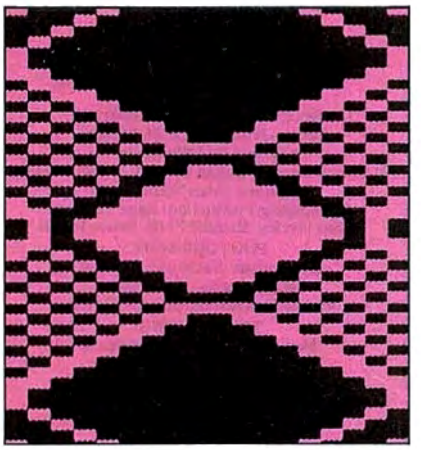
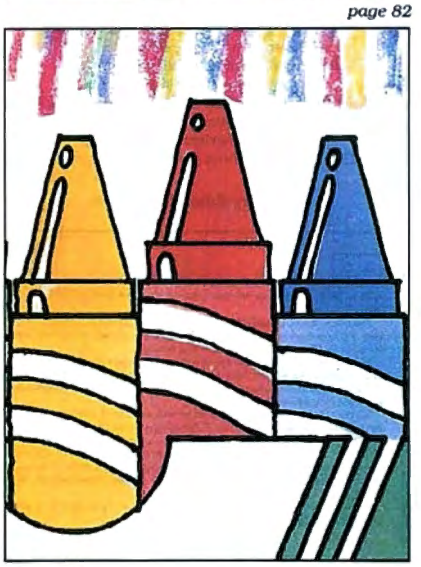
June 1984 80micro

page 50



page 82



page 31

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## Features



## Reviews



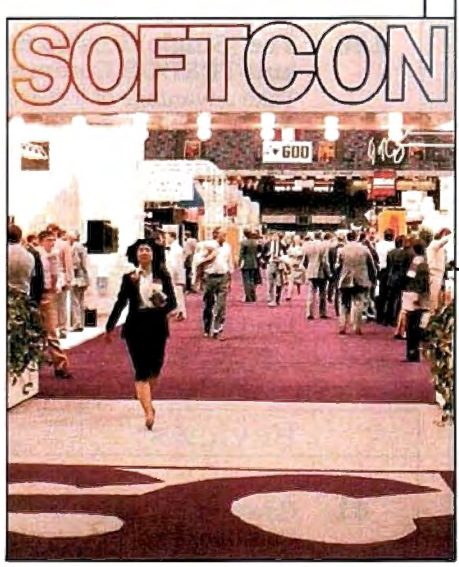
more

## C•Notes / *for the Model 100*



## Departments






*page 18*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LOAD 80 This symbol indicates that the program is available on cassette or disk. For details, see our Load 80 ad (p. 34) and the directory (p. 242).

The left bracket, [, replaces the up arrow used by Radio Shack to indicate exponentiation on our printouts. When entering programs published in *80 Micro*, you should make this change.

*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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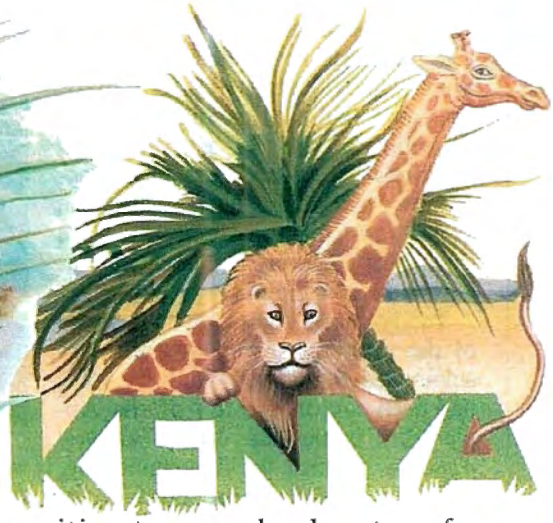


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# Tandy: The Texas Wallflower?

Tandy's position in the microcomputer market is hazy. The days when Tandy had a star to lead its line—one that was mentioned in the same breath with Apple's and Commodore's—are gone. Poor and unaggressive marketing have made the TRS-80 systems forgotten, and have given the company a personality as gray as their computers used to be.

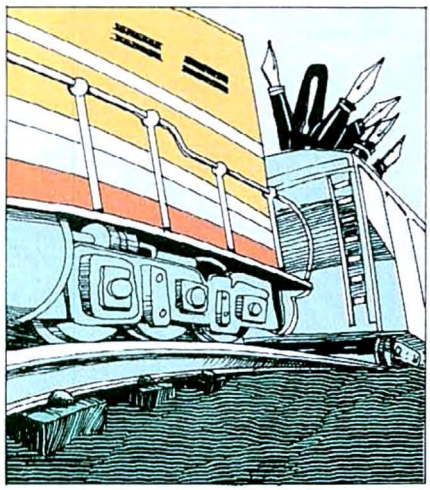
Tandy shows signs that it is aware of the problem. Company executives acknowledge privately that its voice has been lost in the din of the Apple/IBM battle. Ed Juge, formerly Tandy's director of merchandising, has been handed the responsibility of evaluating and redirecting Tandy's marketing efforts. The company hired an outside advertising agency last fall. Its TV ads, if lackluster, appear more frequently, and on such programs as the network premiere of *Star Wars* and on "Good Morning America."

But if public reaction is any indication, the folks in Fort Worth still have some work to do. People have some curious perceptions of Tandy.

Old-time computerists are downright nostalgic. They talk about Radio Shack in the past tense, reminiscing about the early days of the Z80. They tell you that they would have stayed with Tandy if the company had kept up with the industry. Most of them now own CP/M or MS-DOS computers.

Another group is angry and disillusioned. Model I owners claim that Tandy has deserted them. They feel betrayed, and, like the previous group, have turned to other systems.

A third group sees Tandy as a Johnny-come-lately to the real world—that is, the world of IBM and MS-DOS. They rave about the Model 2000 and how you'll be hard-pressed to get more hardware for the money. But they hear that it isn't IBM compatible. They wonder whether the installed base will be big enough to encourage third-party support. They ask



whether Tandy can adequately serve the business community when it has historically targeted home users and hobbyists. Their conclusion: the 2000 is a nice machine, but why risk it when you can buy an IBM PC with guaranteed support and reliability?

Tandy isn't getting respect because it lacks one thing: a strong image in the marketplace. It has failed to project itself as a leader or innovator. It has no panache.

Consider Apple for a moment. The company has adopted a breezy style that appeals directly to young, upwardly mobile professionals. It has done this partly by showing the public the names and faces behind its computers. Remember the celebrity the Macintosh team enjoyed when the Mac was introduced? The message was clear: the people at Apple are businessmen and professionals, but they're also just a bunch of guys having a good time.

Apple is also willing to take risks. The Orwellian Macintosh television ad is an example. It came under much criticism, but it got Apple a lot of press, and showed Apple as an aggressive and creative company with new ideas.

Then there's IBM and its reputation as Big Blue. The company may be huge and faceless, but people sense that its products are dependable, and that the company stands behind them. At the same time, IBM has produced the most effective advertising campaign in the industry. Just about everyone, whether or not they intend to buy a computer, has come to recognize the Charlie Chaplin figure and identify it with IBM.

Now we come to Tandy. It still sells its computers through newspaper inserts, crammed in with stereos and digital watch pens. It has responded to the Apple Mac and IBM PC ads with Bill Bixby. It has no Chaplinesque mascot, no nickname or snappy catchphrase to identify the company to consumers.

Tandy's failure to sell itself properly is disheartening when you realize that its products are highly competitive. The Model 4/4P, for instance, is a superb 8-bit machine for small-business professionals, educators, and home users. The Model 2000 clearly out-performs the IBM PC and most other MS-DOS competitors. And plenty of software is available for both.

So what's the solution? For starters, Tandy needs to reshape its identity. It needs to separate its microcomputer operations from its image as a peddler of electronic gizmos. It needs to launch a coordinated advertising campaign that presents it as a company with some pep, one that understands and caters to creative young professionals and managers.

Tandy has relied on its chain of retail stores to sell its products. It has assumed that people will somehow discover how good its computers are and pop on down to the local Computer Center to pick one up. The strategy has been successful. Even today the Model 4/4P is selling well, and apparently will do so for a while.

But the market is changing. Computer companies are spending a lot of time and money embedding themselves in the public consciousness. If Tandy is to stay competitive, it must do the same. ■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After writing your text with any popular TRS-80 Word Processor, such as NEWSCRIPT, just insert the necessary layout commands, save it to disk, and DOTWRITER will do the rest.

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One version of DOTWRITER 4.0 is for the TRS-80 Models I and III (also LNW and MAX-80), and another is for the TRS-80 Model 4 (**yes, in native Model 4 mode**). At least 48K and two disk drives are needed.

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Versions are available for the Epson MX-80 with Graftrax, MX-100 with Graftrax-Plus, RX-80, and FX-80; the C. ITOH 8510/1550; the Microline 84/92/93; and Radio Shack's DMP series 200/400/500, and 2100. Please specify your printer and computer when ordering!

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## Side Tracked

I read Eric Maloney's March 1984 Side Tracks (p. 10) with great interest and agree that the TRS-80 market has declined. He neglected to mention, however, that CP/M can open new doors for the Model III.

Models III and 4 owners can choose between several methods of adding CP/M to their systems from Radio Shack or from several other sources. Also, Model III owners can upgrade their machines to Model 4's.

CP/M makes available a vast amount of commercial and public-domain software for the Model III. Let's see more on CP/M in future issues.

*Les Weinstock*
*North Brunswick, NJ*

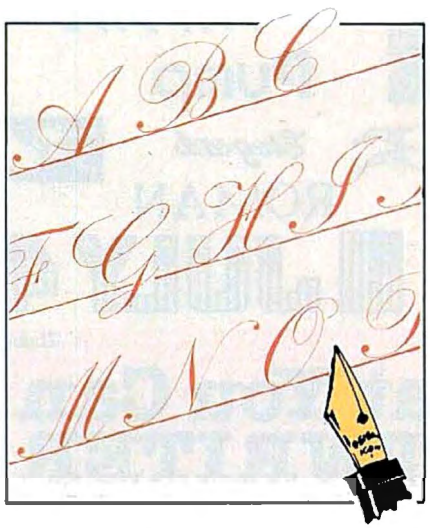
Eric Maloney's editorial in the March issue (Side Tracks, p. 10), is unnecessarily negative. I know that the TRS-80 market is in decline; however, I'm sure that many readers are discouraged by his comments.

Calling mail order buying a snake pit does a disservice to those of us who provide quality products and support. Mumford Micro Systems maintains good relations with its customers, and we are not alone.

I know of several companies that receive high praise from our customers, yet Maloney's editorial makes no mention of these people or this side of mail order. He has contributed to the distrust of *80 Micro* advertisers and the decline of the TRS-80 market.

Finally, TRS-80 customers bear some responsibility for the decline in support of TRS-80s. TRS-80 software has always been inexpensive compared to CP/M or MS-DOS programs. The TRS-80 customers' unwillingness to pay a similar price for comparable products is driving many of us out of the TRS-80 market.

Frankly, I don't believe that people who have been buying $1,500 TRS-80s



are going to start buying $3,000 IBMs. I think the market is there if software authors are willing to write quality programs, if magazines are willing to sell reasonable advertising, and if TRS-80 owners are willing to pay a reasonable price. Perhaps I'm naive.

*Bryan Mumford*
*Mumford Micro Systems*
*Summerland, CA*

*I agree that I presented the doom-and-gloom side of the issue. It certainly wasn't my intent to paint everyone with the same brush. Many companies have excellent reputations, and are unfortunately being hurt by the actions of their less responsible kin.*

*I'm not nearly as pessimistic about the TRS-80 market as my editorial implied. The Model 4 is selling well, and there will continue to be a place for it and similar machines.*

*Eric Maloney*
*Editor-in-Chief*
80 Micro

## Short-Changed

In their article "Weighing the MC68000 Against its Peers" (February 1984, p. 226), Dan Keen and Dave Dischert short-changed the TMS9900.

While it's true that the TMS9900 has only three hardware registers, Keen and Dischert failed to mention that it's based on memory-to-memory architecture, not register-to-register architecture.

This means that you must reserve 32 bytes at the beginning of any Assembly-language program for the 16 work-space registers. The advantage to this is that you can use any memory location for some operations that normally require the use of a register.

Also, the branch command, BLWP, gives you 16 additional work-space registers. Memory is only limited by the number of registers you can use. Overlays can get you past the 64K program size, and you probably won't write a program that compiles into 16 megabytes of object code.

*Mark R. Brown*
*Odessa, TX*

## Manual Override

Regarding John F. Reedich Jr.'s complaints about DOSPLUS 3.5 in the February Input column (p. 13), he should read his manual.

If he looked up CONFIG or typed HELP CONFIG, he would see that he can configure his system for 8-inch drives. Also never assume top of memory without checking 4049 hexadecimal (hex) for the current top of memory.

Both LDOS and DOSPLUS 3.5 keep drivers in high memory—it's in the manual. Mr. Reedich's program bombs because he goes up to FFFF hex without first checking what he can't touch. Instructions on use of patches are also in the manual.

Both DOSPLUS and LDOS are for the advanced user. MULTIDOS and NEWDOS80 are excellent systems if you want simplicity.

*Barry Erick*
*Dallas, PA*

## Late Introduction

Tandy's inability to get TRS-80 programs out in a timely manner is a continual problem for computer consumers. Every time a program that I need is announced as expected to be out soon, it isn't.

When I first bought my Model II, Tandy recalled all the programs because of bugs. I had to hire a programmer due to the lack of reliable programs.

My biggest complaint is the lack of Model 4 software and the delay of SuperScripsit. First, it was supposed to be out in August, then September, November, and January. The program finally came out in February 1984.

Meanwhile, Lazy Writer and LeScript had already come out with an 80-column by 24-line screen for the Model 4 with more memory for word processing. The producers of Lazy Writer and LeScript don't have the resources that Tandy does. If they can do it, why can't Tandy?

*Rod Killen*
*Killen Enterprises*
*Salem, OR*

## Tandy Responds

*Unfortunately, we have had a few delays producing some of the software for the Model 4. However, it is our policy to make sure Tandy products are manufactured to our standards for customer satisfaction.*

*Our goal is to bring to the market timely new products for our customers, but we also realize the importance of producing a quality product. We are not creating these delays to make our customers unhappy, but the other alternative is not to announce any new products until they are fully tested and available in the store.*

*Mark Yamagata*
*Director of Merchandising*
*Personal Computer Products*
*Tandy/Radio Shack*

## Stripes

Your issues contain acres of program listings that readers must copy to use. I suggest that you list future software in bar code format that a simple pen and resident program could read and store.

In every other issue of *80 Micro*, you could reprint a short article on how to construct the necessary hardware and list the software. This would make *80 Micro* more useful by saving thousands of man-hours of coding time.

*Lawrence Self*
*Richardson, TX*

*Your idea is good in theory, but ignores the large amount of space bar codes require. Also, not enough people currently own bar code readers to make it practical.—Eds.*

## Tandy Archives

How many original Model I Level I 4K micros are still in use?

*Lester R. Fritze*
*San Francisco, CA*

*About 3 percent of our readers own a Model I Level I machine.—Eds.*

## 80 ALERT

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On February 21, 1984, Omikron Systems filed for reorganization under Chapter 11. Readers who have claims against Omikron and who have not received a notice from the federal bankruptcy court should write to the United States Bankruptcy Court, Northern District of California, 205 P.O. Building, 5th and H Streets, Eureka, CA 95501.

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I think Triple-D Software has hit the right balance between software protection and the capability for user back-up: Their Arranger program comes with the registered owner's name encrypted into the program.

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This brings the moral argument against pirating to the registered owner, since his name will appear on any disk copies. I find this an excellent compromise, and Triple-D should be congratulated.

*Mike Barlow*
*Pierrefonds, Quebec*

## Cover Girl

I am pleased to see that your February 1984 cover uses a girl to depict computer competency among young people.

The enhancement of desirable role models that this cover provides proves once more *80 Micro*'s leadership in its field.

*Earle S. Libby*
*San Francisco, CA*

## Yachting Circles

My first copy of *80 Micro* was great until I got to p. 186 ("North by Northwest," April 1984).

No matter how good he may be at figuring, I won't consider going with Smith Harris on his boat. With him talking about south longitude and east latitude we'd never get anywhere.

*Mrs. Jean Niemeier*
*Poulsbo, WA*

*Oops! Our seafaring editor will swab the decks for this one.—Eds.*

---

*Send correspondence to Input, c/o* 80 Micro, *80 Pine St., Peterborough, NH 03458.*

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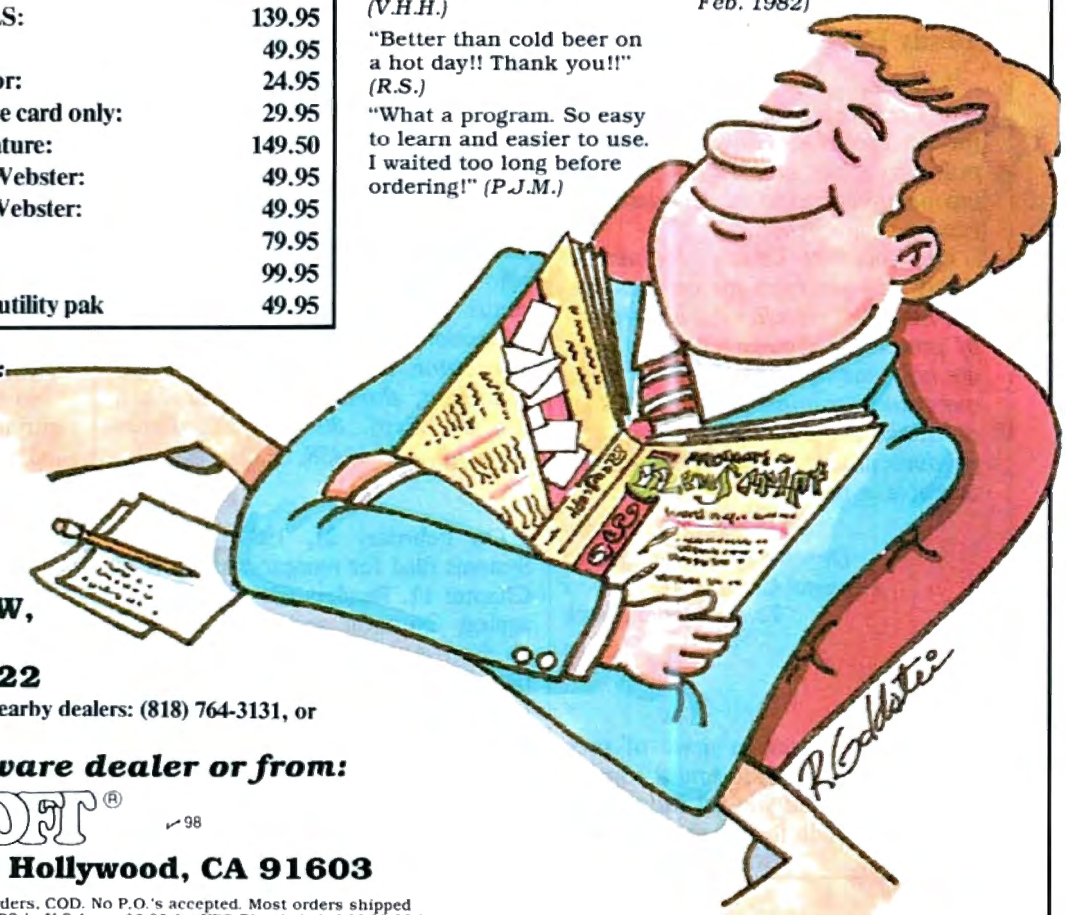

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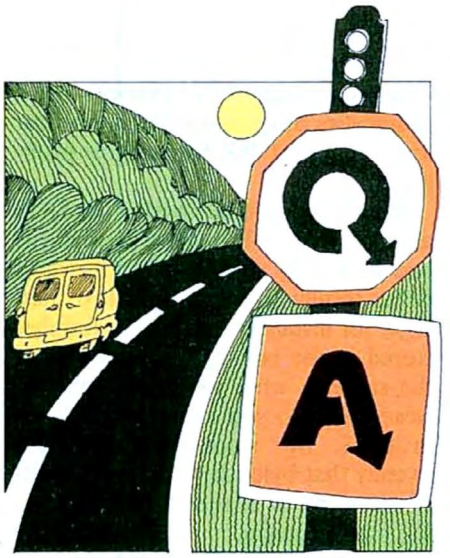
**Q:** I replaced my Model III with a Model 4. I'm running the Radio Shack 5-megabyte hard disk with LDOS 5.1.3 and many applications programs, including Super-Scripsit, Profile III+ (HD), VisiCalc, and several Basic programs. I need to find software, or someone to modify my operating system, so I can use the Model 4's 128K RAM for the MEMDISK feature and possibly for additional memory for VisiCalc, without converting all my hard disk programs. Can you help? *(A.K. Ganschow, Englewood, NJ)*

**A:** Your best source on using the extra 64K in your Model 4 is Logical Systems, manufacturer of LDOS. They are best qualified to modify your DOS to use the full 128K capabilities of your new computer.

Making the computer use the extra memory as a MEMDISK is primarily a DOS function, and won't affect your applications programs. These programs would run as though the upper bank of 64K were a small, but very fast, disk. Don't forget that you'll have to transfer anything stored in that high-bank to a real disk before you power-down the computer so you don't lose the data stored there.

Changing the programs to use the full 128K of RAM requires extensive rewrites, or special patches, neither of which is available right now.

**Q:** In the January 1984 issue James Krywalski requested information on how to modify tape




Series I EDTASM for a disk system. Modification instructions for EDTASM are given in the article "Assemble it Yourself" by Richard Koch (*80 Micro*, December 1980, p. 212). These include techniques on disk file storage.

By following the instructions, Mr. Krywalski can use EDTASM to enhance itself. *(Stuart Cole, Gulfport, MS)*

**A:** Don't know how I missed that one in my reference books. Thanks.

**Q:** In your November 1983 column (p. 312), D.R. of Mason City, IA, had a problem writing to tape using recorders other than his CTR-41. The problem might stem from the different uses of the jacks.

The AUX jack and MIC jack are in series on the CTR-41 and the dummy plug must be in the MIC jack to record via the AUX jack. The CTR-80 puts these two jacks in an either/or circuit arrangement. If you put the dummy plug in the MIC jack, it disconnects the AUX jack, ignoring any data coming from the computer. The solution is to remove the dummy plug from the MIC jack.

I found an answer to the Model I Expansion Interface oxidation problem. I apply copper and brass tarnish preventative polish on the edge connectors every four to six months. I haven't had any system crashes or other line problems since I started doing this. Be sure to use a preventative and not a remover.

A suggestion for readers who have a Trisstick or Alpha Joystick and are tired of taking them apart to repair them is to cut the joystick cable from the interface and wire it to a Radio Shack 9-pin mini plug (part number 276-1537) using this arrangement:

```
  6 7 8 9
1 2 3 4 5
Pin 1 = White wire
Pin 2 = Blue wire
Pin 3 = Green wire
Pin 4 = Brown wire
Pin 5 = not used
Pin 6 = Orange wire
Pin 7 = not used
Pin 8 = Black wire
Pin 9 = not used
```

If R.L. of Bowie, MD (who had cold system problems) installed the EI memory himself, and it's faster than 250 ns RAMs in the keyboard, he could try swapping the EI and keyboard RAM. For some reason, mixing the faster RAM with the Radio Shack RAM gives write errors in the low bank of 16K. The slower chips work fine in the EI (C000–FFFF hexadecimal [hex]) with the fast ones in the keyboard (4000–7FFF hex). I know of two systems that had data read/write problems corrected by this switch. *(Larry Tindle, Houma, LA)*

**A:** I've never tried using copper polish on my system, but it should work. Thanks for the thoughts on the CTR-41, joystick, and memory

problems (although I've been told that Radio Shack uses 350 ns RAM chips as their standard issue).

**Q:** Recently several programs on one of my disks went bad. Among these are Meteor/CMD, FS1/CMD (Flight Simulator), and Asteroid /CMD. When I try to run these games I get an Error 34 (attempt to use non-program file as program). What does this mean, and can I fix it? I have Super Utility Plus.

Also, when I try to run Pinball /CMD, I get Error 35 (memory fault during program load). Is something wrong with my memory?

I have a Model III with two drives, 48K RAM, Gemini 10X printer, and cassette recorder. I also have some machine-language programs on tape that I can't get to disk. I've tried the Tape command in TRSDOS, but the file won't execute properly. I transferred several other programs, such as Galaxian and Attack, just fine. Is there any way to get the others to disk? How do I find the start, end, and execute addresses for a machine-language program after I load it?

Last but not least, here is a patch for D.C.V. (June 1983, p. 355) for fixing Model III Debug to inspect and change addresses below 5000 hex:

```
PATCH *5:0 (ADD=4EDF,FIND=38E6,
CHG=0000)
PATCH *5:0 (ADD=4F04,FIND=D0,
CHG=C9)
PATCH *5:0 (ADD=506E,FIND=38E3,
CHG=0000)
```

*(S.T.V., Pearland, TX)*

**A:** The problem with your first set of programs sounds like a glitch on the disk. Programs have load markers at periodic intervals (Basic program, machine-language program, core-image, or data-file). If one of these load markers is altered, the computer gets confused and thinks that it's loading the wrong type file.

The glitch could have been caused by a voltage spike at a time when you were writing information to the disk, forcing the drive head to skip across one or more tracks and destroying the files it trespassed as well as the file being written. This spasm only takes a microsecond or two, and the computer might not notice its occurrence. If this happened, you can't recover the damaged programs without rewriting the erroneous areas. Since few people know the machine code stored on disk, this would be a Sisyphean task. It would be better to copy the programs over from your back-up disk.

The Error 34 can also result from a bad byte in RAM. The memory fault error indicates that something's wrong with your computer's memory—use a diagnostics program to check out your lowest bank of 16K for possible problems.

Your programs all overlay the DOS area of RAM. It's possible that the bad byte is in an area of DOS that's either totally harmless (in a text message, for instance), or that the number stored in the bad byte happens to be the same as what the DOS wants to store there, so you never see the error in DOS. But since these programs overlay that byte, they try to put a different number in that location, causing your problem.

This could also explain the Error 34 of the previous programs; they store the load file format byte in RAM while they load the associated portion of the program from disk. If that byte happens to hit the bad byte, making it the wrong value, the DOS gets confused, and reports the Error 34. If this is the case, replacing the bad RAM can correct the Error 34 and Error 35 problems.

It's unfortunate, but you can't transfer some tape programs; they just won't work there. A possible conflict is that the disk-transferred program overlays the DOS as it loads off the disk. As a result, the DOS gets lost and can't finish the job.

The only solution, which doesn't always work, is to append an offset routine to the program. The offset routine lets you load the program from the disk into high memory, then transfer the entire program down to its proper execution position in memory. Since the DOS finishes loading the program before the program overlays the DOS, you have a better chance of getting the program to work.

The problem with this approach is that the program might require that you enable the interrupts; on receiving an interrupt, the computer can reset itself. Another problem might be that the program requires that you initialize RAM from Basic, and it expects certain bytes to have specific values that pertain only to Level II Basic. The DOS, of course, has different values in these locations, causing execution problems.

One other reason why you can't transfer a program to disk is that it might not load into memory in a straight sequence. That is, the order of the program on tape isn't the order the program occupies in memory. One example of this type of program is one that puts messages on the video while the program loads.

Finding the start, end, and execute addresses for a machine-language program is difficult, for the reason I just gave above. In general, the first information that loads from tape is the start, end, and execute addresses.

Finding these after loading a program is a matter of using a machine-language monitor to load the program. Some programs report this information as a matter of course; others make you search memory.

**Q:** James Krywalski, in the January 1984 column, asked how to transfer Series I EDTASM from tape to disk. Below is a program with instructions on how to do this. Input and output are still on cassette, but EDTASM loads from the disk in about two seconds instead of several minutes.

```
10 A1=65000-65536:A2=53371-65536
20 FORI=0TO13:READJ:POKEA1+I,J:
POKEA2+I,J:NEXT
30 FORI=1TO6:READX,Y:POKEA2+X,Y:
NEXT
40 END
50 DATA 17,160,140,33,70,70,1,218,67,237,
176,195,25,26
60 DATA 1,70,2,70,4,160,5,140,12,234,13,75
```

First, hold down the break key and turn on the TRS-80. CASS=L. Second, type in and run the program. Third, load the tape EDTASM (SYSTEM *? EDTASM). At the next prompt, type /65000 and hit the enter key instead of just typing in the slash. This transfers execution to the machine-language program POKEd into place by the Basic program. This routine moves EDTASM into high memory and returns control to Level II

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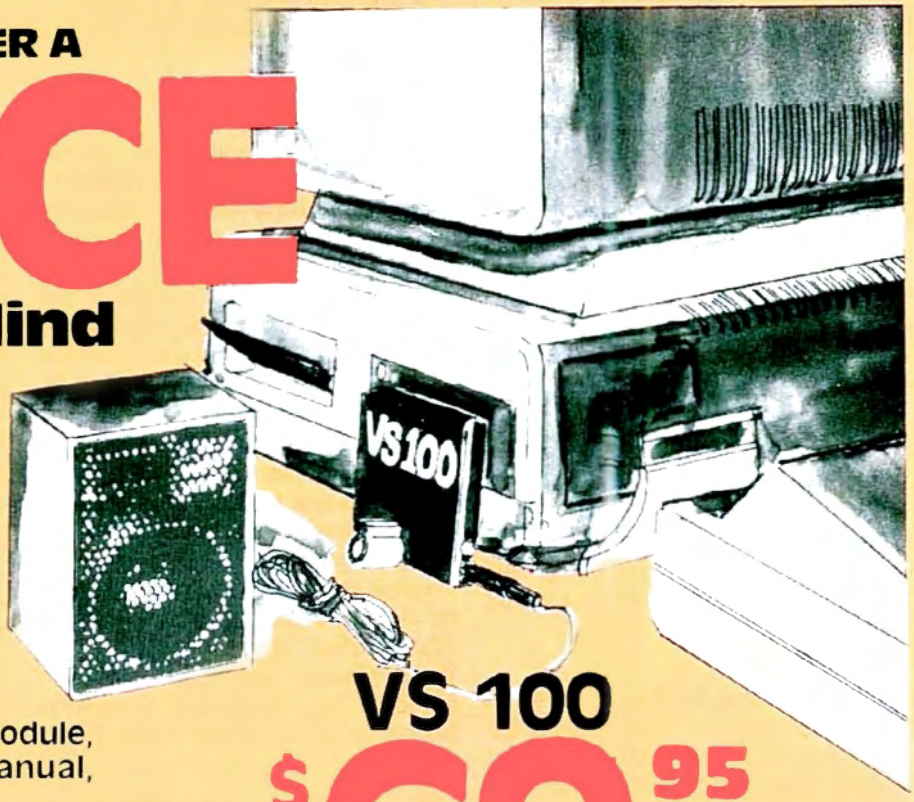


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Basic (the Ready prompt will appear).

Now push the reset button and go into DOS. Type in DUMP EDTASM (START = 8CA0, END = 0D08A, TRA = 0D07B). You now have a copy of tape EDTASM on disk. It loads when you type EDTASM and press the enter key at the DOS prompt. First, it loads into high memory (so it doesn't overlay DOS), then relocates itself to its normal operating address before executing normally. The usual input/output is by cassette tape, as before. *(Byron Drachman, Lansing, MI)*

**A:** For those of you who can't find the *80 Micro* issue that Stuart Cole cites, containing the patches to EDTASM, this is another method.

**Q:** Regarding M. Fagan's letter in the January 1984 column (p. 28), I have a Model I 48K disk-based system with NEWDOS80/V2 EDTASM, and I have to type A/NO/WE to assemble with the switches. Unfortunately I don't remember where I discovered this, but it makes debugging easier. *(Larry Pool, Toledo, OH)*

In response to Mark Read's query regarding the use of a Do chain with Scripsit, he should consider purchasing Lazy Writer, which has a "minido" command in the latest version (3.4 for Model I/III, 4.0 for Model 4). With it you can enter several commands on the same command line. For example, enter LW, call a text file, call an X key, use an X key function, and call an extension. You can program the X key as a Print command.

Better yet, LAZYDO contains a full set of Do features and lets you do almost anything with your word processor and DOS features. *(Sidney Bloom, Frederick, MD)*

**A:** I appreciate the comments, but I think Mark wanted to find a solution that wouldn't require him to purchase and learn an entire new word processor, although that might be the best solution given Scripsit's shortcomings.

**Q:** Thomas Rogers' problem with numerical analysis (January 1984, p. 26) lies in the fact that 1/10 is a number that can't be defined with precision in binary, just as ⅓ can't be defined with precision in decimal.

When you use an indefinite number through several hundred iterations, the error tends to grow in proportion. Exploring possible ways to minimize this error is one of the many facets of numerical analysis. To find the solution, use a step size that is infinitely definable. Generally this is a reciprocal of a power of two—take the number two and raise it to some power then divide one by this solution.

This gives you an infinitely definable number (1/1,024 is a good choice; it's one divided by two to the tenth power). This gives plenty of precision and doesn't encompass any iterative errors. For more information on numerical analysis, read *Numerical Mathematics and Computing* by Ward Cheney and David Kincaid, (Brooks/Cole Publishing Company, Monterey, CA). *(Paul Zoba, Nashville, TN)*

**A:** Thanks for the additional information on dealing with imprecise iterations.

**Q:** I'm using a 48K two-drive Model III with SuperScripsit and I'm having trouble storing long documents. I write fiction pieces that average 40 pages (250 words/page), totaling 10,000 words. I write between five and eight pages a day and store them in a file on a data disk in drive 1. Then I copy the document from the data disk to the system disk in drive zero, and put a back-up disk in drive 1 and recopy the file from drive zero to the back-up disk. This works well until I reach the 26th page when the system disk runs out of space (I removed all unnecessary elements from the disk to maximize space).

When the system disk runs out of room, there's no apparent way to copy the file to a back-up disk. The only way I can continue is to open a new document and repeat the process. Furthermore, I'm not getting the full benefit of storage space for a single document on my data disk.

Would adding a third drive enable me to copy or back up directly from drive 1 to drive 2?

What if I were able to store 30,000 words on the data disk, as Radio Shack specifications state. Could I load this text into the computer when I want to either add to or edit it? When editing, does each operation use space that displaces portions of the disk's capacity?

Some place in the SuperScripsit manual it states that there are 256 spaces in each line and 66 lines to each page. Does this mean that the machine counts off 256 characters? And further, if the title page has only one line does the machine count it as a full page used? Would my overall operation be improved if I used a DOS other than TRSDOS? *(Otto Weill, Sun City West, AZ)*

**A:** First of all, why don't you just use the Backup command to copy the disk in drive 1 to a back-up disk? Treat the original disk as a master disk, building and filing each story on it until the next story would exceed that disk's capacity. At this time, start a new master disk and archive the previous disk.

Other than that, yes, adding a third disk drive would let you copy files directly from drive 1 to drive 2. SuperScripsit stores your files as blocks of characters; when any particular block exceeds memory capacity, it's put on disk to make more room in memory. This way you can easily have a document that exceeds the available memory left after loading SuperScripsit which, incidentally, takes about 20K (far below the document size of 30,000 words—180,000 characters).

When you edit, each time you add characters, the size of your file increases; each time you subtract characters, the file decreases. The actual operations neither add to nor subtract from the total document size.

If your title page only has one line on it, 30 characters long for example, that's all the space taken up on the disk.

Finally, overall operation would be improved if you switched to a new DOS. Most current DOSes include a special copy program that lets you copy a large file from one disk to another without having to copy it to drive zero first.

Now for some general comments about TRSDOS and Scripsit. The most recent version of SuperScripsit is 010203. This version has corrections for a block freeze error, merge error, and end-of-file error, present with pre-

*Continued on p. 203*

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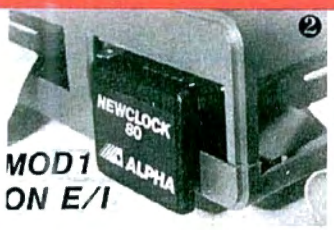


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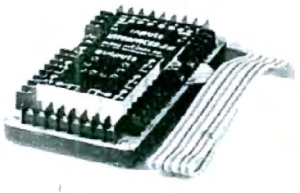

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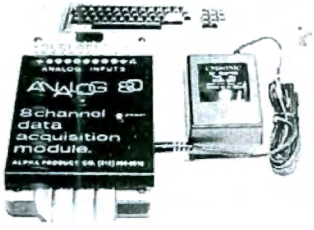
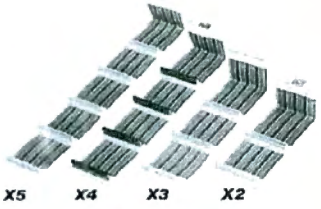



**8 channel 8 bit Analog to Digital converter.** Your TRS-80 can read voltages, temperatures, pressures, light levels, etc. • Input range: 0 to 5.1 Volts. • Resolution: 20mV. • Conversion time: 120 microseconds. In BASIC, you can take up to 100 readings per second. • Port address: selectable. Up to 8 Analog-80's can be connected to your TRS-80 for a total of 64 channels!
Connection: Model I: 40 pin I/O bus. Model III, 4, 4P: requires 50-pin bus adapter ($39.95). Comes complete with power supply, cable, and manual.

## Special Cables




**Disk drive extender cable (8")...C160:$9.95**
Y-Cable for Mod I bus (40 pin): • **X2-40**...$29 • **X3-40**...$44 • **X4**...$59 • **X5**..$74
Y-Cable for Mod 3 & 4 bus (50-pin): • **X2-50**...$34 • **X3-50**...$49 • **X4-50**...$64
Disk drive cable (34 pin): • 2-drive...**C162:**$32 • 4-drive...**C163:**$45
Extension cable, 4 foot: • For printer and drive (34-pin)...**C165:**$22
• For Mod I bus (40-pin)...**C167:**$24 • For Mod 3 & 4 bus (50-pin)...**C169:**$28
Keyboard to E/I (40-pin, 8")...**C161:**$21 If this is confusing, send for our Cable Flyer.
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3) We ship 90% of our orders within 24 hours.
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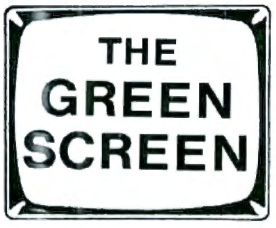


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# Speaking Softly

*New Orleans' Softcon attracts little innovation.*

edited by Eric Grevstad

When people in New Orleans give a party, they tear up the streets. During Softcon, the Feb. 21–23 trade show billed as the software-only answer to Comdex, half the avenues around the Louisiana Superdome were being resurfaced or repaired, as the city readied for Mardi Gras in March and the World's Fair in May. Detours were everywhere. Cab drivers swore.

And software vendors, for the most part, were bored. Sponsors Northeast Expositions dedicated the show to the idea that Comdex and the National Computer Conference are too big and that programs deserve their own exhibit; helped by massive advertising, the first Softcon promised to be a success—it was the largest first-time trade show of any kind, and the third largest computer event even before the festivities began.

On the other hand, it came only two months after Las Vegas' Comdex/Fall. Rather than exciting new products, there were mainly identical displays; Microsoft, for instance, set up the same booth, though with version 1.1 of Word instead of version 1.0.

Three star attractions—VisiCorp, Digital Research Inc., and MicroPro—were no-shows, and nearly everyone on the Superdome floor voiced sentiments similar to Ovation Technologies' marketing vice president Michael Walrod's: "I think there are too many shows. How many can executives attend? You go to shows to see new products, and how can [companies] produce new products when they have to go to trade shows every other week?"


*The scene in the Superdome. (Photo by Amy Campbell)*

### Not Quite Showed Out

There were some things worth seeing at Softcon, if you didn't mind the arena's chilling 48-degree temperature (the air conditioning was finally switched off late the first day). For one thing, despite Northeast's plans, some of the biggest draws were hardware vendors: DEC and Hewlett-Packard appeared in force, and Macintosh drew crowds to the Apple exhibit.

IBM unveiled the blandest machine in New Orleans, its 30-pound transportable PC—a clone of suitcased IBM clones like the Compaq. The Big Blue briefcase costs $2,795 with 256K RAM, 9-inch monitor, and one disk drive; a two-drive model is $3,220.

And Commodore, changing its mind once again, announced it would ship its 264 home computer in late spring, after previewing it at January's Consumer Electronics Show and then postponing it indefinitely. A Commodore competitor, Atari, downplayed its own micros but showed an impressive lineup of AtariSoft programs for Apple and IBM owners.

The show's long shot blended software and hardware marketing: Dysan, trying to keep its 3¼-inch microfloppy from falling under Sony's 3½-inch steamroller, not only showed big-name programs like WordStar and SuperCalc3 in 3¼-inch format, but announced plans to sell 3¼-inch drives as aftermarket add-ons.

Generally, Softcon seemed to have a lighter tone than the MS-DOS-dominated Comdex; besides Commodore and Apple's strong showings, there was a lot of home and educational software. Serious 16-bit programs still held center stage, though, and those products' key word was "integrated."

### Lotus' Second Movement

The leading new product at Softcon was Symphony, Lotus Development Corp.'s upgrade of 1-2-3. Its fast spreadsheet, coupled with graphics and data-base management capabilities, has made 1-2-3 today's best-selling program by far; Symphony adds word processing and communications features, plus the ability to link with other MS-DOS applications. Lotus expects it to reach retailers in July at $695; 1-2-3 will stay on the market at $495.

The most advanced integrated package to date, Ovation, stepped into the limelight as part of Tandy's Model 2000 library last November. At Softcon, Ovation Technologies

# In Touch
## The Alpha Newsletter

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

■ **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

Wendell R. Henry

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# What do people say about Beck diskettes?

*"The best buy in diskettes today! The price/performance is unmatched by anything we've found. It's the kind of "value" that you recommend to your friends."*

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Jefcoat Pest Control
Bay Springs, MS

*"They are the BEST in both PRICE and QUALITY."*

Dr. S.J. Tassinari, President
Long Island Laboratories, Inc.
St. James, NY

*"The diskettes I ordered from Beck were of high quality and low price. Ordering was simple and delivery was amazingly fast."*

Alice H. Blacksin
New England Telephone
Boston, MA

*"The quality of BECK's product is certainly equal to that of the major brands and BECK's pricing is superior. Ordering is easy and delivery is extremely fast; you may be certain of receiving many future orders from us."*

Walter C. Janney III, President
Compucepts, Inc.
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*"Rapid service, low cost and high quality have been my experience with Beck."*

Sanford Low
Cambridge Studios
Cambridge, MA

*"Your disks have proven to be equal or better than the best. Your price, and service within 24 hours, puts you way ahead! More people should know how great you are!"*

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James C. Beck (No relation)
Pyramid Accounting Systems
Denver, CO

*"The disks work great but best of all was getting a pleasant helpful person when I called to order."*

Robert M. Carper
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*"The service and the ease of ordering is exceeded only by the quality of the product itself. Truly comparable to the big guns in the storage media industry!"*

R.A. Proulx
Oregon Marine Construction, Inc.
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*"Your business operation is excellent. Phone order entry is handled quickly & courteously. Shipment is made as promised – quickly. Packaging is good and product is received in perfect shape. Quality is perfect – zero defects. We will certainly re-order from Beck."*

Eugene V. Agee
Aladdin Heating Corp.
San Leandro, CA

# "Best buy in diskettes today"

Craig A. Jefcoat

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*Softcon debuted with a grand entrance. (Photo by Amy Campbell)*

showed publicly the demonstration reserved for Comdex/Fall press, but the all-in-one, windowless program is still some months from the shelves. Communications director Mark Minkin said his firm would announce a delivery date, if not actual deliveries, by Comdex/Spring in May.

Meanwhile, other firms have stepped up to challenge Ovation. Besides windowing products like Symphony and a new version of the pioneering Context MBA, windowless programs like Mosaic Software's Integrated 6 and Softrend Inc.'s Aura rival Ovation's capabilities, if not its elegance. (See "Are Windows Intuitive?" later in this section for a look at the clash of integrated design approaches.)

On a smaller scale, several firms announced ways to integrate or tie together separate programs. Information Unlimited Software's EasyPlan uses windows to link family members like EasyWriter or EasyFiler; Schuchardt Software Systems hopes you'll buy all 10 of its programs (InteWord, InteCalc, and so on), but will sell you InteMate alone if you want to connect existing software.

And some companies settle for data compatibility. Software Publishing Corp. added PFS:Access, an easy-to-use terminal program, to its popular PFS family; there's no PFS:Windows yet, but the firm's home and low-end customers don't care.

### No TRSDOS, Some Sideshows

The only thing missing from Softcon was TRSDOS. Radio Shack didn't have a booth, though Tandy and other publishers had good news about Model 2000 software (see following story), and the only 8-bit TRS-80 program in sight was Anitek Software's LeScript. Company president Peter Ray told *80* that his Model 4 word processor's sales have been good, but that he was at Softcon primarily to sell customized CP/M versions.

Finally, there was the usual trade-show hoopla. Spider-Man and the Incredible Hulk plugged Adventure International's new Marvel Comics graphics games; RDS Software's spokeswoman juggled balls and clubs to promote "data base dexterity."

And Houghton Mifflin Software had potentially the classiest exhibit, a booth decked with quotations from Houghton authors like Thoreau, Emerson, and Henry Adams. Every hour, a ventriloquist in front of the booth chatted about Houghton's software with her rabbit hand puppet. ■

*—E.G.*

## The February Thaw

*Model 2000 software at Softcon.*

**by Amy Campbell**
***80 Micro* staff**

Compared to other press parties (Dynatech Microsoftware rented the *Creole Queen* for a Mississippi cruise), Tandy's Softcon Eve reception at the Royal Orleans Hotel was unpretentious. But the news—Lotus' 1-2-3 ($495) and Sorcim's SuperCalc3 ($395), to be distributed through Radio Shack stores for the Model 2000—made up for the boring hors d'oeuvres.

And, once the show opened, there were more encouraging words for Tandy's MS-DOS micro. Critics gave the 2000's performance rave reviews at its Comdex/Fall debut, but outside software companies were slower to endorse the 80186-based machine. By the time Softcon opened its doors, though, third parties were beginning to realize two things: The 2000's speed and graphics enhance any application, and Tandy's a big friend to have on your side.

Speed? Ed Juge, Tandy's director of market planning, told *80 Micro*, "According to Lotus, [1-2-3's] running as much as six times faster [on the 2000 than on the IBM PC]." LaDonna Womochel, head of Fort Worth's software product planners, added that Sorcim had timed a SuperCalc3 sort at 12 seconds on the 2000 to 35 seconds on the IBM. (For those wondering which integrated spreadsheet to buy, Womochel described SuperCalc3's graphics as "more flexible," while 1-2-3 offers "some more number crunching.")

As for high-resolution graphics, Model 2000 product line manager Don White described PC and Tandy pie charts as "basically the difference between an egg and a circle."

While the 2000's specs are turning the tables on those who thought Tandy goofed by not making a strictly IBM-compatible micro, software vendors are finding Tandy's distribution system a bonus in today's volatile market. Ovation Technologies teamed up with Tandy before either Ovation software or the Model 2000 appeared; today, vice president of marketing Michael Walrod expects Radio Shack stores "to account for 10 to 15 percent of our total sales."

Getting involved with Tandy "makes good sense for us because of their sheer size and power," admitted Mark Farnell, marketing vice president of Information Unlimited Software. "They're retailers *par excellence*." Farnell said that IUS' EasyWriter I and II were in the "redocumentation phase" after successful Model 2000 tryouts, and that making the rest of the line available for the 2000 was "our highest priority."

### To Market, To Market

Only a half-dozen exhibitors had programs running on Model 2000s at their booths, and even some of the 20-odd products on Tandy's November list, such as Tandy versions of PFS:Write and Microsoft Word, were still overdue (see *80 Micro*, January 1984, p. 73). However, as newcomers like 1-2-3 indicate, Tandy is actively drumming up support—White roamed the Superdome looking for new software recruits, and words like "helpful" and "supportive" were beginning to replace "you've got to be kidding" as answers from third-party vendors asked about Tandy cooperation.

Most important, a majority of arena exhibitors said they planned to bring their software to the 2000 market. Alpha Software Corp. vice president Selwyn Rabins described his firm's Data Base Manager II, a $295 DBMS that integrates with users' existing word processors or spreadsheets, as six to eight weeks away: "We're negotiating now with Tandy [as to] how we'll market the package."

Another integrated package, Software Products International's Open Access, combines word processing, data-base management, graphics, communications, and scheduling programs into a $595 bundle. SPI's Camille Joyce told *80* before Softcon that "We're working on [Open Access] right now with Tandy. We don't know the exact date it'll be ready, but I'd say approximately in the second quarter."

Intuit ($395), a six-function, windowless integrated program, made its first appearance at Softcon; Noumenon Corp. president Michael Mead said his company's product would be running on the 2000 within a month. "[The 2000 is] one of the best machines I've seen," he said. "[It makes a] tremendous difference in [the] software's performance, especially the graphics."

The opposite of integration is vertical market software, and the 2000 is attracting its share of that. Real Estate Management Software proudly showed a 2000 at its booth, while AutoCAD president John McLeod felt the Tandy's "speed and graphics make it an exceptional drafting tool" for his computer-aided design program.

Other firms boasting 2000 compatibility are Pyramid (the Number Cruncher series), Open Systems (Software Fitness accounting), Softstar (Business Planning Tool), Bristol Information Systems (Bisiness), SoftCraft (Fancy Font System), Cdex (35 specialized training programs), and Ryan-McFarland (140 companies' RM/Cobol software).

### Overcoming Ignorance

While phrases like "tremendous performance," "great speed," and "super graphics" occurred again and again, some exhibitors haven't learned the 2000's worth. Several ill-informed vendors dismissed the Tandy as an IBM clone or gave a vague "If it runs MS-DOS it'll run our program," and one "Trash-80" scoffer outside the Superdome said, "[Tandy] took away the gunmetal gray, but it's still a piece of junk."

"Anyone who views the machine as an IBM clone certainly hasn't seen one up close," retorted John Hamilton, marketing vice president for MAI Basic Four Business Products, who chose the 2000 as the first micro to carry their mini and mainframe accounting software. "Its performance is just phenomenal, and anyone who thinks otherwise hasn't had their hands on it."

Nevertheless, the Model 2000 still has something of an image problem. The framework is there for software support at several levels (through formal agreements with Tandy, the new Express Order catalog program, and independent suppliers), and the machine has attracted nothing but praise as last winter's hesitation—"Well, we haven't seen it"—starts to thaw.

There are pockets of discontent over Tandy's former unwillingness to supply technical information or encourage outside software, but that's changing fast. The 2000 is still playing catch-up, but it could soon pull ahead in the MS-DOS software race.

On the other hand, some people haven't heard of it yet. One booth worker, asked whether her company's products ran on the new micro, drew a blank: "I don't know. Let me find out," she said. "What was that name again...the Dandy 2000?" ■

## The Whole Tandy Catalog

*New software, new strategies.*

Every software company supports the IBM PC and dozens of booths at Softcon boasted "Macintosh Development Team" posters, but Tandy is moving fast to change its standoffish image when it comes to outside software. Besides Model 2000 announcements from Lotus, Sorcim, and other companies, there's Fort Worth's new Express Order system—TRS-80 owners' ticket to a world of third-party programs.

According to Ed Juge, Tandy's director of market planning, today's "few sheets of paper" listing TRS-80 software will grow to a catalog of programs in every Radio Shack store. Compared to in-house products like Scripsit and Profile, Express Order

*Several Softcon exhibits featured the Model 2000. (Photo by Amy Campbell)*

items will benefit only from Tandy's distribution system; the packages won't carry the Tandy brand, and individual publishers are responsible for after-sale support.

But that distribution system, as Juge points out, is a small vendor's dream—"It'll be available through any store you walk into, regular Radio Shack stores, Computer Centers, dealers, franchises. When you order something, it'll be shipped out of Fort Worth and delivered in about three or four days.

"We're having an awful lot of people show a lot of interest [in the program]," Juge said. "Perfect Writer is already in the warehouse, and WordStar should be there this week. Data Ace is probably not very far. I've signed contracts on those units, and I think we've signed contracts on another eight or 10 [so far]."

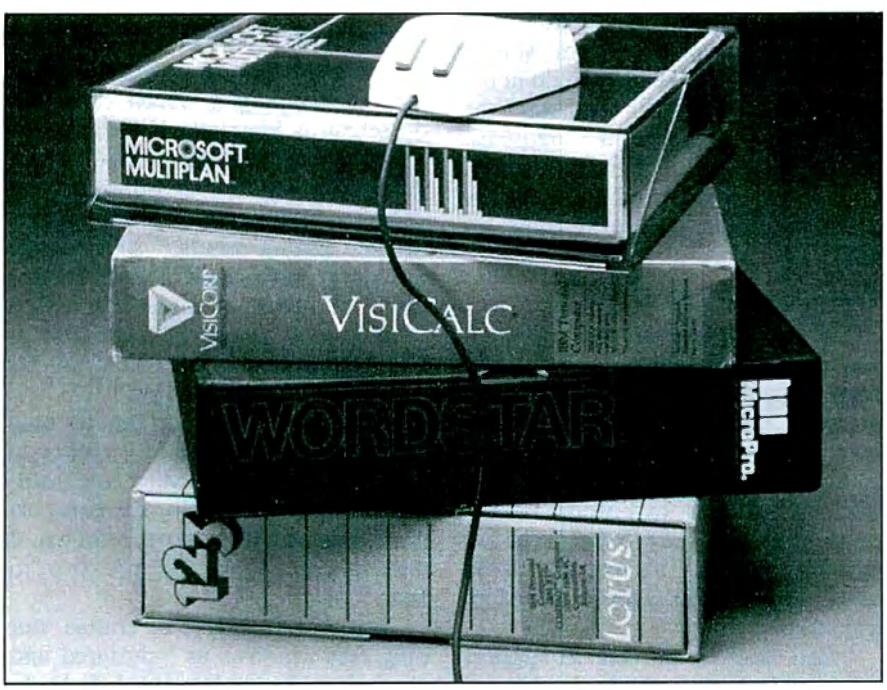
And, though MS-DOS programs for the Model 2000 should fill most of the Express Order catalog, Juge said, "There will be products in that program for different computers." Mark Yamagata, director of merchandising for personal computer products, told *80*, "We're definitely going to have some for the 4," mentioning Ashton-Tate's Friday! as well as Data Ace and WordStar.

The Express Order lineup, Juge said, won't replace official Tandy-supported products like dBase II or MultiMate: "If somebody walks into the store and says 'I want a word processor,' we'll probably demonstrate a word processor, whichever one we sell.

"But we believe there are a lot of people who've either used WordStar or someone's told them about it or whatever, and they come in and say 'I'd like the Tandy 2000 but do you have WordStar for it?' And the manager can say, 'I don't have it in stock, but I can order it.'

*Tandy has other plans to compete with Apple and IBM.*

"We're not going to have any software that has to be shown to sell. We're not going to go into that program and pick up something nobody ever heard of and try to make a star out of it," Juge concluded. "But we'll have what people ask for, and we'll put in some vertical market software that makes sense in its particular market. And if something was to start selling 200 copies a month, we'd probably move it into the stores."




*Tandy plans to attract today's top programs. (Photo courtesy of Microsoft)*

Yamagata put it more bluntly: "[The program's for] someone who already knows about the software. It's a person that knows what he wants. Otherwise, we'd prefer to sell what we have and tell them that we fully support what we have.

"It's a sort of experiment on our part to see if these things are better than ours, and if WordStar sells better than ours, maybe we made a mistake and should put it into every store."

**A New Image**

As if the Express Order program and a growing list of Model 2000 publishers weren't enough, Tandy has other plans to compete with Apple and IBM. There's Juge's new title, for instance; as director of market planning, he'll be responsible for the promotion of high-tech products ranging from computers to cellular radios, leaving the Shack's TV antennas and Realistic Clarinette speakers to other marketers.

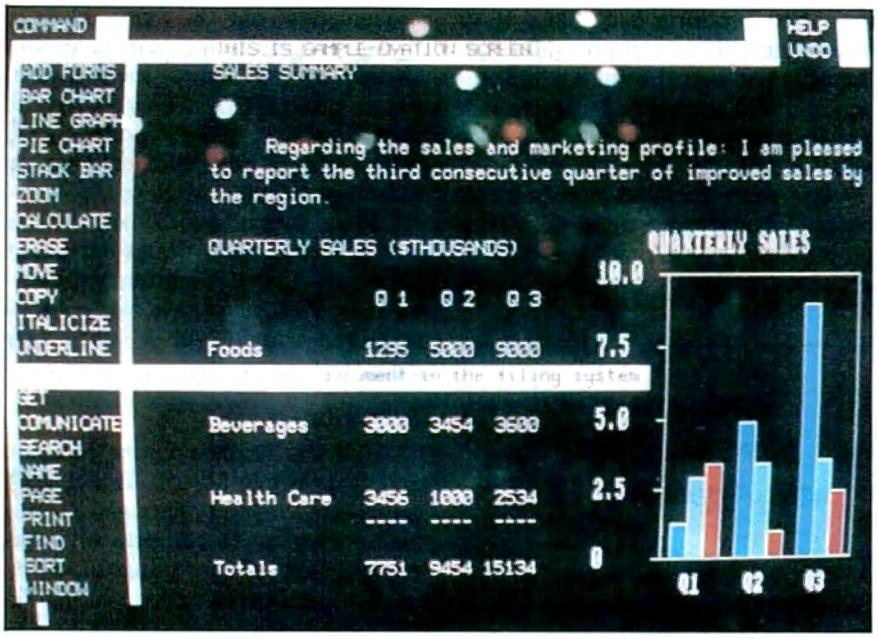
And a public relations expert, Nancy Keene of Dallas' Keller Crescent Co., has signed on to work full-time with Tandy—not vital news to the average TRS-80 owner, but a radical change for the largest American company that does its own advertising, and is trying to shake its unglamorous hardware-store image.

"Part of my charge is to try to help us create a better position for ourselves in the market, and obviously the way people perceive us has a lot to do with that," Juge explained. "I mean, our advertising is still done in house, but it never hurts to polish the image."

And, most of all, there were software product planner LaDonna Womochel's words: "If you want a machine, you want as many applications [as possible]. I think the fact that we have [1-2-3 and SuperCalc3] is an indication that we feel these products are essential in certain areas.

"I think there's lots and lots of opportunity at Tandy for third-party software vendors," Womochel added. "We want to make it easy on them." If Tandy's products have changed in the days between the Models I and 2000, Tandy's foreign policy has changed even more. ■

—*E.G.*




*Ovation tests graphics and spreadsheet data.*

## Are Windows Intuitive?

*Integrated software philosophies.*

If you're not sure integrated software is, in Ovation Technologies president Thomas Gregory's phrase, "the buzzword of 1984," you obviously didn't go to Softcon. No fewer than 87 companies were listed under "Integrated Applications" in the show directory, and those vendors' booths were crowded as soon as the Superdome opened.

Never mind that only a few multifunction packages have reached the market (the Quarterdeck Office Systems spokesman, urging onlookers to compare DesQ with MS-DOS Windows, was talking about two theoretical products). More will come—Creative Strategies International, a San Jose, CA, research firm, predicts a $6.5 billion integrated software market by 1986—and the competition will be fierce.

Right now, contestants are splitting into two camps, with two approaches to the problem of running different micro applications at one time. Pioneers like Lotus, VisiCorp, and Microsoft defend the idea of windows, which let users shuffle programs on screen like papers on a desktop; Ovation and some others say windows are a kludge compared to a unified, "one big program" approach.

*Even window advocates admit that overlapping a dozen programs on screen is impractical.*

And both sides lay claim to a new buzzword, this year's answer to "user-friendly": "intuitive," meaning software that follows the pattern of noncomputer work, or does what a micro novice would expect to do in the course of a job, rather than what the computer environment requires. Noumenon Corp., after test-marketing a five-program product under the name Microman, decided to call it Intuit.

### Psychological Partitions

The first integrated PC program was the Context MBA, and Context Management Systems' marketing vice president Sol Chooljian can hold his own with the new entrants in second-guessing users' psyches: "The guys who started [Context] weren't computer techies, they were user-oriented," he told *80 Micro*. "[And users] need solution support for problems they've got.

"You have to be able to support the user in a way that's as close as possible to the way he thinks about solving a problem. When he's massaging numbers, he doesn't think in terms of [spreadsheet] rows and columns; he may want a picture or pie chart. That's the only reason to have windows, and that's why we had windows first."

Ray Ozzie, system architect for Lotus, said, "[Windows] allow users to partition their work psychologically; here I'm doing this, here I'm doing that. The windows are basically a means to make it easier for the user to assimilate all that data."

But how much partitioning is desirable? Both Ozzie and Chooljian claim their windowing programs are superior to operating environments like VisiOn and DesQ, which use windows to link separate programs. "We should not be confused with an operating environment," Ozzie pointed out. "They're for using different applications; we have what we consider the major applications already there."

"Windowing is trivial technology," Chooljian declared. "Once people decided, hey, I have to have this to sell it, they stuck it on like a Band-Aid."

This, Chooljian said, leads to a "logical shift" as users consciously put aside their spreadsheets and turn to word processing: "That's interfacing, not integration. Context is a seamless solution; it's not feature, feature, feature, feature."

### Squinting at Windows

And even window advocates admit that overlapping a dozen programs on screen is impractical. "There're a lot of interesting things that can be done, that window environments are capable of, but ease of use is not one of their strong points," said Mosaic Software spokesman David Rosenfield. "You've got somebody with a 9- or 11-inch screen, he's got four or five windows up, and he's got his nose against the computer."

While DesQ supports up to nine windows, Quarterdeck marketing manager Jeanne Mowlds confessed, "I don't think people are going to have nine windows on the screen. I think most people will use two to four."

Ovation's Gregory, of course, not only sees windows as "cluttered and confusing" but points out their weakness as teammates: "In some win-

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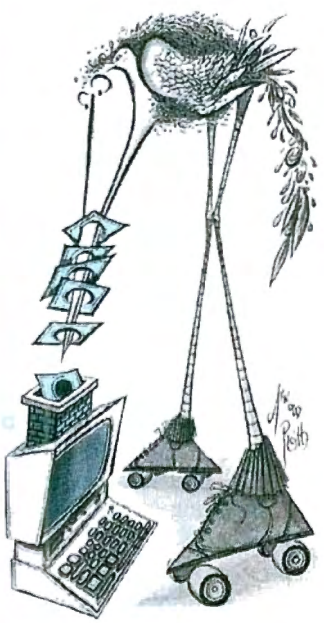

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dowed products, data is not linked between the windows. Transferring the data between applications can be or seem to be complex and challenging."

While Ozzie defended Lotus' partitions—"Customers want integration of the functions and being able to take data from one and put it into the other, not necessarily at the same time"—Chooljian joined Gregory in backing a dynamic or constantly upgraded approach, in which (for example) a change in a spreadsheet simultaneously redraws its graph.

"[Static graphics are] like a snapshot," Chooljian said. "You have to go back into the data base, do some massaging, and then take another snapshot."

"If interaction or dynamic linking is missing," Gregory asked, "what's the point of having integration?"

**What's the Foundation?**

Besides how functions interact, there's the matter of how good they are individually. 1-2-3, Context, and SuperCalc3, Gregory claimed, miss the boat by not offering "full functionality for each application"; they're based on "universal paradigms or single metaphors. They start with a single product, in this case a spreadsheet, and then build or add other applications to it.

"The more the user wants to perform other tasks, whether it be word processing or communications, the less the spreadsheet metaphor applies. After all, you wouldn't select a spreadsheet program to write a marketing proposal or construct a letter."

On the other hand, Ovation's state-of-the-art integration—similar commands let users mix text, graphics, and data base or spreadsheet information in one document—has its price. Ovation marketing manager Michael Walrod admits, "It's the most complex product from an engineering standpoint that I've seen," and prospective users will need 512K RAM, a hard disk, and $795.

More modestly, Softrend Inc.'s Aura ($495) fits a data-base manager, word processor, graphics, and spreadsheet into 256K RAM. It uses a series of menus to link its programs, saying, for instance, "Sales Graph Here" rather than showing it on screen. A few menu choices let users see the graph and return to text.

And, Aura's Marc McConnaughey assured *80*, it's intuitive: "We're what I call more task-oriented. Before, we talked about features and performance; Lotus is very fast, Ovation has lots of features. Now we're going to tasks, helping people actually do their work. You can have it so when you boot up your PC in the morning you don't see Aura's menus, you see your menus. You develop your own interface."

Whether through windows or unified programs, all the multiware makers agree, the point is to reach those who don't currently crunch numbers. Gregory said, "Integrated software has not fulfilled its promise of making the PC a universal business tool. Business management needs integrated software, but it needs software that works for many more people than it does today."

"The market that's untapped for this kind of software," Rosenfield said, "is mostly those who are just starting, who are ready to get in, but are still computerphobes. Most people want the path of least resistance, the easiest and least time-consuming way [to do a job]. Those products that have [integrated] functions, but aren't easy to use, won't sell much." ■

## END BYTES

# Who Owns VisiCalc?

● If VisiCalc were a child, its natural and adoptive parents would be having a **CUSTODY BATTLE**: Software Arts Inc. and VisiCorp are fighting over the rights to the pioneer spreadsheet, with lawsuits and countersuits flying. Software Arts introduced its Apple II program in 1979 and gave VisiCorp the right to produce it for different micros; the Wellesley, MA, firm now claims VisiCorp has forfeited the deal by lackluster marketing, while VisiCorp says Software Arts has failed to provide upgrades.

Both companies badly need a hot seller; Software Arts' TK!Solver has proven limited in appeal, and newer spreadsheets like Multiplan have pushed VisiCalc down the charts. At press time, Software Arts was lining up distributors and promising an improved, more competitive VisiCalc, with its San Jose, CA, rival fighting every step of the way.

● The **NETWORK NATION** reached a minor milestone in February. CompuServe Information Service announced its subscriber base had passed 100,000.

● Such on-line success may encourage a make-or-break venture for **VIDEOTEX**: IBM, CBS, and Sears will supply a nationwide information and shop-at-home service for owners of most popular brands of micros, to begin in 1986 or later. As their joint press release says, the partners' computing, TV, and retail expertise might "realize the full potential of videotex," but anything other than speculation about the service's features or price is a long way off.

● Looking for a **BARGAIN** in Color Computer software? Star-Kits (P.O. Box 209, Mt. Kisco, NY 10549) will send Spell 'N Fix II, a $69 proofreader and spelling checker, free to anyone who sends a blank disk and stamped, self-addressed mailer. Users are asked to "make their own estimate of the program's worth to them," and send a suitable payment.

According to Star-Kits president Peter Stark, the giveaway is an alternative to elaborate copy protection: "Based on our experience, we're convinced that many CoCo owners will get copies of the [program] in a relatively short time. We're sure they will love it, and only hope that enough of them will actually send us a contribution."

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## Better Back-ups

I'm writing in response to Eric Maloney's review of Monty Plays Scrabble (December 1983, p. 38) concerning limited back-up disks.

Under Model III TRSDOS, you can give any file back-up limited protection by setting bit 5 in the first byte of the file's directory entry. When the TRSDOS back-up utility backs up disks, it checks byte 22 hexadecimal (hex) of the boot sector (track 0, sector 1). If this byte is FF hex, as on most disks, the computer simply backs up the disk. But if this byte is not FF hex or 00 hex, the computer backs up the disk and decrements this byte on both the source and destination disks.

Finally, if byte 22 hex is 00 hex, the computer backs up the unprotected files and deletes all back-up limited files from the directory of the destination disk and displays the message, "Maximum Backup Count Exceeded, Protected Files NOT Backed Up."

To correct this back-up limitation problem, either change byte 22 hex to FF hex, or make the following patch to the back-up file:

```
PATCH *7 (ADD = 528E,FIND = C8,
CHG = C9)
```

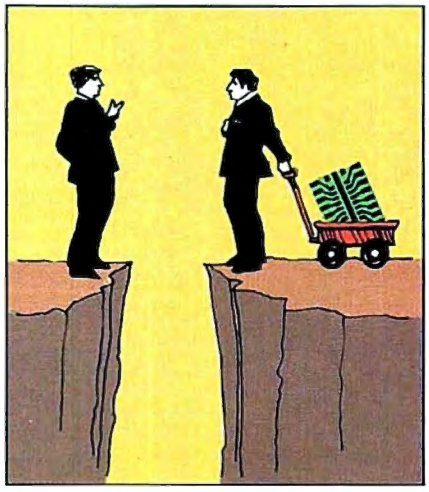
*Matthew J. Kidd*
*7809 Chelton Road*
*Bethesda, MD 20814*

## Sound on Command

Here's a short program that lets you use the Model 4's Sound command:

```
10 CLS:Y = 0:PRINT@(11,0),CHR$(16)CHR$
(23)"Press 0-7 Hear Tone = =>          "
20 GOSUB 50
30 IF X$ = ""THENGOTO20
40 X = VAL(X$):IFX>7ORX<0THENGOTO
20ELSEPRINT@930,X:SOUNDX,Y
:GOTO20
50 X$ = INKEY$:RETURN
```

*Philip V. Wise*
*1817 Glouchester*
*Garland, TX 75042*



## TRSDOS Problems

I've been having a problem with TRSDOS 1.3 on my Model III. One of every three times I ask for a directory in Basic and machine-language programs that call 4419 hexadecimal or the DSPDIR vector, TRSDOS produces garbage.

I discovered the problem in TRSDOS's overlay *10. TRSDOS 1.3 starts searching for directory files at sector 2 of track 17, which is the HIT table. To make TRSDOS 1.3 start reading directory files properly (at sector 3 of track 17), apply the following patch:

```
PATCH *10(ADD = 4E47,FIND = 02,
CHG = 03)
```

*David A. Ryan*
*5 Fox Hill Terrace*
*Ansonia, CT 06401*

## Help Received

In the January 1984 Aid column (p. 16), you printed my request for help with the strange loss of memory caused by scrolling in Disk Basic. I received lots of responses, including two patches I'd like to share with other readers. The first works only with TRSDOS 1.3 dated Wednesday, July 1, 1981. It also removes the frustrating "Can't Continue" error produced when you break a program, scroll around and type in CONT.

```
PATCH BASIC/CMD (ADD = 58C4,FIND =
D5,CHG = 00)
```

The following patch should work with any version of Disk Basic:

```
PATCH BASIC/CMD (ADD = 58F8,FIND =
F1,CHG = 00)
```

*Nate Salsbury*
*610 Madam Moore's Lane*
*New Bern, NC 28560*

## Do Unto Others

Here's the patch Robin Salmansohn asked for (Aid, January 1984, p. 16) to make a Model III display an entire error message rather than only Error X:

```
Track 16 , Sector 16 , Byte 2C , Find 20 ,
Change 18
```

By the way, I'm looking for drivers for my Epson RX-80. Can anyone help?

*Serge Rostan*
*Ecole St. Martin de France*
*BP 25 95301 Cergy-Pontoise Cedex*
*France*

## Simple Separator

I designed a data separator circuit for my Model I (see Figs. 1 and 2). It works quite well on my computer and while I don't have the time to write an article about it, I'd like to pass the information along.

The controller takes advantage of the fact that the 1771 FD clock doesn't care which of its inputs is clock and which is data, as long as they're separated. The 74LS193 is preset to a count of 4 in the lower 3 bits by every pulse, and the most significant byte is preset to its current state. Four clocks

later, the most significant byte turns over and routes the next pulse to the clock/data input opposite from the last pulse. If the pulse is missing, the counter goes through eight counts and turns the most significant byte over again.

*C.W. Gantt*
*3 S. 253 Herrick Road*
*Warrenville, IL 60555*

## Bad Values

Perhaps someone has reported this before, but I just spent four hours discovering that in Model III Basic, the function VAL of any string starting with % produces a syntax error. I've never seen this reported in any manual, so beware.

*Chris Brozek*
*1212 N. Sawtelle*
*Tucson, AZ 85716*

## Help Wanted

I have been looking for an editor/assembler for my disk-drive Model III with no luck. Any suggestions?

*Andres Timor*
*55 Almeria Ave.*
*P.O. Box 140489*
*Coral Gables, FL 33114*

80 Micro*'s Buyer's Guide to Utilities (June 1983, p. 134) lists three Model III disk editor/assemblers: M-ZAL, made by Computer Applications, P.O. Box 214, Rye, NY 10580, 800-354-5400; EDAS IV, from Misosys, P.O. Box 596, Niceville, FL 32578, 904-678-3328; and Instant Assembler, produced by Mumford Micro Systems, P.O. Box 400, Summerland, CA 93607, 805-969-4557. You might also try Radio Shack's EDTASM.*

*—Eds.*

Does anyone know of a way to connect my 64K dual-drive, RS-232 Model 4 with a Sinclair ZX-80? I have a Radio Shack Modem I and want to use the Sinclair for two-player games, word processing control, and giving tests.

*Marty Sellers*
*Rte. 3 Box 118*
*Eutaw, AL 35462*

Can anyone help me locate drafting or architecture software for the Model III?

*Ben H. Nation*
*P.O. Box 391*
*Fairfield, IL 62837*

I can't seem to make TRSDOS 6.0 read and write to a double-sided disk drive. Can anyone help?

*Dennis Watters*
*HHC, 10th Engineering Battalion*
*APO NY 09701*

As a data processing and programming instructor, I feel teaching aids such as old or damaged chips, wafers, and charts would enhance my classes. Does anyone know where I might get these things? Any help would be greatly appreciated.

*James B. Hunter*
*Camillus Junior High School*
*Ike-Dixon Road*
*Camillus, NY 13031*

## DEBUG

My article "Hello Bar Codes, Goodbye Keyboard?" (November 1983, p. 94) contained a small error. On p. 97, I mistakenly said that the Codabar symbol is known as 3 of 9 code. Actually, these are two different codes. All subsequent references are correct.

*Hermes S. Mendez*
*3909 E. Semoran Blvd.*
*Apopka, FL 32703*

## New User's Groups

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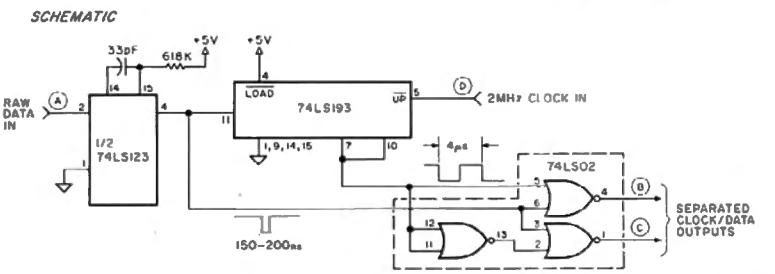


*Figure 1. Schematic diagram of data separator circuit.*

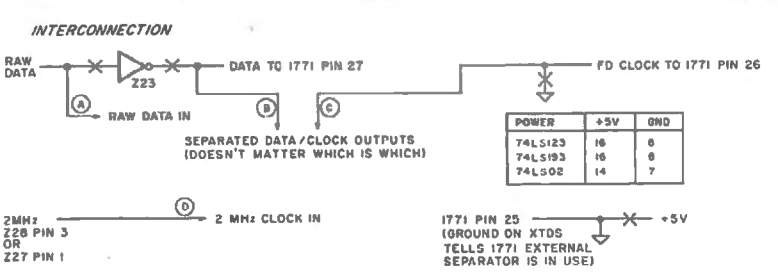


*Figure 2. Diagram of data separator circuit interconnection.*

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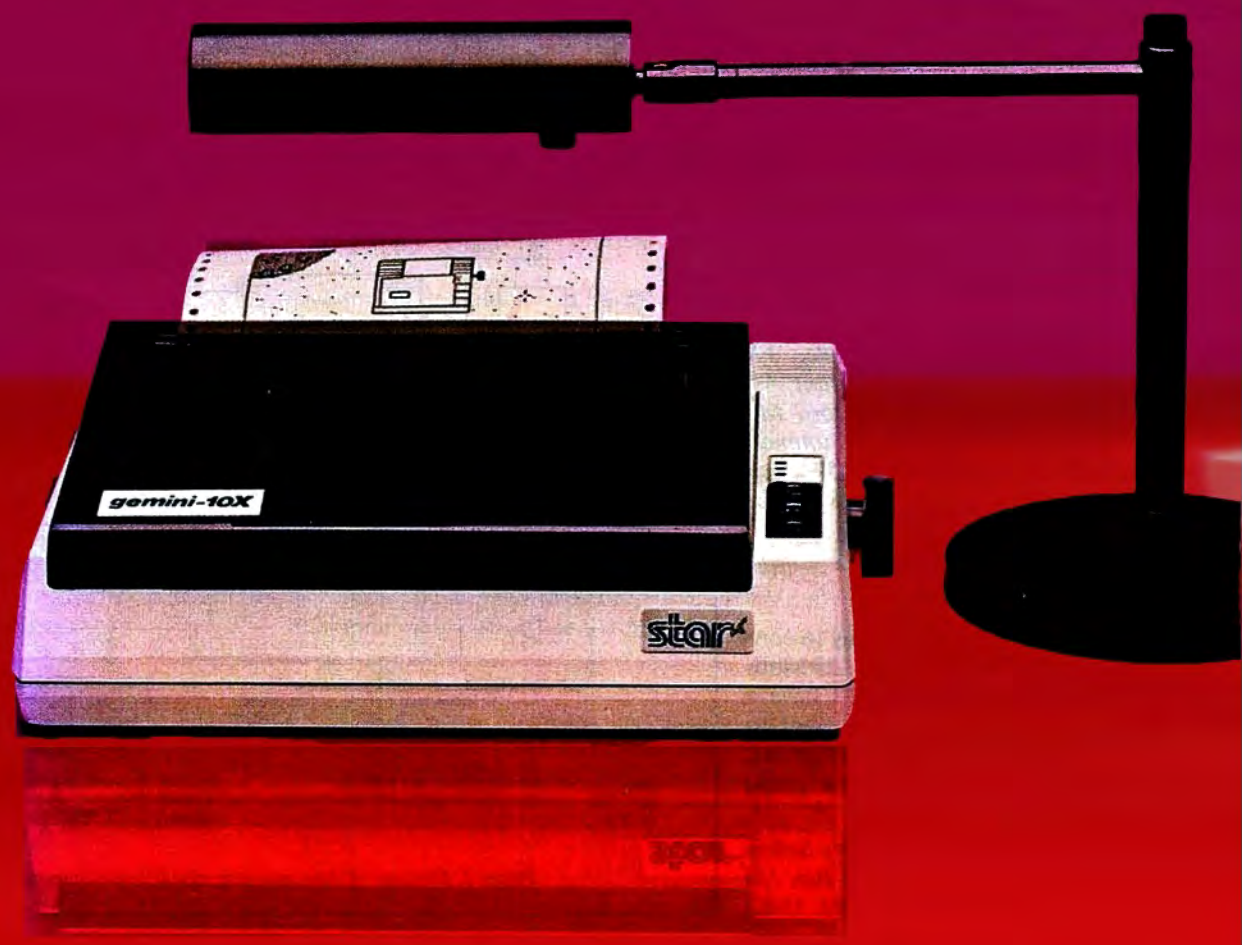
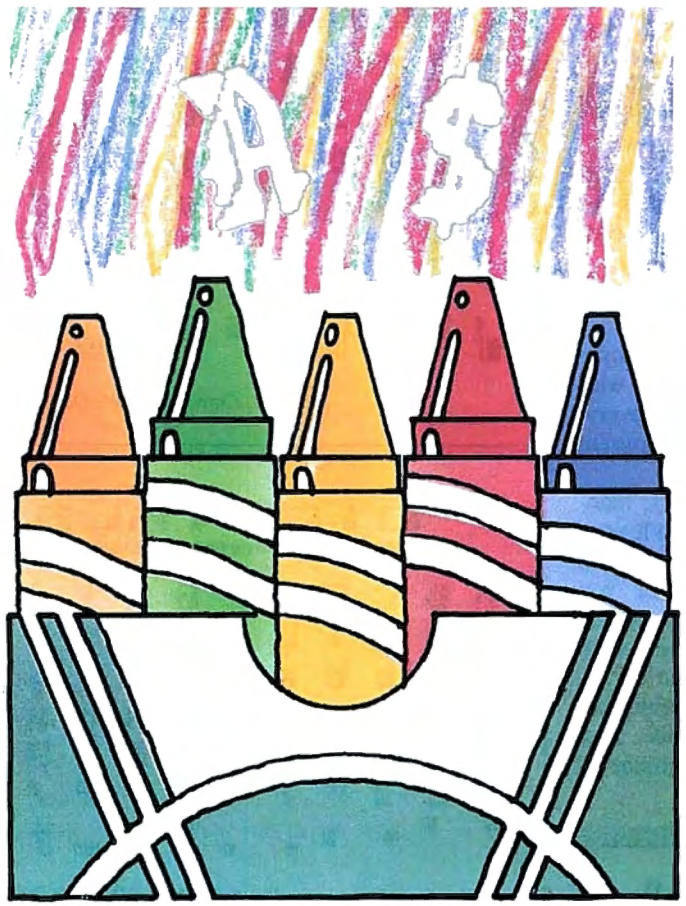


# Designing Your Documents With Crayon Deluxe

by David Dalton

edited by Susan Gubernat



If you're not daunted by Crayon Deluxe's complex instructions, you can use this versatile word processor/graphics package to write and print out documents in a variety of typefaces and graphics designs or custom-design your own fonts. With some time and imagination, you could even develop Elvish runes, foreign-language alphabets, or musical scores.

### Using Crayon Deluxe

Crayon Deluxe works with a dot-addressable printer (see Table 1) to print different typefaces, including Heritage (see Fig. 1), computer-style Digital (see Fig. 2), outline and shadow fonts, commonplace fonts such as italics, and graphics fonts, including borders for your documents. In addition, Crayon Deluxe includes a utility so you can develop your own character set.

Crayon Deluxe is aimed at both the home and office markets. You can use it to print forms, labels, and graphs.

For an extra $50, Pioneer Software supplies Proform Deluxe, which extracts information from data bases you've set up with Radio Shack's Profile data base manager, and uses the data to print invoices, bills, labels, or form letters. The Proform package comes with separate documentation and special disk files to demonstrate its use.

If you don't have a compatible printer, you'll still find Crayon Deluxe worthwhile if you're interested in high-speed graphics. You can design screens, save them to disk, then call the screens from Basic as machine-language subroutines. At more than 40 screens per second, you can really add zip to your games. In fact, Crayon Deluxe works so fast that you can produce an animated TRS-80 movie with the software and a hard disk system.

### Memory Limits

Unfortunately, Crayon Deluxe's power and complexity make it difficult to learn and to use. It's difficult, not because of slouchy programming, but because of the memory limitations of a 48K RAM computer.

Crayon Deluxe doesn't solve the memory problem by using program overlays as SuperScripsit does. The entire program, consisting of about 18,000 bytes, resides in RAM. In addition to the program, the font files that describe the shape of each character take up memory, as does the text you're working on.

You pay a price for the resulting tight fit: for one thing, you use modes instead of menus: a graphics mode, a letter mode, and a command mode, among others. You must move from mode to mode by hitting several keys in sequence or holding down certain keys at the same time. But the keys you have to hit seem arbitrarily assigned rather than intuitively designated and are therefore hard to remember at first.

### Error-Trapping

At one point, the Crayon Deluxe manual states: "Hitting the enter key is always a safe way to figure out where you are if you get lost and can't figure out what you're doing." I promise that you'll get lost. Crayon Deluxe offers no on-line help, and when the program does display a message, it's brief and cursory.

It's especially easy to crash the program before you understand it. For instance, if you accidentally load a font file when you thought you were loading text, the screen will fill with junk and you'll have to reboot the disk. Some of the errors I produced in my early fumblings with the program made the disk reboot itself, and the

Epson MX and FX with Graftrax
Gemini
Prowriter
C. Itoh 8510A
NEC 8023
Microline 92 (with IBM Plug and Play)

*Table 1. Printers compatible with Crayon Deluxe.*

DOS lost the date and time.

Some features of your DOS may work improperly with Crayon Deluxe. Using Crayon under NEWDOS80, I found that some functions of NEWDOS80, such as MINIDOS, won't work because Crayon Deluxe takes over the keyboard matrix to check for key combinations that activate its own various modes.

**Hand-Held Documentation**

The documentation, a handsome and generous manual produced with Crayon Deluxe, seems to cover everything—no mean feat for a program this complicated.

If you're wise, you'll keep the manual in your lap and go through it page by page, doing the suggested exercises. The manual recommends that you plan to spend three evenings getting familiar with the program. Six or 10 evenings might be better, and to become really proficient with the program would take quite a while. Pioneer Software provides a number of demo files on the disk.

**Crayon Deluxe 2.0**

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**Power of the Crayon**

Crayon Deluxe provides a wide array of commands for producing and manipulating graphics. You can reverse an image with two keystrokes, or define a pattern and then repeat it. There are commands for drawing angles, moving images around the screen, centering, erasing, and lighting various combinations of the TRS-80 graphics pixels.

The program also permits mask overlays, that is, you can define a background and use it over and over. If you were writing music, for instance, you could put staff lines and the key signature into a mask overlay instead of redrawing them for each page of music.

Handling text is more awkward with Crayon Deluxe than with standard word processors. Because the program thinks in screens rather than in individual lines, you can only scroll one screen or half-screen at a time. Moving text is even more difficult.

Awkwardness in handling text is the price you pay for the ability to mix both text and graphics. But Crayon Deluxe does handle automatic word-wrap and will justify text on both your screen and a printer.

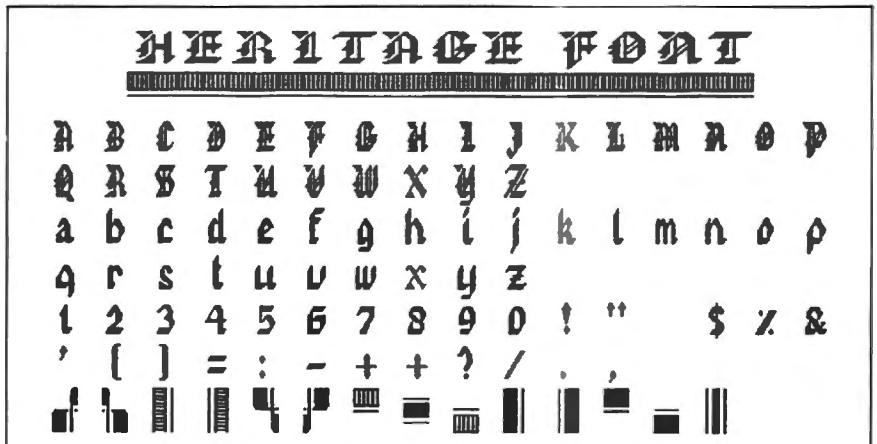


*Figure 1. Crayon Deluxe's Old English typeface.*

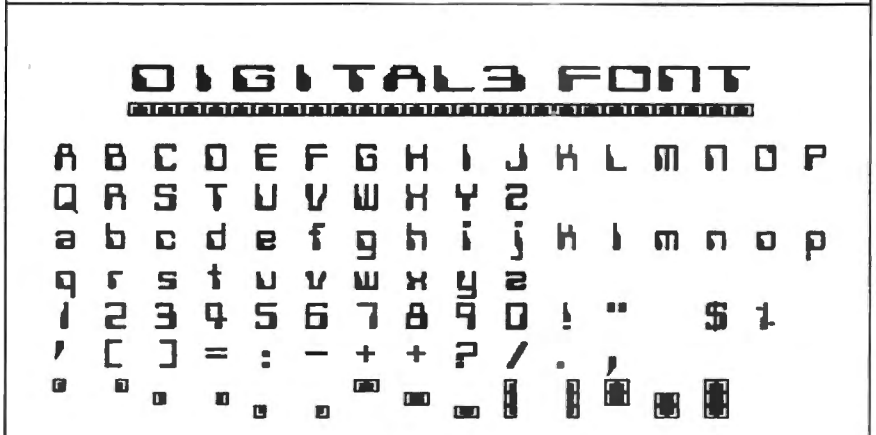


*Figure 2. Crayon Deluxe's Digital font.*

**Overall Impression**

I found no bugs in Crayon Deluxe, although the package as a whole is very unforgiving. If you're patient and take the time to learn this package, it should do a good job for you. Just keep your manual handy and don't forget to use your imagination.

Unfortunately, Crayon Deluxe's files are incompatible with those from other word processors such as Scripsit. Unless you become a wizard at Crayon Deluxe, you'll probably find it unsatisfactory as an everyday word processor. ■

*Continued on p. 37*

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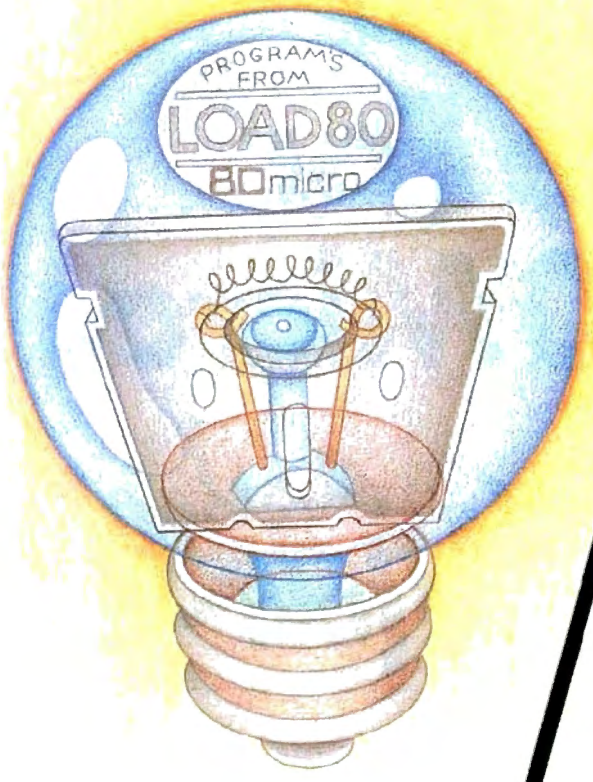


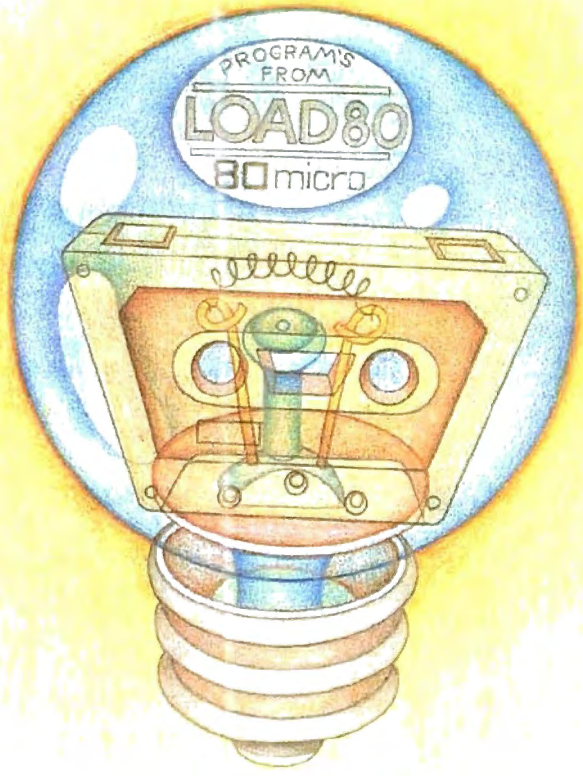


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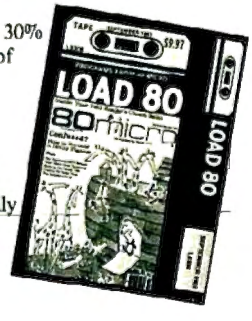


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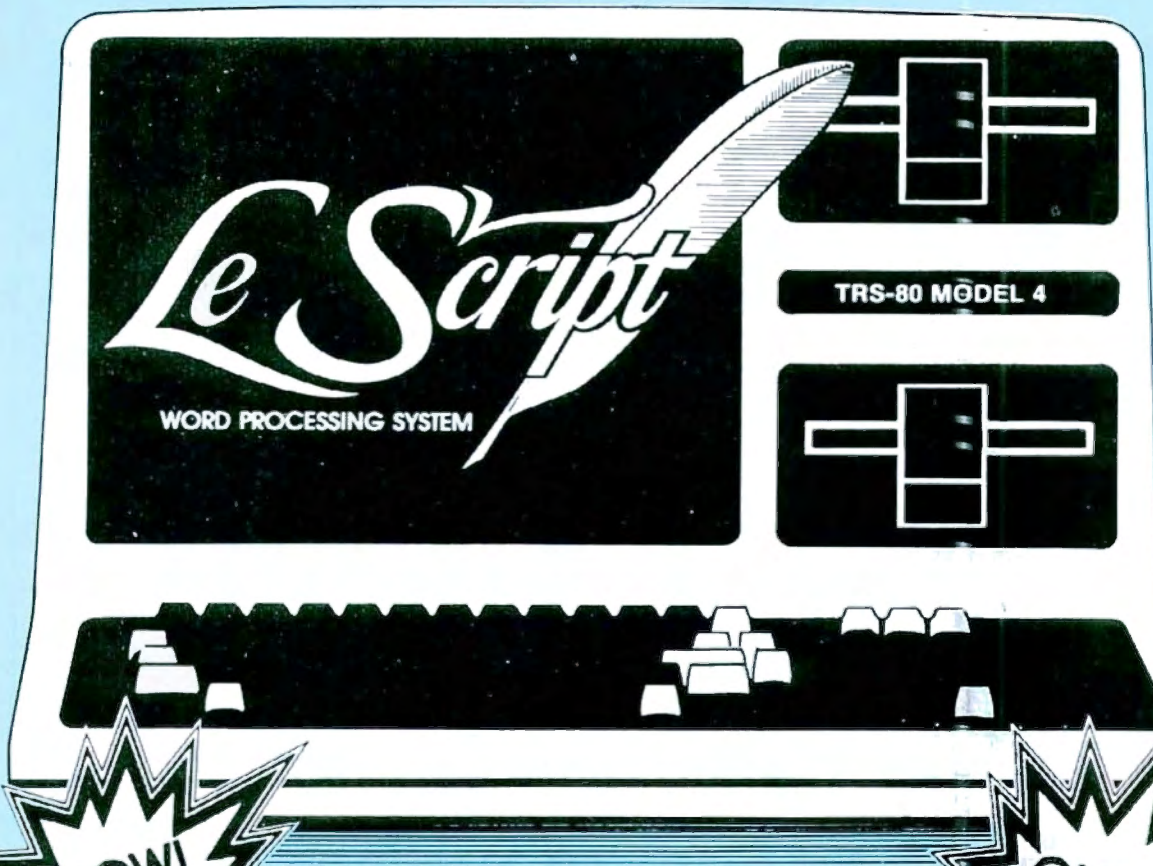


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Continued from p. 32

# Search and Index Files with MAP

by Wynne Keller

Softshell's MAP (Multiple Access Programs) package is a group of programs that lets you index and search text and data files. It does an excellent job of handling unstructured records with optimum flexibility, but at the expense of space efficiency; on a Model III, MAP is limited to 700 records. But if this is enough space for you, MAP might satisfy your requirements.

You can enter information in any format you want, for instance, words, sentences, or fixed fields. MAP indexes every item of three or more characters. It provides a number of file-handling capabilities, such as printing and editing, to make its Search function as useful as possible.

The main programs consist of 3by5 (a card file program), Mindex (an indexing program), and Search (a rapid search program), several utility programs, and sample data. The disk is not copy-protected, and upgrades are free for one year (with a nominal handling charge) to registered owners. While no telephone support is available, the package includes clear documentation and the disk offers a help file.

### Preparation

You must divide the file to be searched into small units, with a marker the program can recognize, for example, a period in text files. With data files, the marker can be either a period or CHR$(13), the invisible character created by pressing the enter key.

The file must be in ASCII format. Most word processors can produce an ASCII format document with special commands. SuperScripsit has a file utility for this purpose, and regular Scripsit can produce an ASCII file if you append the letter A to the name when writing the file to disk. Save a Basic program in ASCII format with a similar command.

Though the format in data base files is normally in ASCII, the end-of-record marker can be a problem. Most data bases don't use either the enter key or a period as a marker for each record. If you know in advance you'll be using MAP, enter a period as part of the last field in each record as you type the data. You'll have to enter markers in an existent data base file that lacks them before using MAP. Fortunately, the widely used Profile III+ data base manager does have a CHR$(13) marker.

Once you've converted the file to be searched to ASCII and properly marked it, Mindex can index it in a few minutes. You won't need to index again unless you make changes in the file.

**MAP 1.3**

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### Searching

The Search function is fast and sophisticated. Use as few as three letters; uppercase/lowercase configurations make no difference. You can use logical And/Or functions. For example, you can ask for any records (or sentences) containing either the word Basic or the word program or both. You don't need to type the whole word; in this example, "pro" is sufficient for program, though the search would then also find such words as product and provide. ("Finding the Search Solution" [*80 Micro*, December 1983, p. 110] explains the fascinating theory behind this technique.)

When the sentence or data line containing the search word appears on screen, you can: continue the search to see if any other matches occur; list the adjacent text, moving forward or backward through the file; or quit the search.

Before you begin the search, you can request display in record or paragraph format, the former for data base files or program files, the latter for word processor files. However, even when this option is properly set, data base files are difficult to read, because fields will run together on screen, and the displayed text is a whole sector, not an individual record.

An outdent option makes each record or paragraph easier to find. The display of text meeting search criteria may be continuous, or one line at a time. Printouts are available for each record, the whole screen, or the entire file.

For convenient file handling you can open an output file to accept either all data found in the search or only what you specify. Because this output file may be a single file, or appended to a preexisting file, you have considerable freedom to rearrange text or data files.

### 3by5

The 3by5 program has enough additional features to approach data base status, permitting data entry, deletion, or rearrangement. Each card (record) can have up to 768 characters (Model III) or 1,025 characters (Model II). There are no field names such as a regular data base would have; you simply type in data and organize it any way you wish.

Unlike other data files, 3by5 organizes data entirely by disk sector—an inefficient use of disk space, but fine for altering data. Since a disk sector comprises 256 bytes, if your cards have only, say, 100 bytes each, then you'll waste 156 bytes of disk space per card. But because cards don't overlap sectors, you can edit them without harming the file. Alternatively, you can allocate as many as three sectors per record on the Model III, and four sectors on the Model II.

3by5 also permits some file manipulation. You can delete, move, or copy cards. The Move function helps keep the cards in order, since there is no sort available. You can move card 19 to empty slot 200, for example. Up to the

limits of disk space, you may expand your card file as needed. The Copy function duplicates a card; copying card 19 to slot 200 would create two identical cards.

**Limitations**

Disk space is 3by5's main limitation. With two disk drives the number of disk sectors represents the maximum number of cards you may have, 700 cards on a Model III; 1,600 on a Model II.

The program cannot span drives; all the data must go on one, and the index and programs on the other. With one drive, you must reduce file size accordingly. The index file takes space too: one sector for every eight sectors of source file.

The search is fast only if the entire index file fits in memory. Model III owners could not have a file which did not fit, but Model II owners would need to be careful, if speed is important, not to exceed a source file of about 1,000 sectors.

The manual suggests inventory, indexing literature, small library card catalogs, and patient information or appointments as possible applications. Perhaps—certainly MAP would be fine for a household inventory, but on a larger scale the 700-record size limit, especially on the Model III, seems a significant problem. If you try to get around that limit by dividing the alphabet on various disks, there would be new problems: the inability to obtain a sorted list and formatted printouts, for example, as well as disk shuffling. ■

## Constant Time-Keeping For Models I, III, and 4

**by R. Walter Steur**

Newclock-80 is a handy, low-cost Model I/III/4 hardware unit that keeps track of the date and time even when your computer's turned off. One of its most convenient features is automatically inserting date and time information into DOS prompts and date-oriented software.

**Using Newclock-80**

Newclock-80 is a compact, flat unit (2 inches by 2¼ inches by 3/8 inch for the Model I) with an attached connector that plugs into your computer's expansion port or the expansion interface screen printer port.

The circuit board is an open-sided metal box with the circuitry exposed, making the battery and the rate adjustment pot easy to reach. You need a lithium battery either from Alpha Products for $1.50, or from your local Radio Shack dealer.


The system uses ports 176–188, seven ports for the date and six for the time. Newclock-80 stores the date in decimal form. You can read and modify any digit with Basic input and output statements.

Alpha Products supplies the operating software on cassette or, for an additional $5, on disk. In the cassette version, all the required functions for the Models I and III come in one Basic program. With one portion of the program you set Newclock-80 to the correct time and choose military or a.m./p.m. format.

Two subroutines, one each for the Models I and III, patch the TIME$ function to read Newclock-80. That routine also adds the TIME$ function to Level II on keyboard-only systems. To use the latter routines, you load the program into memory but don't run it. Next you delete extraneous lines and add a new ending line to run an applications program, clear the screen, or whatever. You then save the revised program to disk or cassette for future use.

If you order the disk version, you get a Model I single-density disk with eight programs. A Basic menu program lists the programs supplied and lets you run them. These include the Timeset program to set Newclock-80, a tutorial on reading the Newclock-80 ports directly from your Basic program, a digital clock/calendar with a 2-inch number display, and TSTRING, which patches TIME$ to read Newclock-80 instead of the internal clock.

Another patch lets you boot up NEWDOS80 2.0 with the correct time and date. The documentation includes this patch in Superzap form, as well as a similar patch for TRSDOS 2.3. The NEWDOS80 patch updates the date only when you boot up or reset your system, while the TRSDOS patch updates constantly.

Two machine-language programs, HITIME1/CMD for the Model I and HITIME3/CMD for the Model III, check and update the date and time every 256 interrupts, or every 6.4 seconds. During disk or cassette input/output (I/O), which disables the interrupts, no update occurs. These two routines normally load and execute in high memory.

If you have other high-memory requirements, the Relocate program lets you move HITIME modules to whatever location you desire. The program modifies the module to load and exc-

**Newclock-80**

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cute at the new address. If you're using either DOSPLUS 3.5 or LDOS 5.1.3, you can save the initialized HITIME module in a configuration file; then you don't need to initialize each time you boot up or reset the system.

If you don't want to patch your DOS permanently, the manual describes an alternate approach. You can run out the two short programs included at the end of TIMESET. These are the Basic equivalents of the TRSDOS and NEWDOS patches and will remain active until you reset.

If you use TSTRING to patch Disk Basic, it detours to the TIME$ command and loads the time/date in Newclock-80 into memory addresses of the internal clock. A dummy statement such as A$ = TIME$ loads the correct time and date into memory addresses, and the time remains correct until disk I/O occurs. Then another dummy A$ statement reads Newclock-80.

### Conclusions

The documentation consists of one 8½- by 11-inch sheet of paper printed with fine print on both sides. It contains all the necessary operating information and a bit of hand-holding for the novice.

Newclock-80 is rated for use to 2 MHz and I used a Model I with a Holmes Sprinter speed-up module installed. I could not set or read Newclock-80 with a clock speed increase of as little as 23 percent.

Alpha Products indicates that the use of speed-up modules is much more prevalent than they realized and that they are revising the software to incorporate an automatic return to normal speed during Newclock-80 access. Since access time is about a millisecond, this should not affect overall operational speed significantly.

No software is available for use with the Model 4 in native mode.

External clock/calendar systems with battery back-up are normally in the $100 range. At 60 percent of that cost, Newclock-80 is not handsomely packaged but it performs as promised.

With the revised software, this clock/calendar unit should be applicable to any Model I, III, or 4 (in Model III mode), even with a speed-up modification. This is a good buy for anyone who wants to get away from nagging date/time prompts. ■

## Convert Model III Programs To Model 4 Format

**by Mark D. Goodwin**

Anyone who wants to convert Model III Basic programs to Model 4 format will save a lot of time and effort with CONV3TO4. This program automatically, albeit slowly, delimits all Basic keywords with spaces, and adjusts most PRINT@ and tab positions to conform to the Model 4's video display.

*I expected CONV3TO4 to be a little slow. After using it, I feel that calling the program a little slow is praising its speed.*

### Program Conversion

To convert a Model III Basic program, you must first save it in ASCII format. Then you transfer the program to a TRSDOS 6.0 disk with the Model 4 CONV command.

After you load CONV3TO4, the menu appears. It has options for sending output to the video display or the printer, saving the converted program, deleting all remarks, and inserting line feeds after colons or before If, Then, and Else statements.

Once you select the menu options, the program prompts for the Model III Basic program's file name. If you select the menu's Save Program option, CONV3TO4 also prompts for the new Model 4 Basic program's file name.

After you enter the file names, CONV3TO4 begins the conversion process by delimiting all Basic keywords with spaces and adjusting the PRINT@ and tab positions. Besides these essential changes, CONV3TO4 makes a comprehensive check for potential errors in the new Model 4 Basic program. Depending on the menu options you select, CONV3TO4 displays or prints appropriate error messages.

### Documentation

The CONV3TO4 manual is nothing short of excellent. It quickly and thoroughly instructs the reader in producing back-up copies of CONV3TO4, saving Model III Basic programs in ASCII format, and transferring Model III Basic programs to a TRSDOS 6.0 disk. Then the manual presents explanations for executing and operating CONV3TO4.

The remainder of the manual explains the error messages CONV3TO4 generates when it detects an error in the new Model 4 Basic program. The manual also presents possible solutions to the problem in the new program.

### Conclusions

Because CONV3TO4 is a Basic program, I expected it to be a little slow. After using it, I feel that calling the program a little slow is praising its speed. It took almost 19 minutes to convert an 11,000-byte program.

I also found a minor bug in CONV3TO4's operations. Whenever the Model III Basic program contains a line zero, CONV3TO4 issues an error message stating that the line is too long to properly convert. Furthermore, it omits line zero from the new Model 4 Basic program. I remedied this problem by renumbering the Model III Basic program before saving it in ASCII format.

*Continued on p. 206*

**CONV3TO4**

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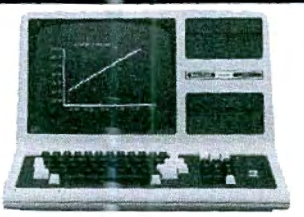

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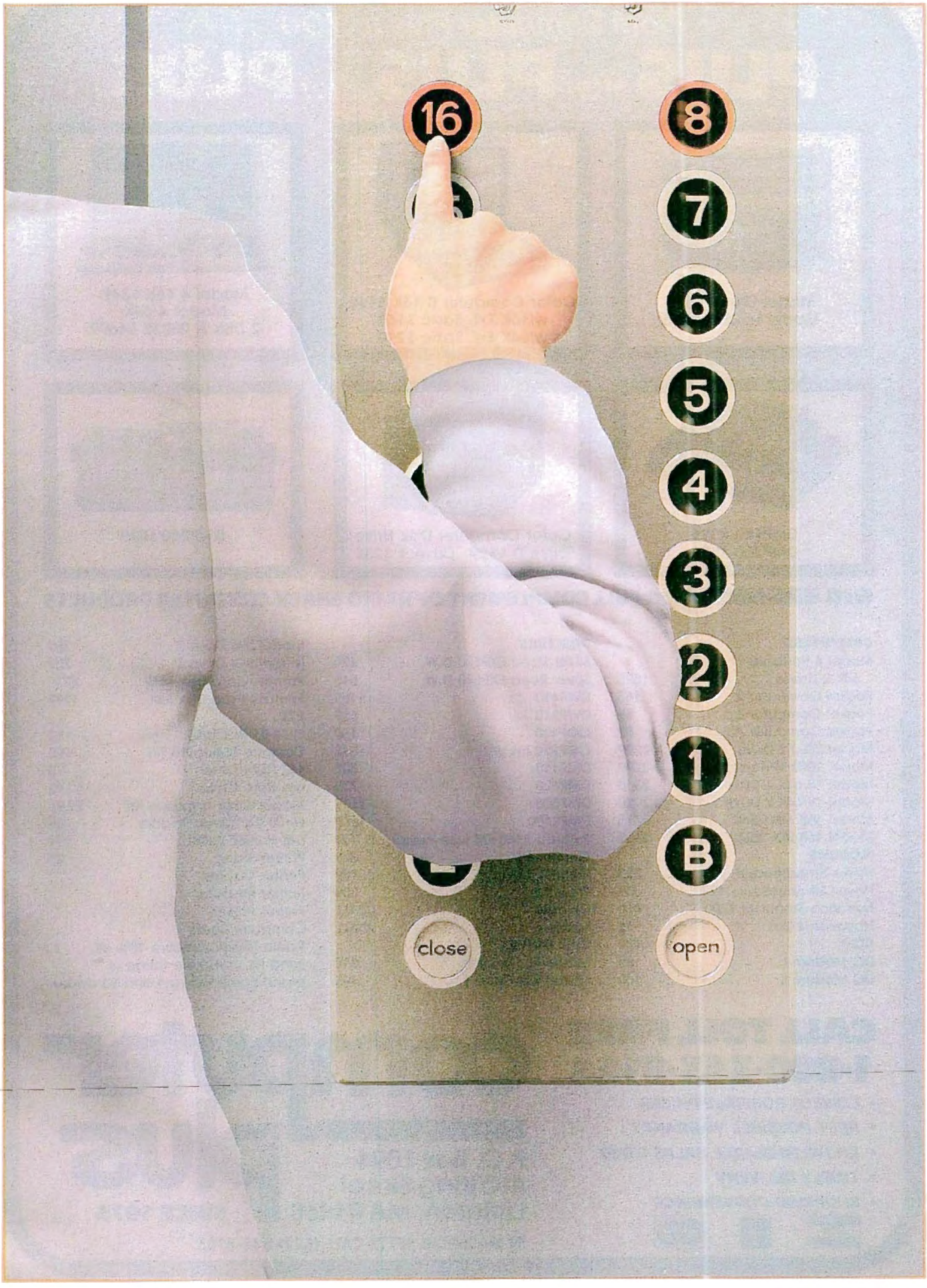




Illustration by Erick Ingraham

# Moving Up To 16 Bits

## How Intel's 80186 Stacks Up

Roger C. Alford gives you the inside scoop on 80186 architecture and compares it to that of other 16-bit chips.

Try to get your hands on an 80186 microprocessor chip and you won't find many around. Considering the 80186's performance and sophistication, it's not hard to understand why manufacturers like Tandy, Raytheon Data Systems, Dulmont Electronics, and Munroe Business Systems are snapping up every one Intel can produce.

I'll examine what makes the 80186 special and compare it to other 16-bit processors.

### Space Savings

Intel's 80186 16-bit microprocessor is a processor board on a chip, replacing up to 20 medium-scale integration (MSI) and large-scale integration devices. The 80186 conserves printed circuit (PC) board space because it's packaged in a 68-pin leadless chip carrier. It also costs a lot less than the parts it replaces. The 80186 represents a trend in the semiconductor industry toward higher integration with improved performance and reduced cost. See the Table for a list of the 80186's features and Fig. 1 for a block diagram of the 80186.

The 80186 is a new member of Intel's 8086 family, and executes the 8086 instruction set. Other family members include the popular 8088, used in IBM's PC and PCjr, and the new 80286, which has on-chip memory management. The 8086 family compatibility is one of the 80186's key features.

Since its first microprocessor, the 4004, Intel has demonstrated a commitment to software compatibility in its microprocessor families. Intel's 8085 (8-bit) and 8086 (16-bit) families share similar architecture. Intel stresses the advantages of this concept in its marketing, but such architectural similarity has drawbacks that I'll examine later in this article.

As I mentioned before, the 80186 can execute the entire 8086 instruction set, but the 80186's central processing unit (CPU) is an improvement over its predecessor's. First, Intel added 10 new instruction types to the 80186 set that make

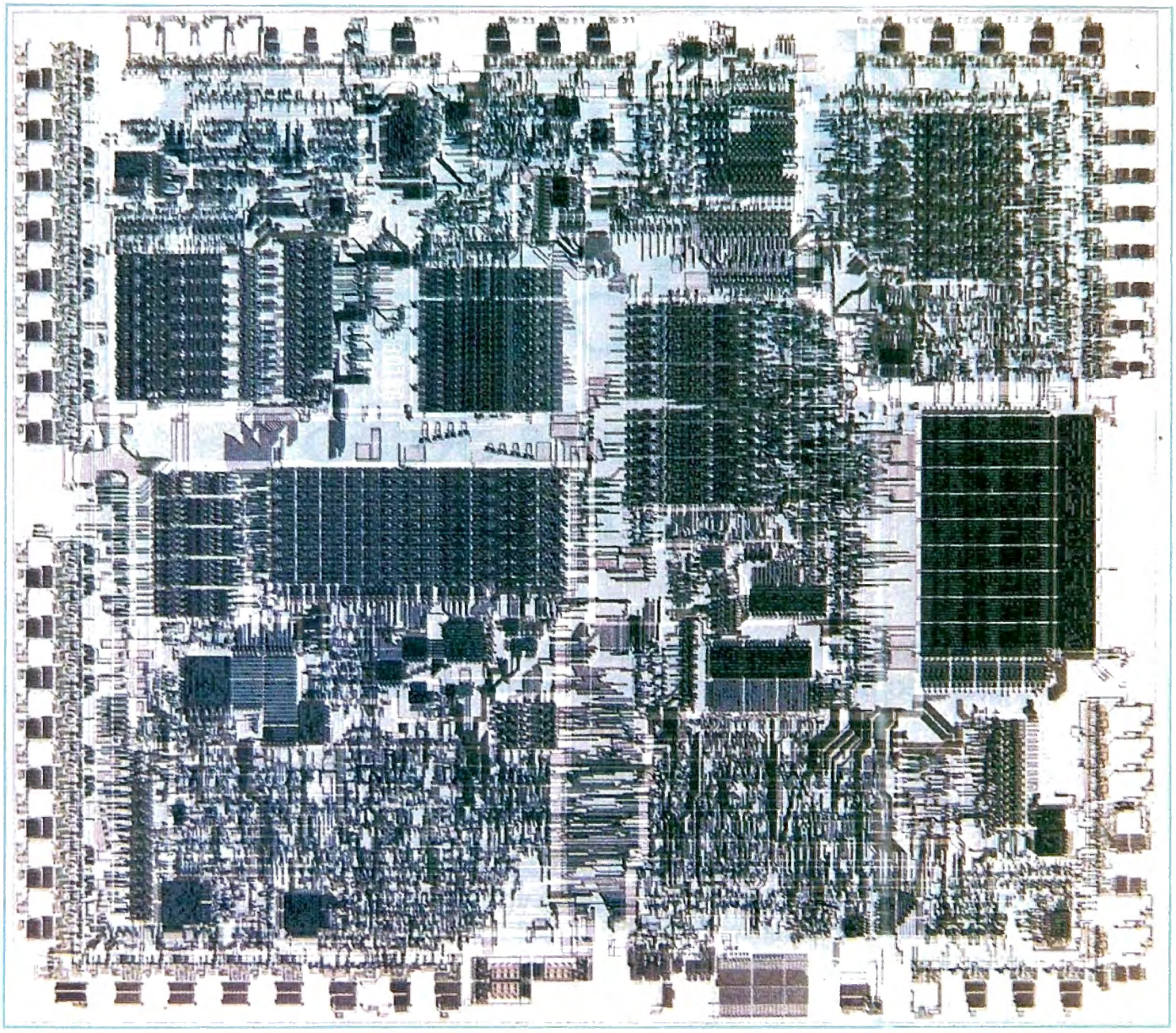

*Photo. Model 2000 80186 communications board. (Photo courtesy of Intel Corp.)*

it easier to program, especially in Assembly language.

Second, Intel redesigned the 80186's CPU architecture so that it executes instructions faster. Changes include adding a new arithmetic logic unit to the bus interface unit (BIU) and allowing independent address calculations. Identical programs running on the 8086 and the 80186 at the same clock frequency execute faster on the 80186. According to Intel, the 8-megahertz (MHz) 80186 executes nearly twice as fast as the standard 5 MHz 8086.

The 80186 has an on-chip clock generator that produces the processor sequencing signal. The clock generator divides the crystal (or other clock input) in half, generating a 50 percent duty cycle clock. Since this clock signal is available on an external pin, the computer can synchronize other logic operations to the 80186's operation. On the other hand, the 8086 and 8088 CPUs require an external 18-pin clock generator chip, the 8284, to generate their 33 percent duty cycle clock.

The 80186 uses direct memory access (DMA) to access system memory and peripheral devices without CPU intervention. This permits higher data transfer rates. A DMA channel refers to one DMA source/destination addressing pair. For example, a one-channel DMA lets the computer quickly move a block of data in memory to a disk controller, using the memory as its source code area and the disk controller as its destination.

The 80186 can perform two DMA transfers simultaneously because it has two on-chip DMA channels. Although only one channel can use the bus at a time, you can give one channel precedence or alternate bus control between channels.

The Photo shows an 80186-based communications controller board from the Model 2000. As you can see, the 80186 takes up little space for all its features. The Model 2000 uses the two 80186 DMA channels to send and receive synchronous data at high transfer rates. The CPU operates regardless of DMA operations; whenever the DMA transfers data, the CPU merely waits for its completion.

Using DMA, an 8 MHz 80186 transfers up to 2 million data bytes per second. This rate decreases during certain DMA accesses or if both channels are operating simultaneously. The source or destination device can make requests, or use unsynchronized requests for maximum throughput. Since the DMA controller is connected internally

to the 80186's interrupt controller, the DMA controller can send interrupts to the CPU and indicate when DMA transfers are complete.

In contrast to the space saved on the PC board by the 80186's on-chip controllers, the Intel 8257 four-channel programmable DMA is a 40-pin chip, and requires controller-to-CPU wiring.

## More Interruptions

Chip manufacturers are designing more and more interrupt-driven systems because they let the CPU perform tasks while waiting for system events to occur. Interrupts let these events request service from the CPU asynchronously (not synchronized to the CPU clock). The interrupt controller arranges for interrupts to operate with the CPU and lets the programmer set, enable, and disable interrupt priorities.

The 80186's internal programmable interrupt controller (PIC) lets both external (off-chip) and internal (DMA, timers, and so on) events generate interrupts to the CPU. In comparison, a typical 8086/8088 system uses the 28-pin package and a wired Intel 8259A PIC.

The 80186's five external interrupt inputs might not be enough for some systems. To account for this, Intel designed the 80186's PIC to connect with an external 8259A that can connect to other 8259As. By cascading controllers, you can use up to 128 interrupts in an 80186-based system.

The digital timers used in microprocessor systems are registers that let the system count down an initial timer value at a predetermined input clock rate. A variety of possible operations

**The 80186's internal logic and software-selected addressing obviates the need for external memory and peripheral chip-select logic.**

can occur when the counter reaches zero. For example, the timer might generate an interrupt to the CPU, change the state of an output line, or toggle the input of another timer. Timers offer a variety of operating modes, and systems can use them in different applications.

The 80186 has three 16-bit programmable timers with capabilities not often found in other general-purpose timer chips. You can choose either an external clock or control signal, or a divided CPU clock for the timer inputs, and both are software-selectable. You can also cascade two timers to create a single 32-bit timer. The 80186's timers are connected internally to its interrupt controller, and can generate interrupts to the CPU.

A feature of the 80186 timers is their ability to alternate between two count values. A timer can count down first with value A, then count down with value B, and so on, toggling its output each time it reaches zero. This lets the timer generate a nonsymmetrical square wave with nearly any desired duty cycle. You can also change the timer count value while the timer is running to generate a frequency-modulated signal.

## Unique Addresses

All microprocessor-based systems use memory and peripheral devices addressable to the CPU. In other words, each device or memory location has a unique address that lets the CPU communicate with it. In most systems, logic generates chip-select signals that enable (activate) the various devices when the CPU presents them. In all but the smallest systems, this requires several small-scale integration (SSI) chips and MSI chips, and a lot of PC board space.

The 80186's internal logic and software-selectable addressing obviates the need for external memory and peripheral chip-select logic. Six memory-select lines and seven peripheral-select lines handle the chip-select requirements of small- to medium-size systems. The peripheral select lines can appear in memory or input/output addressing space.

The 80186's memory selection logic decreases hardware requirements by letting the user select the starting address and size of a chip-select addressing range. Many microprocessor-based systems use RAM and EPROM sockets to accommodate variety in the memory chips. For example, a series of sockets might let you install 2,716 (2K bytes), 2,732 (4K bytes), or 2,764 (8K bytes) jumper-selectable EPROMs.

This flexibility requires on-board jumpers, additional logic, and more board space. In an 80186-based system,

Enhanced 8086 CPU
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*Table. Primary 80186 features.*

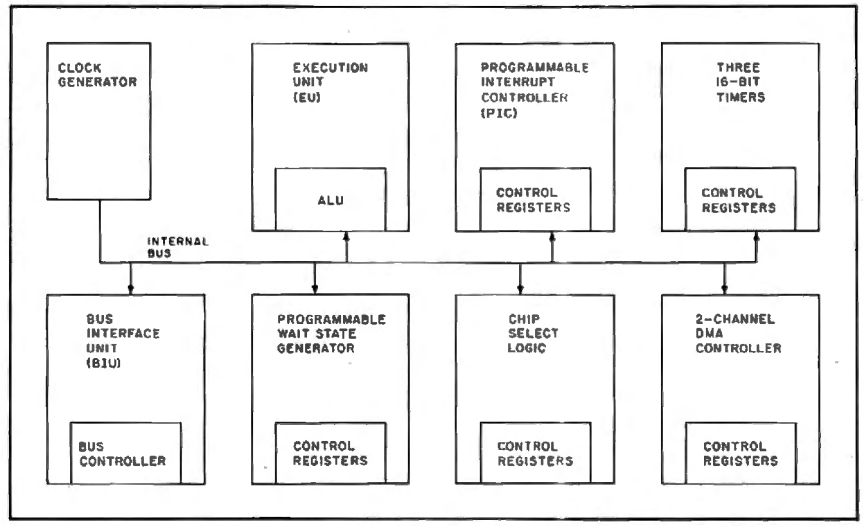


*Figure 1. Primary features of the 80186.*

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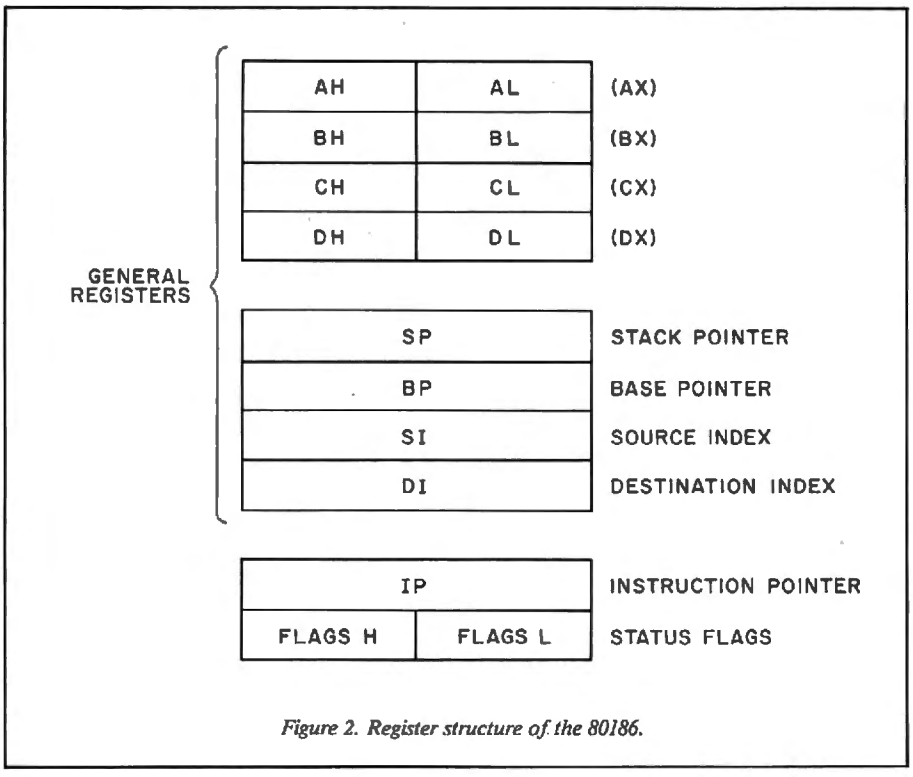


*Figure 2. Register structure of the 80186.*

however, software changes alter the socket addressing for each device's size. Although you might need jumpers, board space is minimized.

Memories and peripherals have access times as low as 30 nanoseconds (ns) and as high as a microsecond, making it difficult to connect them to a microprocessor, especially a high-speed processor. To accommodate devices with access times greater than the CPU's, most systems use wait states to make the CPU pause a certain length of time.

Since different peripherals require different wait states, your system could need a considerable number of SSI and MSI devices and more board space. The 80186 eliminates the need for external logic and lets you specify as many as three wait states for each group of the 80186's memory or peripheral chip-select lines. The 80186 also lets you use external wait states.

Many microprocessor systems require external bus controller chips to generate read/write signals, strobes, and other signals not available from the CPU. The bus controller gets its information from CPU status signals. Systems based on the 8086 and 8088 generally use Intel's 20-pin 8288 bus controller. The 80186's on-chip bus controller functions eliminate the need for external controllers.

## Registers

The 80186's register structure is identical to that of the 8086 and 8088 processors (see Fig. 2). The AX, BX, CX, and DX registers are 16-bit general purpose registers, although the chips can use each register as a pair of 8-bit registers. The chips give H(igh) and L(ow) designators to the 8-bit registers, the suffix referring to the 16-bit full register. The remaining 80186 registers use 16 bits.

The 80186 uses a stack pointer (SP) register to point to the current top-of-stack. The stack accommodates software subroutines and permits orderly interrupt processing and parameter passing.

The base pointer (BP), source index (SI), and destination index (DI) registers are general pointer registers that perform specific operations in various 80186 instructions.

The 80186's instruction pointer register (IP) is often referred to as a program counter in other microprocessors. This register points to the beginning of the CPU's next instruction.

The flag register contains several 1-bit flags that indicate the status of various system parameters and arithmetic or logical result conditions. Flags let the CPU make decisions and alter the direction of program flow.

The 80186's most nonstandard registers are its 16-bit segment registers. The CS, DS, ES, and SS registers provide base addresses for accessing memory and memory-mapped peripheral devices. The CPU multiplies the segment register's value by 16 to shift it left four bit positions. The CPU then calculates the desired memory address as an offset from (added to) this base address.

The 80186 accesses all instructions from the code segment; the IP is an offset into the segment defined by the CS register. Likewise, it makes all stack accesses in the stack segment; the SP is an offset into the segment defined by the SS register. Most data accesses default to the data segment, and the 80186 uses the extra segment as a spare. Segmentation and offset give the 80186 a 20-bit, or 1 megabyte (Mbyte), addressing range, but let each segment address only a 64K block.

## Compatibility Problems

It seems that Intel adopted the 64K block size to remain compatible with its 8085 8-bit family, although Intel denies this. In any case, the segmented architecture of the 80186 and its relatives makes Assembly-language programming difficult. Intel maintains that more and more programmers use high-level languages, which tend to make segmented architecture transparent to the user. This is true, but the 64K limit is a nuisance even in high-level language programming and in many IBM PC-compatible programs.

In comparison, newer 16-bit processors, such as the Motorola 68000 and the National Semiconductor NS16000, have 24-bit (16 Mbyte) linear addressing spaces that eliminate segmentation and its limitations, making programming much easier. The NS16000 architecture, for example, lets most instructions operate on any data size (8-, 16-, or 32-bit) and lets you use internal register or memory operand locations as a source operand or destination operand. The 8086 family instruction set, on the other hand, has many register-specific or data type-specific instructions.

In spite of these architectural limitations, the 80186 is an improvement over the 8086. Its design and instructions increase flexibility and performance. Because of these improvements, 8086 software executes faster on the 80186 and more nearly matches the performance of the newest 16-bit processors. And since most software doesn't reflect the CPU's architecture, the 80186's limitations should be invisible to most users.

Since reliability is directly related to the number of components in a system, the 80186's integration increases the reliability of computers that use it and reduces the time required to fix them.

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Because the 80186 includes the 8086's instruction set, it can run software written for the 8086 or 8088 processors, as long as the programs do not use computer-specific instructions. 80186-based systems supporting MS-DOS can draw on a large software base. Software companies selling IBM PC-specific programs seem willing to make the changes for other popular MS-DOS systems, such as Tandy's Model 2000.

## Bases Loaded

Although the 8086 family architecture is not the best available, this group has the largest software base of any 16-bit processor. The amount of software available for a system is more important than which processor it uses. This is particularly true if the system performs as well as 80186-based systems do.

The 80186's integration is well-designed, but it's not likely to impress the average consumer. Most computer purchasers want a tool to meet their needs, and although the two are related, the consumer is more concerned with performance than chip numbers.

Compare the performance of the 80186 with some of its close relatives. Tandy claims that its Model 2000, using an 8 MHz 80186, is nearly three times as fast as the IBM Personal Computer, which uses an 8088 at slightly under 5 MHz. Instead of using complex benchmark tests, let's simply examine the chip manufacturer's documentation to test the validity of Tandy's assertion.

**Because the 80186 includes the 8086's instruction set, it can run software written for the 8086 or 8088 processors.**

Intel claims that its 8086 CPU, using a 16-bit data bus, works 40 percent faster than the 8-bit bus 8088. Intel also states that the 8 MHz 80186 performs twice as fast as the 5 MHz 8086. Thus the 8 MHz 80186 CPU works roughly 2.8 times faster than the 5 MHz 8088 CPU. And since the IBM PC's 8088 executes at slightly less than 5 MHz, the Model 2000's 8 MHz 80186 should indeed run nearly three times faster.

## Supply and Demand

The already high demand for the 80186 is increasing. Intel's planned production facilities should help meet demand within the next eight to 12 months and force prices slightly lower. And if Intel's negotiations with Advanced Micro Devices regarding second-source production are successful, the 80186 should become more readily available.

Given the popularity of the 8088, an 8-bit data bus version of its 8086, Intel plans to develop a similar chip based on the 80186. The new 80188 will resemble the 80186 internally, but communicate with the world through an 8-bit data bus.

The 80186 is a processor that's going places. The Model 2000 has far greater performance than its competition, and maintains operating system and software compatibility. As a high-performance integrated chip with a large software base to draw on, the 80186 is bound to become even more popular. ■

*Contact Roger Alford at P.O. Box 2014, Ann Arbor, MI 48106.*

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| Characters per record | 1679 | 1000 | 4608 ✓ |
| Records per file | 1300 | 65535 | 16,000,000 ✓ |
| Indexes per file | 1 | 7 | 12 ✓ |
| Number of digits per numeric field | 20 | 10 | 24 ✓ |
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| Files span multiple drives | no | no | up to 8 ✓ |
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Illustration by Richard Cowdrey

# SuperCop II is a do-all copy utility that lets you transfer Model I/III files between magnetic media and convert 500 baud tapes to 1,500 baud.

by Dan Robinson

For those of you who've ever had the arduous task of transferring programs from one storage medium to another, I have some good news. I wrote a Model I/III utility that does the work for you—SuperCop II* copies any file from disk to tape, tape to disk, disk to disk, or tape to tape. It also converts 500 baud tapes to 1,500 baud.

If you upgrade your system to disk, you can convert your tape programs to disk and back up your disks to economical tapes.

You can use SuperCop II to examine or modify disk files with Debug, and write the altered files to tape or disk. SuperCop II also lets you read, modify, print, and write disk boot and directory files.

SuperCop II duplicates any tape recorded at normal baud rates, but it can't copy high-speed tapes or disk files that won't load normally—SuperCop II is a back-up program for unprotected software.

## Building SuperCop II

The final SuperCop II program is actually a combination of three independent programs, assembled by a fourth program. SuperCop II will fit in a normal Model I/III disk editor/assembler if you leave out the program's comments.

If you want to keep the comments, type Program Listings 1, 2, and 3 into a Misosys EDAS editor/assembler (5904 Edgehill Drive, Alexandria, VA 22303). After you enter the listings, enter Program Listing 4 into RAM. Running Listing 4 creates SuperCop II.

EDAS has a unique feature that lets your computer assemble these formidable listings without loading the entire program into memory at once. EDAS keeps the information on disk, and Listing 4 assembles Listings 1, 2, and 3 a piece at a time, passing the information from the disk through memory and back to disk again.

If you'd rather not enter the listings, you can buy an operating command file and the source code on disk. Send $25 to the Laguna Salada Union School District Computer Fund (LSUSDCF), 1625 Higgins Way, Pacifica, CA 94044. The money will go toward computer literacy courses for the students.

**SuperCop II represents an upgraded version of SuperCop I, which appeared in* The Alternate Source *(issue 11).*

## Commands Made Simple

SuperCop II is easy to use, letting you choose all commands directly from a main menu. A discussion of each command, with its definition in parentheses, follows.

D (load disk file) reads your program into the buffer. Enter your file name, and SuperCop II displays the file's start, end, and transfer addresses, as well as file type and buffer location. If the program is offset, SuperCop II displays the operating addresses.

W (write to disk) stores your file on disk after prompting you to enter the file name. Since disk operating systems (DOSes) write files to the first disk they find with space available, make sure you specify an appropriate drive number. SuperCop II displays the grans required to store the program and the file's buffer addresses.

Since SuperCop II reads all bytes, including loader codes, into the buffer, Model III owners may see a D or C next to the stars.

T (load tape file) prompts you to prepare the recorder and loads the file. If you need to interrupt the load, press the break key to return to the main menu.

### *The Key Box*

**Models I and III**
**48K RAM**
**Editor/Assembler**

```
6600  2030 202C 2030 2040 2035 202C 2035 202C .0.,.0...5.,.5.,
6610  2032 202C 2032 202C 2031 3220 2C20 3020 .2.,.2.,.12.,.0.
6620  2C20 3130 202C 2035 202C 2031 202C 2030 ,.10.,.5.,.1.,.0
6630  202C 2030 202C 2032 3920 4020 3520 2C20 .,.0.,.29...5.,.
6640  3520 2C20 3220 2C20 3220 2C20 3020 2C20 5.,.2.,.2.,.0.,.
6650  3620 2C20 3130 202C 2035 202C 2031 202C 6.,.10.,.5.,.1.,
6660  2030 202C 2030 202C 2032 3920 4020 3020 .0.,.0.,.29...0.
6670  2C20 3130 202C 2030 202C 2034 202C 2030 ,.10.,.0.,.4.,.0
6680  202C 2031 3520 2C20 3020 2C20 3020 2C20 .,.15.,.0.,.0.,.
6690  3132 202C 2030 202C 2034 3020 2C20 3020 12.,.0.,.40.,.0.
66A0  2C20 3020 4000 0000 0000 0000 0000 0000 ,.0.............
66B0  0000 0000 0000 0000 0000 0000 0000 0000 ................
```

*Figure 1. Example disk data file.*

*Program Listing 1. Source code for SuperCop II.*

```
*LIST ON
; ********************************************************
; *                                                      *
; *                    SUPERCOP II                       *
; *                                                      *
; ********************************************************
;
        ORG     5555H
;
; ********************************************************
; *                                                      *
; *            DATA BUFFERS AND STORAGE AREA             *
; *                                                      *
; ********************************************************
;
PRNTBF  DEFS    48      ; STORE DATA FOR HARDCOPY
PRNTB1  DEFS    16      ; STORE ASCII FOR HARDCOPY
        DEFB    0DH
RECSL   DEFB    00H     ; STORE RECORDER SELECTION
BUFEND  DEFW    0000H   ; STORE BUFFER EOF
FORMAT  DEFB    00H     ; STORE DISC/TAPE FORMAT
TYPEMK  DEFB    00H     ; STORE FILE TYPE
STADR   DEFW    0000H   ; STORE START ADDR
ENDAD   DEFW    0000H   ; STORE END ADDR
TRFAD   DEFW    0000H   ; STORE TRF ADDR
OFST    DEFW    0000H   ; STORE OFFSET RANGE
DOFST   DEFW    0000H   ; STORE DISK OFFSET
OSADR   DEFW    0000H   ; STORE OFFSET START ADDR
OEADR   DEFW    0000H   ; STORE OFFSET END ADDR
OTADR   DEFW    0000H   ; STORE OFFSET TRF ADDR
BYTE    DEFB    00H     ; STORE BYTE COUNT
FILE    DEFS    50      ; STORE FILESPEC
TFILE   DEFS    7H      ; STORE TAPE FILESPEC
INST    DEFS    2DH     ; STORE KEYBOARD INPUT
BUF     DEFS    256     ; DISK INPUT BUFFER
        DEFS    100
STACK   EQU     $       ; TOP OF STACK
        NOP
        NOP
;
; ********************************************************
;
START   CALL    INTRO
;
; ********************************************************
; *                                                      *
; *     CHECK FOR MODEL III AND MIII TRSDOS              *
; *                                                      *
; ********************************************************
;
MIIICK  LD      A,(0003H)       ; CHECK IF MODEL I
        CP      74H
        JP      Z,COMD
        LD      HL,4411H        ; HI-MEM
        LD      (ZBUF+1),HL
        LD      HL,RDBYT3       ; CHANGE PROBLEM TAPE
        LD      (CHG4+1),HL
        LD      HL,DTRD3        ; CHANGE DATA TAPE
        LD      (DTRD+1),HL
        LD      A,0C9H          ; PUT RETURN AT CASSETTE
        LD      (ROM13),A       ; AND ROM CALL
        LD      HL,COMD         ; CHANGE CASSETTE RESET
        LD      (4204H),HL
        LD      HL,ROM14        ; READ BYTE ROUTINE
        LD      (READ+1),HL
        LD      HL,CHG3         ; CASSETTE SELECT ROUTINE
        LD      (CHG+1),HL
        LD      A,00H           ; SET MIII INTERRUPT
        LD      (RESET),A
        LD      HL,4430H        ; CHECK MIII TRSDOS
        LD      A,(HL)
        INC     HL
        ADD     A,(HL)
        INC     HL
        ADD     A,(HL)
        CP      0F5H
        JP      NZ,COMD         ; JUMP IF NOT MIII TRSDOS
        LD      A,0C0H          ; FIX ERROR DISPLAY
        LD      (ERCK+1),A
;
; ********************************************************
; *                                                      *
; *            OPTION SELECTION AREA                     *
; *                                                      *
; ********************************************************
;
COMD    CALL    ROM06           ; TURN CASSETTE OFF
        LD      SP,STACK        ; SET STACK POINTER
        LD      HL,41A6H
        LD      B,63
        LD      A,0C9H
COMD1   LD      (HL),A
        INC     HL
        DJNZ    COMD1
        LD      A,20H           ; PRINT TWO SPACES
        LD      (3C3EH),A
        LD      (3C3FH),A
        EI                      ; ENABLE INTERUPTS
        LD      A,83H   ; PUT BLOCK CURSOR ON SCREEN
        CALL    ROM07
        LD      A,19H   ; LINEFEED
        CALL    ROM08
KEY     CALL    ROM01   ; INPUT COMMAND KEY
        CP      0H
        JR      Z,KEY
        CP      60H             ; CHECK FOR UPPER CASE
        JR      C,KEY1
        SUB     20H
KEY1    CP      42H     ; JUMP TO DEBUG
        JP      Z,440DH
        CP      57H     ; W=WRITE TO DISC
        JP      Z,WRITE
        CP      45H     ; E=EXIT TO DOS
        JP      Z,402DH
        CP      52H     ; RECORDER SELECT
CHG     JP      Z,RECSLT
        CP      44H     ; D=INPUT DISCFILE
        JP      Z,DISK
        CP      53H     ; LOAD PROBLEM TAPE TO BUFFER
        JP      Z,PROBLD
        CP      50H     ; P=WRITE TO TAPE
        JP      Z,TAPWRT
        CP      54H     ; T=TAPE ADDR & LOAD TO BUFFER
        JP      Z,TAPE
        CP      41H     ; ADD/DELETE BYTES IN BUFFER
        JP      Z,BUFCHG
```

P (write to tape) prepares the recorder and writes the file. Again, pressing the break key stops the process and returns to the command menu.

Tapes copied from disk files use the disk program's name. Basic tapes use only the first letter, tapes assembled with EDTASM use the first six characters, and object (system) tapes use the first six characters or blanks up to the slash (/) mark.

S (load special tape) lets Model III users load Model I 500 baud tapes. After it prompts you to prepare the cassette, SuperCop II switches to 500-baud and loads the file. As with the other functions, the break key lets you escape the process. S loads all 500-baud tapes, including nonstandard format tape files.

SuperCop II saves nonstandard format files to disk for examination by monitor programs, but they won't run. You can copy nonstandard tapes to tape for back-up purposes, or convert them to 1,500 baud for the Model III.

H (hardcopy) prints the buffer file. Press the break key to interrupt the printer.

B (enter Debug) lets you enter Debug to view or modify the program in the buffer. Before loading a disk or tape, SuperCop II writes the buffer with zeros to ease viewing. To return to the command menu, type G5778.

E (exit to DOS) exits SuperCop II and returns to DOS.

On the Model I, R (recorder select) asks whether you want to use recorder 1 or 2. You can use one recorder to read tape files and another to write them.

On the Model III, R displays the familiar "Cass?" prompt, letting you toggle between low or high baud rates. SuperCop II lets you load a tape at one speed and write it at a different speed.

A (adjust buffer) lets you change the

```
6600  0102 005E 9783 9797 83AB A387 95B5 BCB5  ................
6610  BDBC BAB3 B495 8080 8080 8080 8080 809C  ................
6620  8C9C 9C8C AC8C 9C94 95B0 95B5 B0AA 8E90  ................
6630  9583 8383 8383 8383 8381 B0B0 B0B0 B0B0  ................
6640  B0B0 9095 8095 9580 AAB8 8195 8D8F 8D8F  ................
6650  8F8E 8C8D 85AA 83AB AB83 8397 9BAB AAB8  ................
6660  BEBA BCB4 B7B9 BA80 8080 8080 8080 8080  ................
6670  A88C ACAC 8C8C 9CAC ACAA A0BA AAB0 909D  ................
6680  A5AA 8283 8383 8383 8383 83A0 B0B0 B0B0  ................
6690  B0B0 B0B0 AA80 AAAA 8080 B596 AA8A 8E8F  ................
66A0  8E8F 8D8D 8E8E B799 AAB0 958D 868A 8085  ................
66B0  8080 8080 809C A4A8 8094 B799 AA83 9580  ................
66C0  8080 8080 B090 A080 909D A6AA 8C95 8381  ................
66D0  8280 81AA B384 B5BA 8A8C 8185 8A80 8080  ................
66E0  8090 A88C 9094 A8AA B384 97AB 8080 8080  ................
66F0  80A0 B080 90A0 AA8C 919D AE82 8380 8182  ................

6700  8387 8182 0102 005F AB83 8082 8383 8383  ................
6710  8080 8C9C 8488 AC8C 8088 8E8C 8C8E 8080  ................
6720  B0B0 90A0 B0B0 80A0 B9B0 B0BA 8080 828B  ................
6730  9380 8397 8180 8383 8383 8180 88AC 8C80  ................
6740  8C9C 8480 8C8D 8C8C 8580 A0B0 B080 B0B0  ................
6750  9080 B2B4 B0B0 9580 9C8D 9483 8781 8090  ................
6760  80B0 B490 8D9C 8580 8080 8090 80B7 B395  ................
6770  8081 80A8 8EAC 828B 8380 8080 A0B8 B08A  ................
6780  AC8E 8080 8080 A080 AAB3 BB80 8280 A6B3  ................
6790  B384 8080 8080 988C 8C90 8283 8380 A0B0  ................
67A0  B080 898C 8C81 88B3 B399 8080 8080 A08C  ................
67B0  8CA4 8083 8381 80B0 B090 828C 8C86 0100  ................
67C0  0101 0001 FF01 FF00 FFFF 00FF 01FF BA90  ................
67D0  8080 A0B5 8080 A880 8381 8094 8283 A080  ................
67E0  8E84 8090 888D 8991 8080 82A6 8080 A484  ................
67F0  8081 8898 8082 9090 8284 A0A0 8089 9D84  ................

8600  FE30 2006 79B7 2805 3E30 120E 0123 1310  .0..y.(.>0...#..
8610  EE1B 3E30 123A F67D B728 10FE 1638 023E  ..>0.:...(...8.>
8620  1611 0A54 473E 5B12 1310 FC3A 6269 FE01  ...TG>.....:bi..
8630  C821 F07D 1138 5401 0006 7EFE 3020 0879  .!...8T.....0..y
8640  B71B 2806 133E 3012 0E01 1323 10EC 3E30  ..(..>0....#..>0
8650  1B12 3AF7 7DB7 C8FE 1638 023E 1611 3554  ..:.....8.>..5T
8660  473E 5B12 1B10 FCC9 0000 0000 0000 0000  G>..............
8670  0000 0000 0000 0000 0000 0000 3030 3030  ............0000
8680  0113 007E 3030 3030 3030 3030 0303 0130  ....00000000...0
8690  3000 FFFF FF02 0293 6300 0000 0000 0000  0.......c.......
86A0  0000 0000 0000 0000 0000 0000 0000 0000  ................
86B0  0000 0000 0000 0000 0000 0000 0000 0000  ................
86C0  0000 0000 0000 0000 0000 0000 0000 0000  ................
86D0  0000 0000 0000 0000 0000 0000 0000 0000  ................
86E0  0000 0000 0000 0000 0000 0000 0000 0000  ................
86F0  0000 0000 0000 0000 0000 0000 0000 0000  ................
```

*Figure 2. Disk object file of Nova.*

length of a buffer file. If you make a patch with Debug, this command lets you include the patch when SuperCop II writes the file to tape or disk. To use this command, enter a plus or minus sign and two decimal digits.

SuperCop II devotes special attention to offsets. Tape programs normally occupy low memory and conflict with the DOS when you transfer them to disk. SuperCop II relocates tape programs before you write them to disk, letting you execute them from DOS.

Converting disk files to tape poses the opposite problem. If you have offset a program when saving to disk, you must write them to tape as if they were in their normal operating position. SuperCop II adds offsets to tape programs when you transfer them to disk, and removes the offsets when writing to tape. SuperCop II removes offsets only to make disk transfer possible.

## Limitations

SuperCop II is versatile, but it can't do everything. For example, if you write a Basic file stored on disk in ASCII format to tape, the CLOAD command won't recognize it. Such files don't load in Basic, and terms like LSET and MKI$ produce errors. I also recommend you avoid the incredibly long and slow back-up disk data files require.

SuperCop II's ROM routines have difficulty with certain tape formats, such as those without end-of-file (EOF) markers, especially on the Model III at 1,500 baud. Reading these tapes sends SuperCop II into never-never land, but you can load them as System or Basic files into Basic, or into EDTASM, Electric Pencil, VisiCalc, and Scripsit.

SuperCop II loads files into the buffer in their loading format (tape or disk), letting you examine or modify a

```
82D0  01ED 512B 7CB5 20FB 1D20 F3D9 C900 0111 ..Q+.............
82E0  6A9C F321 0080 1100 5501 6A1C EDB0 C30B j..!....U.j.....
82F0  5B02 026A 9C00 0000 0000 0000 0000 0000
```

*Figure 3. Disk offset file of Invaders.*

```
6600  3520 4449 4D41 2831 3130 290D 3330 2047 5.DIMA(110).30.G
6610  4F53 5542 3630 3030 0D35 3020 473D 303A 0SUB6000.50.G=0:
6620  503D 313A 543D 3336 0D38 3020 474F 5355 P=1:T=36.80.GOSU
6630  4232 3030 300D 3930 2047 4F54 4F31 3030 B2000.90.GOTO100
6640  300D 3130 3020 2720 2A20 4452 4157 2047 0.100.'.*.DRAW.G
6650  5249 4420 2A0D 3130 3520 434C 530D 3131 RID.*.105.CLS.11
6660  3020 464F 5258 3D30 544F 3132 300D 3131 0.FORX=0TO120.11
6670  3520 2049 4658 3C31 3054 4845 4E31 3330 5..IFX<10THEN130
6680  0D31 3230 2020 5345 5428 582C 3029 0D31 .120..SET(X,0).1
6690  3330 2020 5345 5428 582C 3629 0D31 3430 30..SET(X,6).140
66A0  2020 5345 5428 582C 3132 290D 3135 30F2 ..SET(X,12).150.
66B0  2053 4554 2858 2C31 3929 0D31 3630 2020 .SET(X,18).160..
66C0  5345 5428 582C 3234 290D 3137 3020 2053 SET(X,24).170..S
66D0  4554 2858 2C33 3029 0D31 3830 2020 5345 ET(X,30).180..SE
66E0  5428 582C 3336 290D 3139 3020 4E45 5854 T(X,36).190.NEXT
66F0  580D 3230 3020 464F 5259 3D31 544F 3335 X.200.FORY=1TO35
```

*Figure 4. Disk Basic ASCII file of Troll.*

```
6600  FFC7 6809 0084 3A8E 3130 3032 3000 D968 ..h...:.10020..h
6610  0A00 B835 3235 3A99 582C 592C 5A3A 8600 ...525:DX,Y,Z:..
6620  E268 1900 8D39 3030 00F9 6832 004D 4424 .h...900..h2.MD$
6630  D522 5249 4449 4355 4C4F 5553 223A 9200 ."RIDICULOUS":..
6640  0C69 3300 4D44 24D5 2241 4253 5552 4422 .i3.MD$."ABSURD"
6650  3A92 0022 6934 004D 4424 D522 4752 4F54 :.."i4.MD$."GROT
6660  4553 5155 4522 3A92 003A 6935 004D 4424 ESQUE":..:i5.MD$
6670  D522 4E4F 4E53 454E 5349 4341 4C22 3A92 ."NONSENSICAL":.
6680  004F 6936 004D 4424 D522 4641 5243 4943 .0i6.MD$."FARCIC
6690  414C 223A 9200 6869 3700 4D44 24D5 2250 AL":..hi7.MD$."P
66A0  5245 504F 5354 4552 4F55 5322 3A92 007A REPOSTEROUS":..z
66B0  6938 004D 4424 D522 5349 4C4C 5922 3A92 i8.MD$."SILLY":.
66C0  0090 6939 004D 4424 D522 5345 4E53 454E ..i9.MD$."SENSEL
66D0  4553 5322 3A92 00A7 693A 004D 4424 D522 ESS":...i:.MD$."
66E0  4952 5241 5449 4F4E 414C 223A 9200 BD69 IRRATIONAL":...i
66F0  3B00 4D44 24D5 2246 414E 5441 5354 4943 ;.MD$."FANTASTIC
```

*Figure 5. Compressed Disk Basic file of Android Nim.*

file before writing it to a new file. In this way, SuperCop II accommodates files with multiple origins. The exception to this is tape data files: To conserve memory and make Debug easier to use, SuperCop II doesn't load tape data file 256-byte leaders or their synchronization bytes into the buffer.

## Format Formalities

As I mentioned earlier, you can use Debug to examine and modify disk and tape files, but to do so effectively, you should be familiar with their formats.

Disk data files use many types of data and delimiters. Figure 1 is an example of a short numerical file. A 20 hexadecimal (hex) byte (an ASCII space) precedes and follows each number, followed by a 2C byte (an ASCII comma) and so on. Each data block ends with a 0D byte (carriage return), but disk data files don't use EOF markers.

Disk object files begin with a 01 loader code, followed by a count of the bytes in each code block, including the 2 address bytes. A 2-byte address in least significant byte-most significant byte (LSB-MSB) form and the actual code bytes come after.

The last code block in a disk object file begins with a 02 byte, representing the program's transfer address or entry point. A second 02 byte count appears next, followed by the entry point's LSB-MSB address. Figure 2 is a sample disk object file, taken from the game Nova.

A disk object file's offset is coded into 15 bytes at the end of the file. Figure 3 is an example offset object file, Radio Shack's Invaders game, as created by LMOFFSET. The F3 byte disables the program's interrupts and the 210080 indicates that the program will move data from its 8000 hex loading address.

The 110055 code tells the computer to relocate the program to 5500 hex. 016A1C indicates that the program will move 1C6A hex bytes, and the command EDB0 performs this task. C30E5B jumps to the program's normal entry point at 5B0E hex, and the disk file's offset loader begins at 9C6A, its transfer address.

When you examine files with utilities such as Superzap, the area after the end of the file is seldom zeroed; it usually contains the data left in the buffer from the previous sector when it was written to disk. To find the EOF, follow the 01 codes into the final sector and use the last byte count to locate the 02 code.

```
6600  D353 4F52 5432 20B0 B0B0 B6B0 203B 534F .SORT2.....;SO
6610  5254 5320 322D 4259 5445 2041 4444 5245 RTS.2-BYTE.ADDRE
6620  5353 4553 2049 4E20 4153 4345 4E44 494E SSES.IN.ASCENDIN
6630  4720 4E52 4445 520D B0B0 B0B7 B020 3B4E G.ORDER.......;N
6640  4E20 454E 5452 592C 204C 4142 5441 4220 N.ENTRY..LABTAB.
6650  4D55 5354 2043 4F4E 5441 494E 2041 4444 MUST.CONTAIN.ADD
6660  5245 5353 204E 4620 5354 4152 5420 4F46 RESS.OF.START.OF
6670  2054 4142 4C45 0DB0 B0B0 B8B0 203B 4C41 .TABLE.......;LA
6680  4245 4E44 204D 5553 5420 434F 4E54 4149 BEND.MUST.CONTAI
6690  4E20 4144 4452 4553 5320 4F46 2054 4142 N.ADDRESS.OF.TAB
66A0  4C45 2045 4E44 0DB0 B0B0 B9B0 2009 4F52 LE.END........OR
66B0  4709 3830 3030 4809 3B44 454C 4554 4520 G.8000H.;DELETE.
66C0  5748 454E 2049 4E53 4552 5445 4420 494E WHEN.INSERTED.IN
66D0  2052 4F55 5449 4E45 0DB0 B0B1 B0B0 2053 .ROUTINE.......S
66E0  4F52 5409 4C44 0944 452C 284C 4142 5441 ORT.LD.DE.(LABTA
66F0  4229 0DB0 B0B1 B1B0 2009 4C44 0948 4C2C B).........LD.HL.
```

*Figure 6. Example disk EDTASM file.*

```
7C00  6767 696E 7320 5761 790D 2020 2020 2020 ggins.Way.......
7C10  2020 2020 2020 2020 2020 2020 2020 2020 ................
7C20  2020 2020 2020 2020 2020 5061 6369 6669 ..........Pacifi
7C30  6361 2C20 4341 2E0D 2020 2020 2020 2020 ca,.CA..........
7C40  2020 2020 2020 2020 2020 2020 2020 2020 ................
7C50  2020 2020 2020 2020 2020 2020 2020 2020 ................
7C60  3934 3034 340D 00FF FFFF FFFF FFFF FFFF 94044...........
7C70  FFFF FFFF FFFF FFFF FFFF FFFF FFFF FFFF ................
7C80  FFFF FFFF FFFF FFFF FFFF FFFF FFFF FFFF ................
7C90  FFFF FFFF FFFF FFFF FFFF FFFF FFFF FFFF ................
7CA0  FFFF FFFF FFFF FFFF FFFF FFFF FFFF FFFF ................
7CB0  FFFF FFFF FFFF FFFF FFFF FFFF FFFF FFFF ................
7CC0  FFFF FFFF FFFF FFFF FFFF FFFF FFFF FFFF ................
7CD0  FFFF FFFF FFFF FFFF FFFF FFFF FFFF FFFF ................
7CE0  FFFF FFFF FFFF FFFF FFFF FFFF FFFF FFFF ................
7CF0  FFFF FFFF FFFF FFFF FFFF FFFF FFFF FFFF ................
```

*Figure 7. Example disk Electric Pencil file.*

A loader location containing anything other than a 01 or 02 indicates a comment. The number of bytes in the remark comes after the non-loading code, followed by the remark bytes. Examine the beginning of TRSDOS or Electric Pencil 2.0 files for examples.

Disk Basic ASCII files are easy to read because the text side of the display is in English. The first byte is an ASCII coded line number and each line ends with a 0D carriage return. Disk Basic ASCII files don't use EOF. Figure 4 contains part of the Disk Basic ASCII file game Troll.

Disk Basic files in compressed format always begin with an FF byte. Such files use TRS-80 tokens, but the ASCII strings stand out in the display. Figure 5 contains a compressed Disk Basic file of the pioneer video game, Android Nim. The first 2 bytes of each line represent the address of the next line (rather than the current line). Each ends with a 00 byte, and 2 additional 00 bytes mark the end of the file.

Disk EDTASM files begin with a D3 byte, followed by a 6-byte file name padded with spaces, the line number with bit 7 set (the byte begins with B), and a 20 space separating the line number from the label field. The rest of the code is ASCII, with a 09 horizontal tab separating the end of each segment and a 0D carriage return at the end of each line. See Fig. 6 for an example disk EDTASM file. END comes before the program's entry point or label. A 1A byte marks the end of the file.

Disk Electric Pencil uses ASCII files with a 00 byte at the end (see Fig. 7). Electric Pencil expands tabs to 20 hex spaces and ends paragraphs with 0D hex. Most text files, including Scripsit files saved in ASCII, follow the same pattern, but they might contain control codes above 7F hex and don't indicate the end of a file.

```
6600  5554 4255 4720 203C 0080 43ED 4339 48C1 UTBUG..<..C.C9H.
6610  0B0B 0BED 433B 48ED 4B39 48C3 AB43 CD32 ....C;H.K9H..C.2
6620  45ED 7B39 482A 3B48 C3B7 4431 8049 1806 E..9H*;H..Dl.I..
6630  3180 49C3 D343 F3ED 7339 4831 3948 FDE5 1.I..C..s9h19h..
6640  DDE5 E5D5 C5F5 08D9 E5D5 C5F5 3180 4906 ............1.I.
6650  10C5 CD3C 45C1 10F9 2100 3C22 3D48 CD3C ...<E...!.<"=H.<
6660  453E 0032 4E48 D3FF 3E23 CD32 45CD C845 E>.2NH..>#.2E..E
6670  FE46 CA0D 48FE 42CA DF47 FE4D 281A FE4A .F..H.B..G.M(..J
6680  CAA5 44FE 5228 59FE 47CA 9343 FE50 CAD3 ..D.R(Y.G..C.P..
6690  44FE 4CCA 0645 18D5 CD32 45CD 8945 3240 D.L..E...2E..E2@
66A0  48CD 8945 323F 48CD 7B45 DD2A 3F48 CD0F H..E2?H..E.*?H..
66B0  45CD 7B45 CDC8 45FE 0D28 0E21 3B44 E521 E..E..E..(.!;D.!
66C0  8C45 E5C3 A745 DD77 00DD 23DD 223F 48CD .E...E.w..#."?H.
66D0  3C45 DD21 4048 CD0F 45DD 2BCD 0F45 18C7 <E.!@H..E.+..E..
66E0  DD21 2548 0603 C5CD 8344 DDE5 CD3C 45DD .!%H.....D...<E.
66F0  E13E 20CD 3245 CD83 44DD E5CD 3C45 CD3C .>..2E..D...<E.<
```

*Figure 8. T-Bug tape file.*

```
6600  D3D3 D353 F442 0100 843A 46D5 3830 0026 ...S.B...:F.80.&
6610  4302 0055 D531 3A81 5AD5 30BD 3437 3A83 C..U.1:.Z.0.47:.
6620  285A 2C55 293A 875A 3AB2 4032 342C 2220 (Z,U):.Z:.@24,".
6630  5241 4449 4154 494F 4E20 444F 4D45 2022 RADIATION.DOME."
```

*Figure 9. Basic tape file of Space Taxi.*

```
7C00  6E73 6F6E 0D20 2020 2020 2020 2020 2020 nson............
7C10  2020 2020 2071 AD20 2020 2020 2020 2020 .....q..........
7C20  2020 2020 2020 2031 3632 3520 4869 6767 .......1625.Higg
7C30  696E 7320 5761 790D 2020 2020 2020 2020 ins.Way.........
7C40  2020 2020 2020 2020 2020 2020 2020 2020 ................
7C50  2020 2020 2020 2020 5061 6369 6669 6361 ........Pacifica
7C60  2C20 4341 2E0D 2020 2020 2020 2020 2020 ..CA............
7C70  2020 2020 2020 2020 2020 2020 2020 2020 ................
7C80  2020 2020 2020 2020 2020 2020 2020 3934 ..............94
7C90  3034 340D 2020 2020 2020 2020 2020 2020 044.............
7CA0  2020 2020 2020 2020 2020 2020 2020 2020 ................
7CB0  2020 2020 2834 3235 2920 3335 392D 3333 ....(415).359-33
7CC0  3338 0D00 F900 FFFF FFFF FFFF FFFF 38..
```

*Figure 10. Tape Electric Pencil file.*

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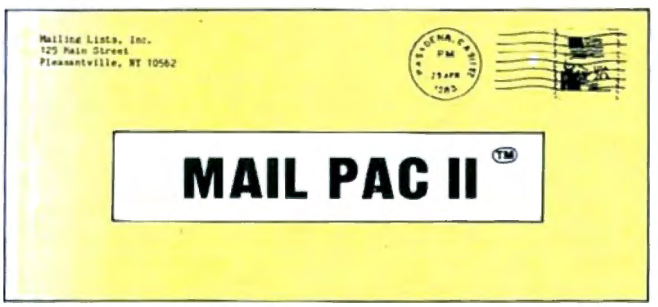


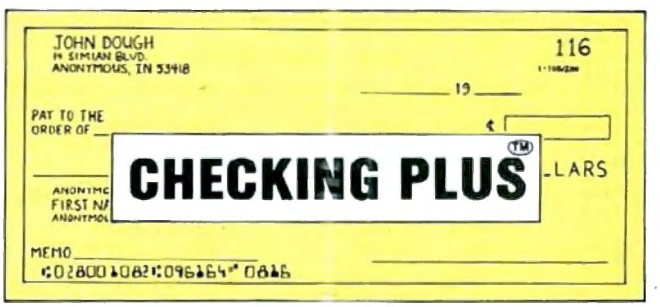


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Stores from one to one million names in Zip Code, Numerical or Alphabetical order. The only limitation is your disk storage space.

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## Tape Formats

Tape formats begin with a 256-byte leader and an A5 synchronization byte. Object files begin with 55, an identifying byte, and a name of up to 6 bytes. With file names shorter than 6 bytes, the remaining bytes are padded with a 20 hex code.

Figure 8 contains the object file for T-bug. It loads at 4380 hex and its entry point is 43A0 hex. The program is coded in blocks of data indicated by a 4-byte addressing sequence. These 4 bytes begin with 3C (the synchronization byte) followed by the number of data bytes and the loading address in LSB-MSB format. Following the block of program code is a 1-byte checksum. Then the sequence begins again with another 3C byte. A 78 byte indicates the final block, and an LSB-MSB program entry address comes after.

Tape data files follow a format similar to disk data files, and tape EDTASM files are identical to their disk counterparts.

Basic tape files begin with three D3 bytes and a 1-byte name. The LSB-MSB address of the next line comes after. Each line ends with a 00 byte, and 2 additional 00 bytes mark the EOF. Since this format is identical to the disk version except for the beginning, Fig. 9 contains only the first part of Radio Shack's Space Taxi game.

Finally, tape Electric Pencil files begin with a byte count, including the data block and checksum. Figure 10 contains an example tape Electric Pencil file. A 00 byte follows the final data byte, and an additional 00 byte marks the EOF. ■

*Dan Robinson is an advisor to the LSUSDCF. Contact him at 1625 Higgins Way, Pacifica, CA 94044.*

*Listing 1 continued*

```
01360          CP      48H     ; HARDCOPY
01370          JP      Z,PBF
01380          JR      COMD
01390 ;
01400 ; ***************************************************
01410 ; *                                                 *
01420 ; *              WRITE TO DISK ROUTINES             *
01430 ; *                                                 *
01440 ; ***************************************************
01450 ;
01460 WRITE    CALL    BOT             ; CLEAR BOTTOM OF SCREEN
01470          LD      HL,AMSG         ; DISPLAY MESSAGE
01480          CALL    DOS1
01490          CALL    CLRSPC          ; CLEAR FILESPEC
01500          LD      HL,0000         ; CLEAR OFFSET ADDRESSES
01510          LD      (DOFST),HL
01520          CALL    LINP            ; GET FILESPEC
01530          LD      A,03H           ; MARK FILESPEC END
01540          LD      (DE),A
01550          CALL    UPRCAS          ; CONVERT TO UPPER CASE
01560          LD      HL,(BUFEND)     ; CALCULATE FILE LENGTH
01570          LD      DE,TBUF
01580          OR      A
01590          SBC     HL,DE
01600          INC     HL
01610          PUSH    HL
01620          LD      B,0             ; LOGICAL RECORD LENGTH
01630          LD      IY,TBUF         ; DATA BUFFER
01640          LD      DE,FILE         ; FILE CONTROL BLOCK
01650          LD      HL,BUF          ; I/O BUFFER
01660          EXX
01670          LD      DE,FILE         ; FILE CONTROL BLOCK
01680          LD      B,0             ; LOGICAL RECORD LENGTH
01690          LD      HL,BUF          ; I/O BUFFER
01700          CALL    DOS7            ; OPEN FILE
01710          JP      NZ,ERCK         ; CHECK FOR DOS ERROR
01720          POP     BC              ; FILE LENGTH
01730          LD      A,(FORMAT)      ; CHECK IF DISK FORMAT
01740          CP      00              ; = TAPE FORMAT
01750          JP      Z,WT2
01760 ; ***************************************************
01770 ; *          WRITE TO DISK FROM DISK FORMAT         *
01780 ; ***************************************************
01790 WT1      LD      A,(IY)          ; GET BYTE FROM BUFFER
01800          INC     IY              ; INCREMENT BUFFER
01810          DEC     BC              ; DECREMENT BYTE COUNT
01820          CALL    DSKWRT          ; WRITE TO DISK
01830          CALL    ROM11           ; BLINK STAR
01840          LD      A,B             ; CHECK FOR COMPLETION
01850          OR      C
01860          JR      NZ,WT1
01870          CALL    DOS5            ; CLOSE FILE
01880          JP      COMD
01890 ; ***************************************************
01900 DSKWRT   EXX                     ; EXCHANGE REGISTERS
01910          CALL    ROM02           ; WRITE ONE BYTE TO DISK
01920          EXX                     ; EXCHANGE REGISTERS
01930          JP      NZ,ERCK         ; CHECK FOR DOS ERROR
01940          RET
01950 ; ***************************************************
01960 ; *          WRITE TO DISK FROM TAPE FORMAT         *
01970 ; ***************************************************
01980 WT2      LD      A,(TYPEMK)      ; CHECK FILE TYPE
01990          CP      01              ; OBJECT FILE
02000          JP      Z,WT2AA
02010          CP      03              ; BASIC FILE
02020          JP      Z,WT6
02030          CP      7               ; PENCIL FILE
02040          JR      Z,WTTPEN
02050          JP      WT1             ; DATA FILE
02060 ; ***************************************************
02070 ; *          ELECTRIC PENCIL TAPE FORMAT            *
02080 ; ***************************************************
02090 WTTPEN   LD      A,(IY)          ; READ BYTES IN BLOCK
02100          LD      B,A
02110          INC     IY
02120 WTPN2    LD      A,(IY)          ; GET BYTE FROM BUFFER
02130          CP      00H             ; CHECK EOF MARK
02140          JR      Z,WTPN3
02150          CALL    DSKWRT          ; WRITE TO DISK
02160          INC     IY              ; ADJUST BUFFER
02170          DJNZ    WTPN2           ; REPEAT FOR BLOCK
02180          CALL    ROM11           ; BLINK STAR
02190 WTPN1    INC     IY              ; BYPASS CHECKSUM
02200          LD      A,(IY)          ; GET BYTE
02210          LD      B,A             ; BLOCK BYTE COUNT
02220          INC     IY              ; ADVANCE BUFFER
02230          JP      WTPN2           ; CONTINUE
02240 WTPN3    CALL    DSKWRT          ; MARK EOF
02250          LD      DE,FILE
02260          CALL    DOS5            ; CLOSE FILE
02270          JP      COMD
02280 ; ***************************************************
02290 ; *              OBJECT FILE FORMAT                 *
02300 ; ***************************************************
02310 WT2AA    LD      IY,TBUF         ; SET BUFFER ADDRESS
02320          LD      HL,0000         ; ZERO OFFSET ADDRESS
02330          LD      (DOFST),HL
02340          LD      A,(IY+9)        ; GET LSB OF LOAD ADDRESS
02350          LD      E,A
02360          LD      A,(IY+10)       ; GET MSB OF LOAD ADDRESS
02370          LD      D,A
02380          LD      HL,8000H        ; CHECK IF LOAD ABOVE
02390          OR      A               ; 8000H - FIND NUMBER TO
02400          SBC     HL,DE           ; BE ADDED TO LOAD ABOVE
02410          JP      M,WT2A          ; DOS
02420          LD      (DOFST),HL      ; STORE ADD VALUE IF +
02430 WT2A     LD      BC,0008         ; BYPASS 1ST 8 BYTES
02440          ADD     IY,BC           ; OF TAPE FORMAT
02450 WT5      LD      A,01            ; INSERT LOADER CODE
02460          CALL    DSKWRT          ; WRITE BYTE
02470          LD      A,(IY)          ; GET BLOCK BYTE COUNT
02480          INC     IY
02490          LD      B,A             ; PLACE IN B
02500          INC     A               ; ADJUST FOR ADDRESSES
02510          INC     A
02520          CALL    DSKWRT          ; WRITE TO DISK
02530          PUSH    BC
02540          LD      BC,(DOFST)      ; CHECK IF NUMBER MUST
02550          LD      A,B             ; BE ADDED TO LOAD ABOVE
02560          OR      C               ; DOS
02570          POP     BC
02580          JP      NZ,OSTAJ        ; IF SO, JUMP
02590          LD      A,(IY)          ; GET LSB LOAD ADDRESS
02600          CALL    DSKWRT
02610          INC     IY
02620          LD      A,(IY)          ; GET MSB LOAD ADDRESS
02630          CALL    DSKWRT
02640          INC     IY
02650 WT4      LD      A,(IY)          ; GET DATA BYTE
02660          INC     IY              ; ADJUST BUFFER
02670          CALL    DSKWRT          ; WRITE TO DISK
02680          DJNZ    WT4             ; COMPLETE BLOCK
02690          CALL    ROM11           ; BLINK STAR
02700          INC     IY              ; BYPASS CHECKSUM
02710          LD      A,(IY)          ; GET LOADER CODE
02720          INC     IY
02730          CP      78H             ; CHECK FOR TRANSFER
02740          JR      NZ,WT5
02750          LD      BC,(DOFST)      ; CHECK IF NUMBER TO
02760          LD      A,B             ; BE ADDED TO ADDRESS
02770          OR      C
02780          JP      NZ,OTAJ         ; JUMP FOR ADJUSTMENT
02790          LD      A,02            ; DISK TRANSFER CODE
02800          CALL    DSKWRT
02810          LD      A,02            ; TWO BYTES FOLLOW
02820          CALL    DSKWRT
02830          LD      BC,(OTADR)      ; TRANSFER ADDRESS
02840          LD      A,C             ; LSB ENTRY ADDRESS
02850          CALL    DSKWRT
02860          LD      A,B             ; MSB ENTRY ADDRESS
02870          CALL    DSKWRT
```

*Listing 1 continued*

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*Listing 1 continued*

```
02880           EXX                     ; EXCHANGE REGISTERS
02890           CALL    DOS5            ; CLOSE FILE
02900           JP      COMD
02910 ; *****************************************************
02920 OTAJ      LD      A,01            ; BLOCK ID CODE
02930           CALL    DSKWRT          ; WRITE TO DISK
02940           LD      A,11H           ; BYTE LENGTH OF OFFSET
02950           CALL    DSKWRT          ; WRITE TO DISK
02960           PUSH    HL
02970           LD      HL,(OEADR)      ; GET NORMAL ADDRESS
02980           INC     HL
02990           LD      BC,(DOFST)      ; GET VALUE TO ADD TO
03000           OR      A               ; LOAD ABOVE DOS AND ADD
03010           ADC     HL,BC           ; FOR BLOCK ADDRESS
03020           LD      A,L             ; WRITE LSB TO DISK
03030           CALL    DSKWRT
03040           LD      A,H             ; WRITE MSB TO DISK
03050           CALL    DSKWRT
03060           PUSH    HL
03070           LD      A,0             ; SET UP CODES FOR
03080           CALL    DSKWRT          ; BLOCK MOVE
03090           LD      A,21H           ; HL COSE
03100           CALL    DSKWRT
03110           LD      A,00            ; LOAD ADDRESS
03120           CALL    DSKWRT
03130           LD      A,80H
03140           CALL    DSKWRT
03150           LD      BC,(OSADR)      ; NORMAL ADDRESS
03160           LD      A,11H           ; DE CODE
03170           CALL    DSKWRT
03180           LD      A,C
03190           CALL    DSKWRT
03200           LD      A,B
03210           CALL    DSKWRT
03220           PUSH    HL
03230           LD      HL,(OEADR)      ; FIND BYTES TO MOVE
03240           LD      BC,(OSADR)
03250           OR      A
03260           SBC     HL,BC
03270           PUSH    HL
03280           POP     BC
03290           POP     HL
03300           LD      A,01            ; BC CODE
03310           CALL    DSKWRT
03320           LD      A,C             ; LSB OF BYTES TO MOVE
03330           CALL    DSKWRT
03340           LD      A,B             ; MSB OF BYTES TO MOVE
03350           CALL    DSKWRT
03360           LD      A,0EDH          ; BLOCK MOVE CODE
03370           CALL    DSKWRT
03380           LD      A,0B0H
03390           CALL    DSKWRT
03400           LD      A,0C3H          ; JUMP CODE
03410           CALL    DSKWRT
03420           LD      BC,(OTADR)      ; TO NORMAL ENTRY ADR
03430           LD      A,C
03440           CALL    DSKWRT
03450           LD      A,B
03460           CALL    DSKWRT
03470           LD      A,02            ; DISK TRANSFER CODE
03480           CALL    DSKWRT
03490           CALL    DSKWRT
03500           POP     BC
03510           POP     HL
03520           LD      A,C             ; LSB OF ENTRY POINT
03530           CALL    DSKWRT
03540           LD      A,B             ; MSB OF ENTRY POINT
03550           CALL    DSKWRT
03560           EXX
03570           CALL    DOS5            ; CLOSE FILE
03580           JP      COMD
03590 ; *****************************************************
03600 OSTAJ     PUSH    BC              ; SAVE REGISTERS
03610           PUSH    HL
03620           LD      A,(IY)          ; GET NORMAL LOAD ADDRESS
03630           INC     IY              ; LSB OF LOAD
03640           LD      L,A
03650           LD      A,(IY)          ; MSB OF LOAD
03660           INC     IY
03670           LD      H,A
03680           LD      BC,(DOFST)      ; GET VALUE TO BE ADDED
03690           OR      A               ; TO LOAD ABOVE DOS
03700           ADC     HL,BC
03710           PUSH    HL
03720           POP     BC              ; PUT DIFFERENCE IN BC
03730           POP     HL
03740           LD      A,C             ; WRITE LSB TO DISK
03750           CALL    DSKWRT
03760           LD      A,B             ; WRITE MSB TO DISK
03770           CALL    DSKWRT
03780           POP     BC
03790           JP      WT4             ; CONTINUE
03800 ; *****************************************************
03810 ; *               BASIC FILE FORMAT                   *
03820 ; *****************************************************
03830 WT6       LD      A,0FFH          ; LOAD BASIC IDENTIFIER
03840           CALL    DSKWRT          ; WRITE TO DISK
03850           INC     IY              ; ADVANCE BUFFER PAST
03860           INC     IY              ; TAPE ID
03870           INC     IY
03880           INC     IY
03890           DEC     BC              ; ADJUST BYTE COUNT
03900           DEC     BC
03910           DEC     BC
03920           DEC     BC
03930           JP      WT1             ; SAME AS DISK FORMAT
03940 ;
03950 ; *****************************************************
03960 ; *                                                   *
03970 ; *            RECORDER SELECT ROUTINE                *
03980 ; *                                                   *
03990 ; *****************************************************
04000 ;
04010 RECSLT    CALL    BOT             ; CLEAR BOTTOM OF DISPLAY
04020           LD      HL,CASMSG       ; DISPLAY MESSAGE
04030           CALL    DOS1
04040 CASSEL    CALL    ROM01           ; GET ONE CHARACTER
04050           CP      0
04060           JR      Z,CASSEL
04070           CP      31H             ; RECORDER NO. 1
04080           JR      Z,CASS1
04090           CP      32H             ; RECORDER NO. 2
04100           JR      NZ,CASSEL
04110 CASS1     SBC     A,31H           ; ADJUST BYTE & STORE
04120           LD      (RECSL),A
04130           JP      COMD
04140 ;
04150 ; *****************************************************
04160 ; *                                                   *
04170 ; *            READ DISK FILE ROUTINE                 *
04180 ; *                                                   *
04190 ; *****************************************************
04200 ;
04210 DISK      CALL    ZBUF            ; ZERO DATA BUFFER
04220           LD      A,01            ; STORE DISK TYPE CODE
04230           LD      (FORMAT),A
04240           LD      HL,AMSG         ; DISPLAY MESSAGE
04250           CALL    DOS1
04260           CALL    CLRSPC          ; CLEAR FILESPEC
04270           CALL    LINP            ; GET FILESPEC
04280           LD      A,03H
04290           LD      (DE),A          ; ADD FILESPEC END MARK
04300           CALL    BOT             ; CLEAR BOTTOM OF SCREEN
04310           CALL    UPRCAS          ; CONVERT TO UPPER CASE
04320           LD      HL,FILE         ; DISPLAY FILENAME
04330           CALL    DOS1
04340           LD      DE,FILE         ; FILE CONTROL BLOCK
04350           LD      HL,BUF          ; I/O BUFFER
04360           LD      IY,TBUF         ; DATA BUFFER
04370           LD      B,0             ; LOGICAL RECORD LENGTH
04380           CALL    DOS4            ; OPEN FILE
04390           JP      NZ,ERCK         ; CHECK FOR DOS ERROR
04400 RDBT      LD      B,0             ; INITIAL BYTE COUNT
04410           CALL    ROM05           ; READ BYTE
04420           CP      01              ; CHECK IF OBJECT FILE
04430           JP      Z,DOBJCT
04440           CP      0FFH            ; CHECK IF BASIC FILE
04450           JP      Z,DBASIC
04460           CP      0D3H            ; CHECK IF EDTASM FILE
04470           JP      Z,DEDTAS
04480           CP      00              ; CHECK FOR LEADING
04490           JR      Z,NOLOAD        ; COMMENT BLOCK
04500           CP      20H
04510           JP      M,NOLOAD
04520           JP      DDATA           ; DATA FILE TYPE
04530 ; *****************************************************
04540 ; *            READ DISK OBJECT FILE                  *
04550 ; *****************************************************
04560 DOBJCT    LD      (IY),A          ; PUT BYTE IN BUFFER
04570           INC     IY
04580           CALL    ROM05           ; READ BYTES IN BLOCK
04590           LD      (IY),A
04600           INC     IY
04610           LD      B,A             ; BYTE COUNT
04620           CALL    ROM05           ; READ LSB OF ADDRESS
04630           LD      (IY),A
04640           INC     IY
04650           LD      L,A
04660           CALL    ROM05           ; READ MSB OF ADDRESS
04670           LD      (IY),A
04680           INC     IY
04690           LD      H,A
04700           LD      (STADR),HL      ; STORE START ADDRESS
04710           DEC     B               ; ADJUST BYTE COUNT
04720           DEC     B
04730 LOOP3     CALL    ROM05           ; READ BYTE
04740           LD      (IY),A          ; STORE IN BUFFER
04750           INC     IY
04760           INC     HL              ; INCREMENT ADDRESS
04770           DJNZ    LOOP3
04780           CALL    ROM11           ; BLINK STAR
04790 LOOP2     CALL    ROM05           ; READ LOADER CODE
04800           LD      (IY),A
04810           INC     IY
04820           CP      02H             ; CHECK TRANSFER MARK
04830           JR      Z,TRF
04840           CALL    ROM05           ; READ BYTE COUNT
04850           LD      B,A
04860           LD      (IY),A
04870           INC     IY
04880           DEC     B               ; ADJUST BYTE COUNT
04890           DEC     B
04900           CALL    ROM05           ; READ LSB LOAD ADDRESS
04910           LD      (IY),A
04920           INC     IY
04930           LD      L,A
04940           CALL    ROM05           ; READ MSB LOAD ADDRESS
04950           LD      (IY),A
04960           INC     IY
04970           LD      H,A
04980           JP      LOOP3           ; READ BLOCK OF DATA
04990 ; *****************************************************
05000 NOLOAD    LD      (IY),A          ; BYPASS REMARKS
05010           INC     IY
```

*Listing 1 continued on p. 144*

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## BUSINESS 100 PROGRAM LIST

| | NAME | DESCRIPTION |
|---|---|---|
| 1 | RULE78 | Interest Apportionment by Rule of the 78's |
| 2 | ANNUI | 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 | BRFAKEVN | 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 | TAXDFP | 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 | REQWITH | 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 | CONDPROF | Conditional profit tables |
| 51 | OPTLOSS | Opportunity loss tables |
| 52 | FQUOQ | Fixed quantity economic order quantity model |
| 53 | FQEOWSH | As above but with shortages permitted |
| 54 | FQEOQPB | As above but with quantity price breaks |
| 55 | QUEUECB | 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 | MERGANAL | 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 | DOME 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 | LOANAFFD | 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 convertable bond |
| 100 | PORTVAL9 | Stock market portfolio storage-valuation program |

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# Command Performance

by Raymond E. Wilson

**Now you can efficiently edit Model 4 JCL files and automatically execute TRSDOS commands.**

A drawback to using the Model 4's job control language (JCL) files is that you can't edit a file after you enter it with the Build command. I've found a way to solve this problem so you can use JCL files more effectively (see Program Listing 1).

You can use JCL files to automatically execute repetitive multiple command entries and to compile and execute commands selectively. JCLs can also provide program input when you use them to run other programs.

Along with the JCL file editor, I've included two listings that demonstrate how you can save time with JCL files. BASLIST automatically prints out a series of Basic program listings (see Program Listing 2). Another program, TRS, lets you execute any of nine TRSDOS commands from a menu (see Program Listing 3). You can use this file to execute a command sequence—such as the back-up utility—automatically.

*The Key Box*

**Model 4**
**64K RAM**
**Disk Basic**
**Printer Optional**

## File Editor

MAKEDO lets you create or edit files previously created with the Build command (see Listing 1). This program works for any of the TRSDOS files, including JCL and key stroke multiply (KSM) files. It handles files up to 200 lines long and 50 characters wide. It doesn't allow more than three consecutive spaces and won't save a file that contains blank lines.

I built several special features into Listing 1, including a default file extension of /JCL. If you enter a file named FILE and press the enter key, the file comes out as FILE/JCL:0. To get a file without an extension, enter the trailing slash and nothing after it.

You can force another drive number by typing :X, where X represents the drive number you choose. Lines 540–570 handle file entry and check and assign the default extension.

Lines 10–190 are portions of a standard program initialization routine. Line 130 contains a function to strip blank spaces from a line. I adapted it from *Basic Faster and Better* by Lewis Rosenfelder (IJG Inc.) and modified it to permit three spaces instead of one.

Lines 200–470 are subroutines. Line 200 is a time delay routine and lines 220–270 are file-handling and error routines. The program doesn't check for a preexisting file when it creates a new one, so if you use the name of an existing file, the program writes over it.

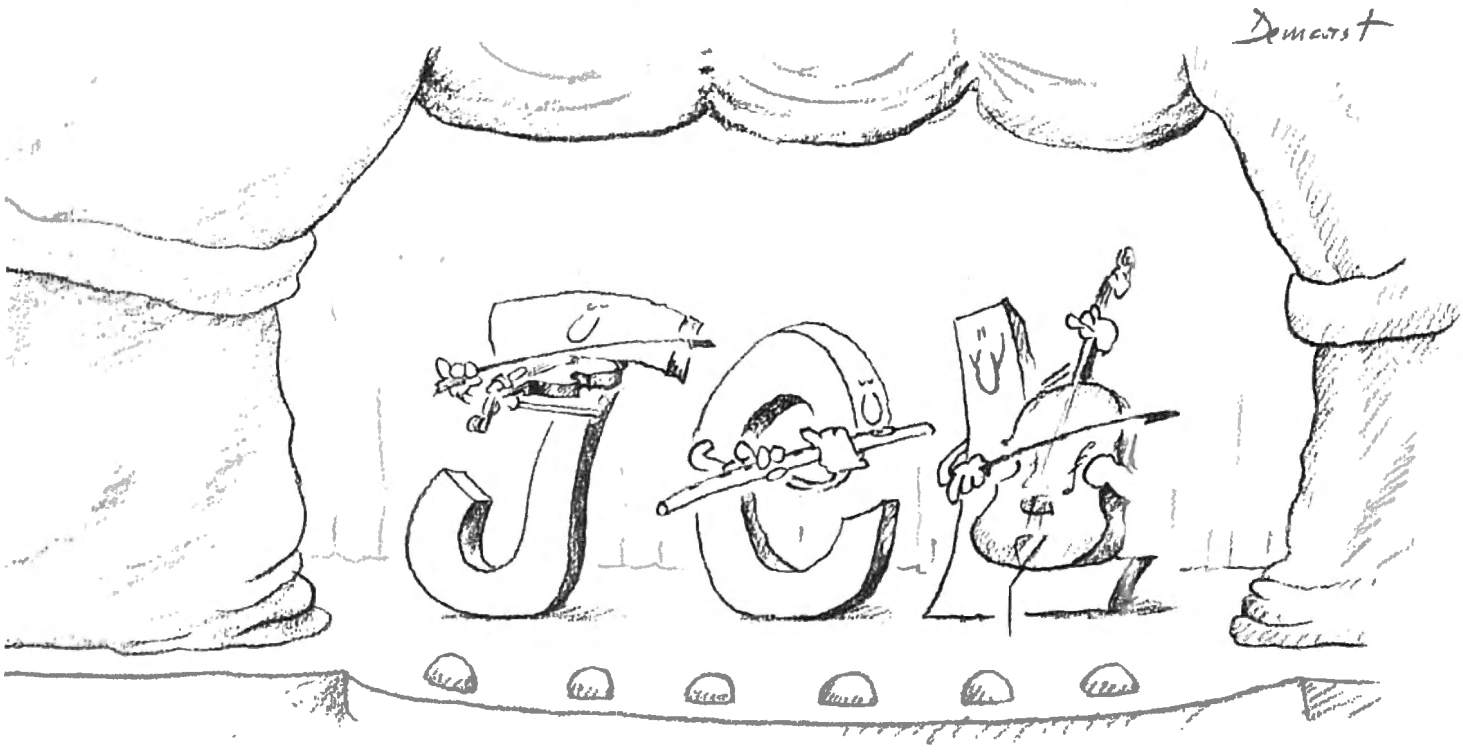
Lines 290–460 contain a modified INKEY$ routine. This routine allows special keys for data input (see the Table). When starting on a new line, the program prompts you with periods to show line length. You can't enter more than 50 characters when creating or editing files.

## Program Operation

The main program routine starts at line 480 with a menu of four options. Press the C key to create a new file, the E key to edit an existing file, the P key to print a file with edit line numbers, and the F1 key to exit to TRSDOS Ready.

The P option loads and prints your file and places the line numbers in front of each line. The line numbers are necessary for editing and referencing lines.

The E option lets you edit a preexisting file. The program prompts you to enter the file name, then loads that file. If the program doesn't find the file, it prompts you to reenter the file name. This particular editor is a line editor,




not a screen editor, so you must enter the number of the line you want to edit.

The program file displays the file list, including line numbers, 15 lines at a time. Press any key to scroll to the next 15 lines. Write the line numbers of any lines you want to edit on a piece of paper or mark them on the file printout for easy reference.

After you edit the lines, the program redisplays the file. Press the F1 key to end the edit session.

The program instructs you to press the enter key to save the file or press the F1 key to erase the file from the Model 4's memory buffer. The F1 key and other special keys work the same when creating a new file.

If you find that you need to add a new line (for example, after line 14), edit line 15 and press the F2 key. Line 15 and all succeeding lines move down one line, leaving the cursor on a line filled with periods. Enter the new line and press the enter key. The program redisplays the file so you can see the new line.

To delete a line, enter the line number you want to delete and press the F3 key. All succeeding lines move up one line, filling the space.

The program won't save a file containing blank lines. Press the F3 key to delete these lines. After you delete them all, the program saves the file, returns to the edit function, and displays the file.

When you create a new file, enter one line after another. All special keys are functional (where applicable). After you enter the 14th line, the screen clears, and the program displays the last line you entered at the top of the screen with the cursor and line prompt just below it.

The program maintains a line at the top of the screen that indicates the name of the file you're working on and whether the program is in the edit or create mode.

Use the up- and down-arrow keys to scroll through the file. When you create a file, the program scrolls through the lines, but when you edit one, the program displays the lines individually on the screen's bottom line.

Lines 590–860 contain the editing module. The printing module uses the file loading routine in lines 600–700. Then line 700 branches to lines 1240–1300. The creation module is in lines 980–1230.

## Example JCL Files

BASLIST in Listing 2 lets you print out a group of Basic program listings automatically. You can run Basic programs from a JCL file as long as the inputs are not INKEY$ commands. For example, you could set up your JCL file as follows:

```
Basic Program/BAS
1
A
A
X
```

If your Basic program contains Input, Line Input, or INPUT$(1) commands, the JCL file loads Basic, loads and runs your program, and feeds the first input with 1, the next with A, the next with A, and the last with X.

At the end of the program, the JCL file returns control to Basic or to the TRSDOS command level and displays the message "Job Done."

When you call the BASLIST program, it first loads Basic and clears all programs from memory. Then it loads the first of several programs, lists the program to the printer, sends a form feed to the printer (CHR$(12)), and clears memory to load the next program.

The JCL file repeats these steps for all programs in the package, then exits Basic and ends with the message "Job Done—TRSDOS Ready."

This time-saving JCL file is particularly useful if you write multiple-program packages. You don't have to type in the commands for each program or manually advance the printer after each listing—the JCL file does it all for you.

The command to execute BASLIST is DO=FILE. This command file does not require compilation. However, the special macro codes (predefined JCL instructions) shown in Listing 3 do require compilation.

TRS in Listing 3 prints a menu of nine TRSDOS commands that you can invoke automatically. By using this JCL file you can execute the commands in sequence.

To execute TRS, type DO FILE. The

*Program Listing 1. MAKEDO.*

```
10 REM
20 REM  ┌──────────────────────────────────────────────┐
30 REM  │          DO FILE CREATION & EDIT PROGRAM     │
40 REM  │       RAYMOND E. WILSON  -  MARI-RAY ASSOCIATES
50 REM  │                                              │
60 REM  │            TRS-80 MODEL 4 ** OCT 01, 1983    │
70 REM  │                                              │
80 REM  │       PROGRAM ID= MAKEDO/BAS  + USER FILES   │
90 REM  └──────────────────────────────────────────────┘
100 CLEAR : DE$ = STRING$ (50, "."): LA$ = CHR$(24): CLS
110 FC$ = CHR$(129) + CHR$(130) + CHR$(131) + CHR$(11) + CHR$(10) : ' <F1> + <F2
> + <F3> + UP ARROW + DOWN ARROW
120 COF$ = CHR$ (15): CON$ = CHR$ (14): DEF FN UC$(AQ$) = CHR$ (( ASC (AQ$) - 32
))' COF$=CURSOR OFF - END UNDERLINE : CON$ = CURSOR ON - START UNDERLINE
130 DEF FN SS$(AX$) = LEFT$ (AX$ + "     ", INSTR (AX$ + "     ","     ") - 1)
140 DATA JAN,FEB,MAR,APR,MAY,JUN,JUL,AUG,SEP,OCT,NOV,DEC
150 OPTION BASE 1 : DIM DT$(12),A$(200) : FOR I = 1 TO 12: READ DT$(I): NEXT I
160 DT$ = DT$( VAL ( DATE$ )) +  " " +  MID$ ( DATE$ ,4,2) + " 19" + RIGHT$ ( DA
TE$ ,2)
170 IF MID$(DT$,5,1) = "0" THEN MID$(DT$,5,1) = " "
180 CL$ = CHR$(30): CS$ = CHR$(31): XI$="####" : X2$= STRING$(79,"-"): X3$= STRI
NG$(79,"="): X4$= STRING$(79,"_"): X8$= CHR$(124): X9$="$$####.##"
190 GOTO 480: REM * * * * SUBROUTINES BEGIN HERE * * * *
200 FOR J% = 1 TO 1000: NEXT J%:RETURN '          --TIME DELAY ROUTINE--
210 REM * * * * * * * * FILE HANDLING & ERROR ROUTINES * * * * * * * *
220 ON ERROR GOTO 230: FLAG%=0: OPEN "I",1,FL$: ON ERROR GOTO 0: RETURN
230 IF ERR = 53 THEN FLAG%=1: RETURN ELSE IF ERR = 64 THEN FLAG%=2: RETURN
240 ON ERROR GOTO 0: STOP
250 ON ERROR GOTO 260: FLAG%=0: OPEN "O",1,FL$: ON ERROR GOTO 0: RETURN
260 IF ERR = 64 THEN FLAG%=2: RETURN
270 ON ERROR GOTO 0: STOP
280 REM * * * * * * BEGIN INKEY$ ROUTINE * * * * * *
290 DUM$= INKEY$ : VAR$= MID$(DE$,1,IL%): FC=0: ED=0: GOTO 310
300 DUM$= INKEY$ : ED=1: VAR$=ED$: VAR$=VAR$+ STRING$ (IL%- LEN (VAR$)," "): FC=
0
310 W=1: PRINT COF$;VAR$; : FOR LA% = 1 TO IL% : PRINT LA$;: NEXT LA%: PRINT CON
$;
320 IK$ = INKEY$ : IF IK$="" THEN 320
330 IF W > IL% THEN 370 ELSE IF IK$ = > " " AND IK$ < = ")" THEN 430
340 IF IK$ = CHR$ (25) THEN IF W <= IL% THEN PRINT MID$(VAR$,W,1);: W=W+1: GOTO
440
350 IF IK$ = CHR$ (9) THEN IF W <= IL% THEN MID$(VAR$,W+1,IL%-W) = MID$(VAR$,W,I
L%-W): MID$(VAR$,W,1)=" ": GOTO 450
360 IF IK$ = CHR$ (4) THEN IF W <= IL% THEN MID$(VAR$,W,IL%-W) = MID$(VAR$,W+1,I
L%-W): MID$(VAR$,IL%,1)=" ": GOTO 450
370 PC= INSTR (FC$,IK$): IF FC <> 0 THEN IK$= CHR$(13): GOTO 410
380 IF W=1 THEN 410 ELSE IF IK$=CHR$(8) THEN PRINT IK$;"."; CHR$(24);: W=W-1: MI
D$(VAR$,W,1)=" ": GOTO 320
390 IF IK$ = CHR$(27) THEN FOR LA% = 1 TO IL%: PRINT LA$;: NEXT LA% : ON ED + 1
GOTO 290,300 '           * * * CHR$(27) = SHFT UP ARROW * * *
400 IF IK$ = CHR$ (24) THEN PRINT IK$;: W=W-1: GOTO 320
410 IF IK$ <> CHR$(13) THEN 320 ELSE IF ED=0 THEN VAR$= MID$(VAR$,1,W-1) ELSE VA
R$= FNSS$(VAR$)
420 PRINT COF$; : FOR LA% = 1 TO W - 1: PRINT LA$; : NEXT LA% : PRINT VAR$; SPC(
IL% - LEN (VAR$));: RETURN
430 MID$(VAR$, W, 1) = IK$: W = W + 1: PRINT IK$;
440 IF IL%=1 THEN GOSUB 460: IK$=CHR$(13): GOTO 410 ELSE 320
450 PRINT COF$; : FOR LA% = 1 TO W - 1 : PRINT LA$; : NEXT LA% : PRINT VAR$; : F
OR LA% = 1 TO IL% - W + 1 : PRINT LA$; : NEXT LA% : PRINT CON$;: GOTO 320
460 IF VAR$ => "a" AND VAR$ <= "z" THEN VAR$ = FN UC$ (VAR$): RETURN ELSE RETURN
470 REM * * * * * * END INKEY$ ROUTINE * * * * * *
480 CLS : PRINT "Mari-Ray Associates"; TAB(34)"FILE EDITOR"; TAB(68)DT$: PRINT X
4$
490 PRINT : PRINT : PRINT : PRINT TAB(30)"Press <C> to Create file": PRI
NT : PRINT TAB(30)"Press <P> to Print file": PRINT
500 PRINT TAB(30)"Press <E> to Edit file": PRINT : PRINT TAB(30)"Press <F1> to E
xit TRSDOS": PRINT
510 PRINT : PRINT TAB(30)"Your Selection: ";: IL%=1: GOSUB 290: IF FC=1 THEN 530

520 IF VAR$="C" OR VAR$="E" OR VAR$="P" THEN B$=VAR$: GOTO 540 ELSE 480
530 PRINT @(2,0),CS$: PRINT @(11,20),"* * * * * * * ALL THROUGH! * * * * * * * *";
 PRINT @(20,0),;: SYSTEM
540 PRINT @(14,0),CS$: PRINT @(18,20),"ENTER FILE NAME: ";: IL%=12: GOSUB 290
550 SR%= INSTR(VAR$,"/"): SC%= INSTR(VAR$,":"): IF SR%=0 AND SC%=0 AND LEN(VAR$)
 < 9 THEN FL$=VAR$+"/JCL:0": GOTO 580
560 IF SR%=0 AND SC% > 0 THEN FL$= MID$(VAR$,1,SC%-1)+"/JCL"+ MID$(VAR$,SC%): GO
TO 580
570 IF SR% > 0 AND MID$(VAR$,SR%+1,1) < "A" THEN FL$= MID$(VAR$,1,SR%-1)+ MID$(V
AR$,SR%+1) ELSE FL$=VAR$
```

*Listing 1 continued*

| Key | Function |
|---|---|
| Shift/up arrow | Undo edits on a line and restore |
| Control-I | Insert a space at the cursor |
| Control-D | Delete character at cursor |
| Shift/right arrow | Nondestructive right cursor |
| Shift/left arrow | Nondestructive left cursor |
| Up arrow | Go to previous line |
| Down arrow | Go to next line |
| F1 | Exit from current process or as prompted |
| F2 | Insert a line and move other lines down |
| F3 | Delete a line and move other lines up |

*Table. Special input keys for the BASLIST file.*

computer compiles the program and places the compiled version in the System file. (You can have only one compiled program on a disk at a time.)

To execute a command, type its option number as specified in Listing 3. Option 1 gives you a directory of the drive of your choice, option 2 gives you the amount of memory free, and option 3 tells you how much space you have on the drive you specify.

Option 4 formats drive 1, option 5 backs up drive 1 to drive zero, and option 6 formats drive 1 and backs up drive zero to drive 1. Option 7 enters Basic, option 8 runs MAKEDO (Listing 1), and option 9 exits to TRSDOS.

Don't enter the line numbers at each line in Listings 2 and 3 since they are from a Basic file editor and aren't part of the file.

The periods at the beginning of the lines in Listing 3 indicate that the line is a comment. The computer displays them on the screen but doesn't execute them. By using comment lines, you can create a menu of commands that saves you time in typing and memorizing long or often used commands.

The command to send the file directory information to the printer is DIR :0 (S,I,A,P). S, I, A, and P indicate system, invisible, all information on the file, and print out the file.

Two slashes at the beginning of a line specify one of the macros. The If macro (//IF) makes a comparison. Line 11 checks whether you entered compilation with O on the command line.

Line 18 and others following it do the same thing for P. You enter the command to compile by typing at TRSDOS: DO TRS or DO TRS (O,P) and pressing the enter key.

The first command provides any of the file commands with default to drive zero, but doesn't send the information to the printer. The second command lets the file commands work on drive 1 and sends the information to the printer. This works only on the first three options listed in the menu. The other commands do not depend on the command line entry.

The Assign macro assigns a value to a variable. It assigns D the value zero in line 12 in Listing 2, and in line 14 it assigns D the value 1. The If macro in line 11 checks to see if you entered a zero on the command line. If you didn't, D equals zero.

In line 13, the Else macro drops the program through to line 14 where it sets D equal to 1.

The End macro is the ending point for the If comparison. The KEYIN

macro waits for and retrieves one numeric character from the keyboard. The characters beginning with a percent sign are hexadecimal (hex) numbers that control the display. %0A executes a line feed, and %09 is a tab character.

//1–//9 are special macros used with KEYIN that the program searches for after the KEYIN command. For example, if you enter a 1, the program goes to line 17; if you enter a 2, the program drops to line 25, and so on.

On the applicable commands, the program again checks the command line input for a P to determine whether to route your output to the printer or the display.

Entering P on the command line sends the program to the line after the Else macro. In any other case the program drops to the next line. This is the actual command sent to TRSDOS, just as if you had entered it from the keyboard.

Entering the #D# command substitutes the value of variable D that the Assign macro set. Line 21 adds P to send the directory to the printer.

The Exit macro releases the computer from JCL control. I created a loop that

*Listing 1 continued*

```
580 IF B$="E" OR B$="P" THEN 590 ELSE 980
590 PRINT @(2,0),CS$: PRINT @(2,31),"EDIT: ";FL$: PRINT X2$: PRINT
600 FLE$="Loading "+FL$+".....": PRINT @(11,( INT((80- LEN(FLE$))/2))),FLE$;: PR
INT COP$
610 GOSUB 220: IF FLAG%=0 THEN 670
620 PRINT @(11,0),CL$: ON FLAG% GOTO 630,650
630 PRINT @(11,33),FL$;" DOES NOT EXIST!": PRINT @(12,35),"TRY AGAIN."
640 GOSUB 200: GOTO 480
650 PRINT @(11,23),FL$;" IS IMPROPER FILE SPEC": PRINT @(12,35),"TRY AGAIN."
660 GOSUB 200: GOTO 480
670 C=1:X=0:V=5:VS=20:MS=23:LN=21
680 IF EOF(1) THEN C=C-1: GOTO 700
690 LINE INPUT #1,LNE$: A$(C)=LNE$: C=C+1: IF C > 200 THEN PRINT "ERROR - FILE T
OO LONG!";: CLOSE 1: GOSUB 200: GOTO 10 ELSE GOTO 680
700 CLOSE 1: PRINT @(V,0),CS$;: IF B$="P" THEN 1240 ELSE PRINT @(LN,0),X3$;: FOR
 I=1 TO C
710 PRINT @(V,0),I;: PRINT @(V,10),A$(I);: V=V+1
720 IF V > VS THEN PRINT @(MS,25),"Press <ANY KEY> to Continue ";: IL%=1: GOSUB
290: V=5: PRINT @(V,0),CS$;: PRINT @(LN,0),X3$;: PRINT @(MS,0),CL$;
730 NEXT I
740 PRINT @(MS,0),"Enter line number to change [<F1> to Exit]: ";: IL%=3: GOSUB
290
750 PRINT @(MS,0),CL$;: IF FC=1 THEN 870
760 X%= VAL(VAR$): IF X% < 1 OR X% > C+1 THEN PRINT @(MS,0),"INVALID NUMBER!";:
GOSUB 200: PRINT @(MS,0),CL$;: GOTO 740
770 IF X% > C AND C < 200 THEN C=C+1
780 PRINT @(MS,0),X%;: PRINT @(MS,10),;: IL%=50: ED$=A$(X%): GOSUB 300
790 A$(X%)=VAR$: IF FC = 0 THEN 700
800 ON FC GOTO 870, 810, 830, 850, 860 ' <F1>-<F2>-<F3>-<UP ARW>-<DN ARW>
810 FOR IN%=C+1 TO X%+1 STEP -1: A$(IN%)=A$(IN%-1): NEXT IN%: A$(X%)="": '
INSERT A LINE
820 C=C+1: GOTO 780
830 FOR DL%=X% TO C-1: A$(DL%)=A$(DL%+1): NEXT DL%: A$(C)="": '          DELETE
CURRENT LINE
840 C=C-1: GOTO 700
850 IF X% > 1 THEN X%=X%-1: GOTO 780 ELSE 780 '       MOVE BACK 1 LINE
860 IF X% < C THEN X%=X%+1: GOTO 780 ELSE 780 '       MOVE FORWARD 1 LINE
870 PRINT @(5,0),CS$: PRINT @(11,19),"Press <ENTER> to save file - <F1> to abort
 ";
880 IK$= INKEY$ : IF IK$="" THEN 880
890 IF ASC(IK$)=13 THEN 900 ELSE IF ASC(IK$)=129 THEN 10 ELSE 880
900 FLAG3%=0: FOR CHK%=1 TO C: IF A$(CHK%)="" THEN FLAG3%=FLAG3%+1: NEXT CHK%
910 IF FLAG3%=0 THEN 930
920 PRINT @(15,20),"THERE ARE ";FLAG3%;" EMPTY LINES - YOU MUST FILL OR DELETE!"
;: GOSUB 200: GOTO 700
930 GOSUB 250: IF FLAG%=0 THEN 970 ELSE CLOSE
940 PRINT @(V,0),CS$: PRINT @(11,0),"THERE IS A FILE NAME ERROR IN ";FL$
```

*Listing 1 continued*



✓ See List of Advertisers on Page 227

sends it back to the compiled program by inserting DO = SYSTEM/JCL.

You cannot reenter drive numbers without exiting and recompiling the file with proper command line entries.

The Stop macro leaves the operation in the control of whatever program you ran with the JCL or in the command mode of Basic or TRSDOS. The /// macro tells the compiler that no more numbers or options follow and to execute the JCL.

Two other useful macros are an Alert macro (//Alert) that sounds a warning and a macro that flashes a message on the screen (//Flash). These macros demonstrate that JCL is a highly versatile adjunct to your DOS. ■

---

*You can reach Raymond E. Wilson at 7519 Bubbling Spring Lane, Houston, TX 77086.*

*Program Listing 2. The BASLIST file.*

```
 1      BASIC
 2      NEW
 3      LOAD "AR/BAS"
 4      LLIST
 5      LPRINT CHR$(12)
 6      NEW
 7      LOAD "ARINQ/BAS"
 8      LLIST
 9      LPRINT CHR$(12)
10      NEW
11      LOAD "ARSETUP"
12      LLIST
13      LPRINT CHR$(12)
14      NEW
15      LOAD "ARSTAT/BAS"
16      LLIST
17      LPRINT CHR$(12)
18      NEW
19      LOAD "END/BAS"
20      LLIST
21      LPRINT CHR$(12)
22      NEW
23      LOAD "LOG/BAS"
24      LLIST
25      LPRINT CHR$(12)
26      NEW
27      LOAD "MERGE/BAS"
28      LLIST
29      LPRINT CHR$(12)
30      NEW
31      LOAD "REPORT/BAS"
32      LLIST
33      LPRINT CHR$(12)
34      NEW
35      LOAD "SETUP/BAS"
36      LLIST
37      LPRINT CHR$(12)
38      NEW
39      LOAD "STATAN/BAS"
40      LLIST
41      LPRINT CHR$(12)
42      NEW
43      LOAD "VASS/BAS"
44      LLIST
45      LPRINT CHR$(12)
46      NEW
47      SYSTEM
```

*End*

*Listing 1 continued*

```
950 PRINT @(13,0),"PLEASE REENTER: ";: IL%=14: ED$=FL$: GOSUB 300
960 FL$=VAR$: GOTO 930
970 FOR RE%=1 TO C: PRINT #1,A$(RE%): NEXT RE%: CLOSE : GOTO 100
980 PRINT @(2,0),CS$: PRINT @(2,29),"CREATE: ";FL$: PRINT X2$: PRINT
990 C=0:X%=1:V=5:MS=23:LN=21
1000 PRINT @(V,0),CS$: PRINT @(LN,0),X3$;
1010 PRINT @(V,0),X%;: PRINT @(V,10),;: IL%=50: IF A$(X%) > "" THEN ED$=A$(X%):
GOSUB 300 ELSE GOSUB 290
1020 A$(X%)=VAR$: IF X% > C AND A$(X%) > "" THEN C=X%
1030 IF PC=0 THEN 1210
1040 ON FC GOTO 870, 1050, 1080, 1110, 1160 : ' <F1>-<F2>-<F3>-<UP ARW>-<DN ARW>

1050 IF X% < C THEN FOR IN%=C+1 TO X%+1 STEP -1: A$(IN%)=A$(IN%-1): NEXT IN%: A$
(X%)="": '      INSERT A LINE HERE
1060 C=C+1: TMP=V: FOR II=X% TO X%+(20-V): PRINT @(V,0),II;: PRINT @(V,10),A$(II
);: V=V+1: NEXT II
1070 V=TMP: GOTO 1010
1080 IF X% > 0 THEN FOR II=X% TO C-1: A$(II)=A$(II+1): NEXT II: A$(C)="" '
DELETE A LINE HERE
1090 C=C-1: TMP=V: FOR II=X% TO X%+(20-V): PRINT @(V,0),II;: PRINT @(V,10),A$(II
);: V=V+1: NEXT II
1100 V=TMP: GOTO 1010
1110 IF X% > 1 AND V > 5 THEN X%=X%-1: V=V-1: GOTO 1010
1120 IF X% < 2 THEN GOTO 1010
1130 PRINT @(5,0),CS$: V=5: PRINT @(LN,0),X3$;: FOR II=X%-1 TO X%+14
1140 PRINT @(V,0),II;: PRINT @(V,10),A$(II);: V=V+1: NEXT II
1150 V=5: X%=X%-1: GOTO 1010
1160 IF X% < C AND V < 20 THEN X%=X%+1: V=V+1: GOTO 1010
1170 IF X%=C THEN 1010
1180 PRINT @(5,0),CS$: PRINT @(LN,0),X3$;: V=5: FOR II=X%+1 TO X%+16
1190 PRINT @(V,0),II;: PRINT @(V,10),A$(II);: V=V+1: NEXT II
1200 V=5: X%=X%+1: GOTO 1010
1210 IF X% < 200 THEN X%=X%+1: V=V+1: IF V < 20 THEN 1010
1220 PRINT @(5,0),CS$: PRINT @(LN,0),X3$;: V=6
1230 PRINT @(5,0),X%-1;: PRINT @(5,10),A$(X%-1);: GOTO 1010
1240 PRINT @(2,0),CL$;: PRINT @(2,31),"PRINT: ";FL$;: PRINT @(11,20),"STANDBY -
printing in progress";COF$
1250 GOSUB 1260: GOTO 1280
1260 LPRINT "Mari-Ray Associates"; TAB(34)"FILE EDITOR"; TAB(68)DT$: LPRINT X4$
1270 LPRINT : LPRINT TAB( INT((80- LEN(FL$))/2))FL$: LPRINT : LPRINT X3$: LPRINT
 : LC%=0: RETURN
1280 FOR II= 1 TO C: LPRINT USING "####";II;: LPRINT TAB(10)A$(II)
1290 LC%=LC%+1: IF LC% > 58 THEN LPRINT CHR$(12): GOSUB 1260
1300 NEXT II: LPRINT CHR$(12): GOTO 100
```

*End*

*Program Listing 3. The TRS file.*

```
 1      .COMMAND MENU FOR TRSDOS 6.0
 2      .    1  DIRECTORY
 3      .    2  FREE SPACE MAP
 4      .    3  DEVICE MAP
 5      .    4  FORMAT DRIVE 1
 6      .    5  BACKUP DRIVE 1 TO 0
 7      .    6  FORMAT THEN BACKUP 0 TO 1
 8      .    7  ENTER COMMAND MODE OF BASIC
 9      .    8  RUN MAKEDO/BAS
10      .    9  EXIT TO TRSDOS READY
11      //IF -O
12      //ASSIGN D=0
13      //ELSE
14      //ASSIGN D=1
15      //END
16      //KEYIN %0A %09 %09 Your Selection 1-9:
17      //1
18      //IF -P
19      DIR :#D# (S,I,A)
20      //ELSE
21      DIR :#D# (S,I,A,P)
22      //END
23      DO = SYSTEM/JCL
24      //EXIT
25      //2
26      //IF -P
27      FREE :#D#
28      //ELSE
29      FREE :#D# (P)
30      //END
31      DO = SYSTEM/JCL
32      //EXIT
33      //3
34      //IF -P
35      DEVICE (B)
36      //ELSE
37      DEVICE (B,P)
38      //END
39      DO = SYSTEM/JCL
40      //EXIT
41      //4
42      FORMAT :1 (Q=N,ABS)
43      DO = SYSTEM/JCL
44      //EXIT
45      //5
46      BACKUP :0 :1
47      DO = SYSTEM/JCL
48      //EXIT
49      //6
50      FORMAT :1 (Q=N,ABS)
51      BACKUP :0 :1
52      DO = SYSTEM/JCL
53      //EXIT
54      //7
55      BASIC
56      //STOP
57      //8
58      BASIC MAKEDO/BAS
59      //STOP
60      //9
61      //EXIT
62      ///
63      //STOP
```

*End*

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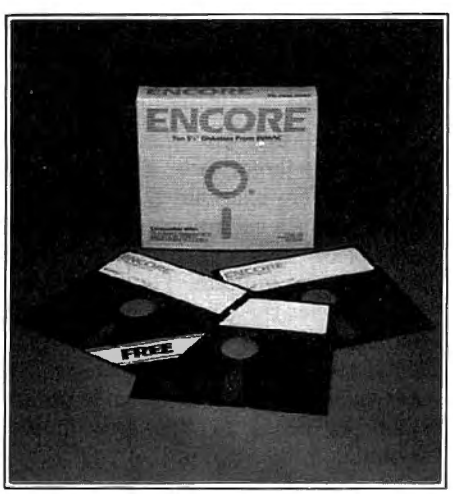


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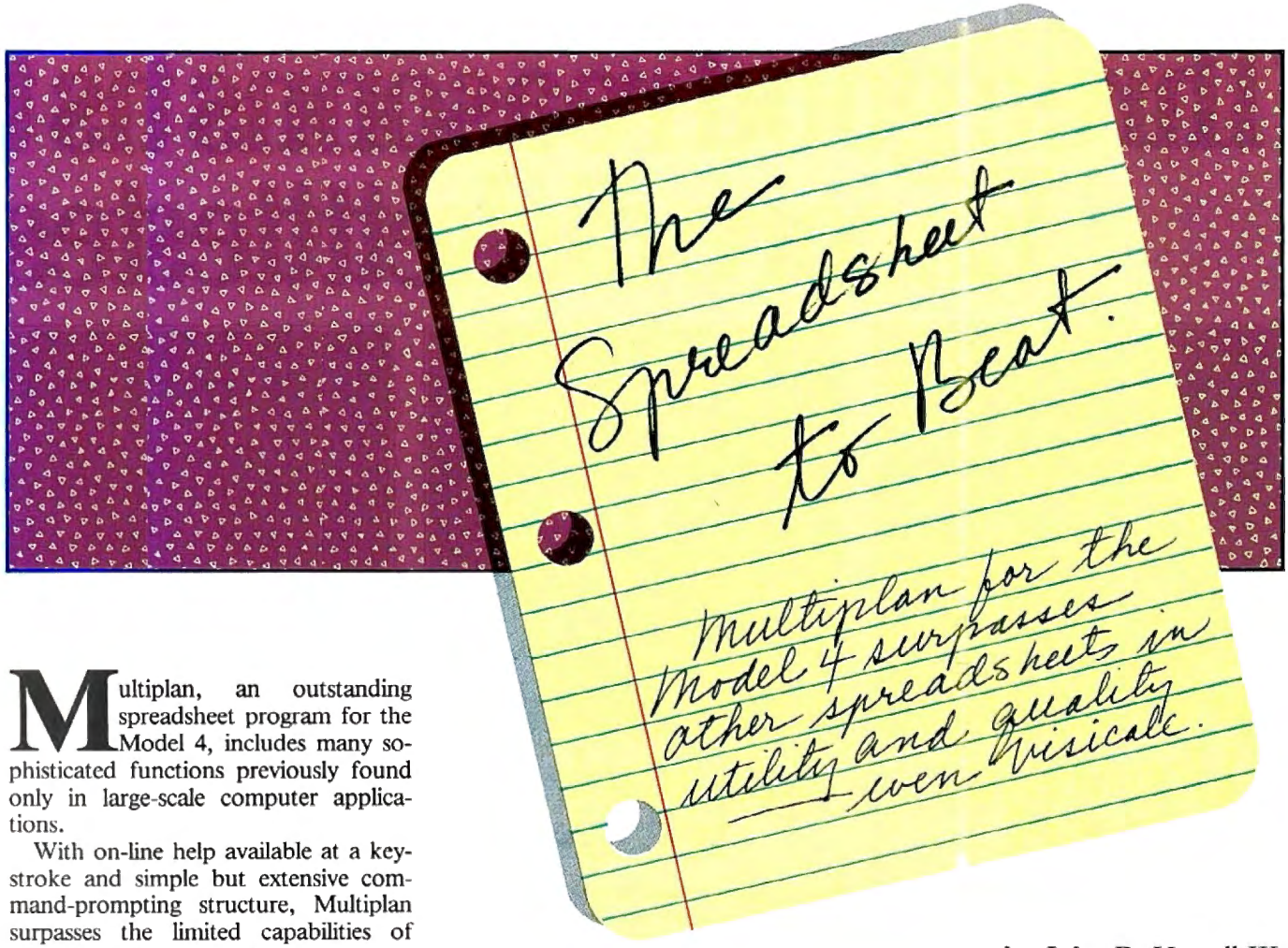


Multiplan, an outstanding spreadsheet program for the Model 4, includes many sophisticated functions previously found only in large-scale computer applications.

With on-line help available at a keystroke and simple but extensive command-prompting structure, Multiplan surpasses the limited capabilities of VisiCalc and other similar spreadsheet software.

by John B. Harrell III

## Multiplan in Detail

Multiplan replaces the tired pad of paper, pencils, erasers, and adding machine necessary in accounting work with an electronic "sheet" of paper comprising rows and columns of blank cells.

The worksheet is made up of cells, each of which is the intersection of a particular row and column. A sheet can be up to 63 columns wide and 255 rows long. You can store one of three types of information in each of these 16,065 blank cells: a label, number, or formula that references other cells in the spreadsheet.

The program provides a convenient method of maintaining ledger entries suitable for cash flow analysis, forecasting, budgeting, and much more. You provide all the necessary information to build the basic sheet layout. The computer moves, copies, and formats data for tedious and repetitive mathematical calculations (see the Table for a list of Multiplan's functions).

**Multiplan**

★ ★ ★ ★ ★

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| | |
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| *Good docs?* | ★★★★☆ |
| *Bug free?* | ★★★★★ |
| *Does the job?* | ★★★★★ |

## Command Structure

Because Multiplan's commands and options are jargon-free, they're simple to invoke. For example, the Copy command copies a cell or group of cells the number of times you specify and in the direction you indicate. The Blank command deletes the contents of the active cell. Name assigns a name label of up to 31 characters to a cell or grouping of cells; you can use this name as an absolute reference to this area in any formula.

The Window command splits the current window (screen) horizontally or vertically, so that you can compare entries physically far apart on the spreadsheet. Window also establishes or removes a border from the current window, closes the window specified, or links two windows to scroll the contents together.

The Sort command reorders the rows on the worksheet by sorting values on the selected column into ascending or descending order as well as sorting the worksheet on multiple columns.

Other commands in the program are equally easy to use.

Besides prompting at key command decision points, Multiplan guesses at the most appropriate command response. By basing this response on the last command executed and the position of the cursor locating the active cell, the user can rapidly select responses to repetitive commands.

Another feature you'll notice the first time you enter a formula is the moveable cursor (active cell) that can determine the bounds of the function command. For example, to total a row of numbers, you can type in SUM( and position the arrow keys so that the cursor

falls on the first cell of the column you want to add. Then press the colon key to denote a range, using the arrow keys to position the cursor over the last number in the row. Close the formula with a right parenthesis. Multiplan has done all the legwork in providing the relative references in this formula.

Multiplan formulas can consist of numerical data or text. Most often, a formula will contain absolute and relative cell references and may contain logical and error values.

## Speed Limits

Multiplan for the Model 4 is no speed demon. The complexity of the operations and the use of command overlays from the slow floppy-disk drives combine to slow down the program. But don't dismay: Multiplan's speed is comparable to PerfectCalc's or VisiCalc's.

You can get better performance by running Multiplan on a 128K Model 4 using the Memdisk feature to store command overlays. The disk contains the command sequence for creating a memory disk as a job control language (JCL) procedure. If the disk included the command structure to create the "disk" and copy the Multiplan overlay file, you could load and run Multiplan automatically each time you boot the disk.

In addition, Multiplan's compatibility with the version now available for the Model 2000 provides an unheralded ability for data and information exchange within the Radio Shack product line.

## The Package

The distribution disk contains the Multiplan software and a copy of the TRSDOS 6.X operating system. Follow the clear directions to make the necessary back-up copy and you're ready to run Multiplan.

Documentation is an important part of an application this complex. Multiplan provides 421 pages of complete, thorough documentation to lead you through every aspect of its inner workings.

The manual is conveniently divided into three sections. The first part introduces Multiplan and its implementation on the Model 4. Here you learn how to back up your disks and transfer Multiplan for hard disk or Memdisk operation.

The second part of the manual, a tutorial, illustrates Multiplan's many complex operations by providing a sample worksheet to set up and follow.

The remaining section of the manual, the Multiplan reference section, provides a detailed description of Multiplan's available commands and intrinsic functions.

There are few typographical errors. Sadly, the two omissions I discovered are significant and both pertain to the format codes used with the Format Cells command. Most of the examples used in the command directory section of the book are superior and provide great insight into Multiplan's functioning, though a few are somewhat cryptic.

Further, the Print Options command only briefly mentions the printer set-up command string, but never indicates how to use this feature. While the TRS-80-specific section of the book covers this feature, I had to read the book three times before I stumbled on it.

Appendices provide many helpful hints, a glossary of terms, conversion hints, and examples for the VisiCalc user, an explanation of the Symbolic Link File Format (SYLK) for external file storage, and extended problem-solving using the iteration option.

Since Multiplan reads VisiCalc files, a valuable section of the manual explains the differences between the two so you can use your old VisiCalc files with Multiplan.

| | |
|---|---|
| ABS(number) | MAX(list) |
| And(list) | MID(text,start,count) |
| ATAN(number) | MIN(list) |
| Average(list) | MOD(dividend, divisor) |
| Columnb( ) | NA( ) |
| COS(number) | Not(logical) |
| Count(list) | NPV(rate,list) |
| Dollar(number) | Or(list) |
| EXP(number) | Pi( ) |
| False( ) | REPT(text,count) |
| Fixed(number,digits) | Round(number,digits) |
| If(logical,then,else) | Row( ) |
| Index(area,subscr) | Sign(number) |
| INT(number) | SIN(number) |
| ISERROR(value) | SQRT(number) |
| ISNA(value) | STDEV(list) |
| LEN(text) | Sum(list) |
| LN(number) | TAN(number) |
| LOG10(number) | True( ) |
| Lookup(number,table) | Value(text) |

*Table. Multiplan's function directory.*

## Conclusion

Multiplan truly belongs to the next generation of software.
prompting and proposed command response features alone elevate Multiplan orders of magnitude above its nearest competitors. ■

---

*You can contact John Harrell at 1519A Carswell Circle, Bolling Air Force Base, Washington, DC 20036.*

# MONITORING FINANCIAL HEALTH:

## Analyzing the Annual Report

by Gary Leslie

No stock market investment is without risk, but a careful financial analysis of those companies that interest you can reduce your chances of making a bad investment. This program helps you analyze one of the most important sources of a corporation's financial status—its annual report.

My annual report analysis program runs on the Models I and III, and on the Models II and 100 with the changes I've indicated. You input data from an annual report's balance sheet, income statement, and source and application-of-funds statement (see Fig. 1); the program makes some calculations and produces a table of 13 indicators of a firm's financial standing (see Fig. 2 for a sample printout).

This information provides an overview of a company's financial health that you can use to narrow down the field of prospective investments prior to consulting a stockbroker. You can also use these indicators to maintain a yearly profile of your stock investments or as a basis for comparison with industry averages or other firms.

The program is written in Level II Basic and requires 16K RAM. You can run it with only 4K by eliminating lines 10–30, changing the last statement in line 900 to read GOTO 900, deleting line 910, and removing all remarks.

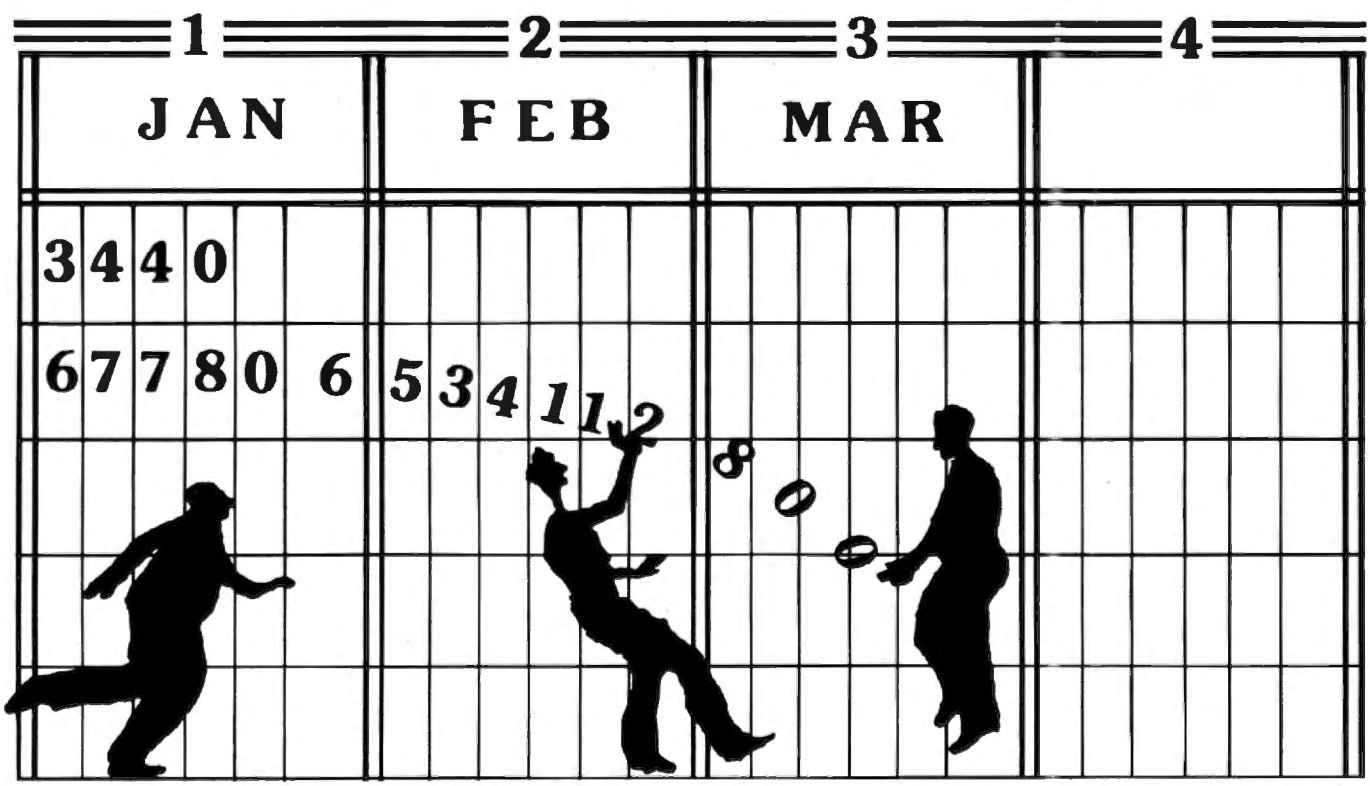
I designed this program for those who have a basic understanding of financial statements. Readers who need assistance understanding the data should obtain a book of frequently used business terms to be sure they're entering the correct data.

Annual reports are public information that the Securities and Exchange Commission (SEC) requires all publicly traded corporations to provide. You can get a free copy of any public corporation's annual report by writing to the company.

### Running the Program

The annual report analysis program prompts you to input financial data, lets you correct errors, then displays a table of 13 financial indicators.

To run it, type in Program Listing 1. Models 100 and II users should type in the changes in Program Listings 2 and 3, respectively.



```
                    DATA FROM INCOME STATEMENT
                    **************************

NET EARNINGS(NET INCOME)                          ? 300000
OPERATING PROFITS(PROFIT BEFORE TAXES)            ? 635000
SALES                                             ? 2550000
TOTAL REVENUES                                    ? 2750000
TOTAL TAXES(FED,STATE,FOREIGN)                    ? 250000
NUMBER OF SHARES OUTSTANDING                      ? 100000

                    DATA FROM BALANCE SHEET
                    ***********************

TOTAL STOCKHOLDERS EQUITY                         ? 1250000
TOTAL CURRENT ASSETS                              ? 1300000
TOTAL CURRENT LIABILITIES                         ? 300000
LONG TERM DEBT                                    ? 150000

        DATA FROM SOURCE & APPLICATION OF FUNDS STATEMENT
        *************************************************

DIVIDENDS PAID                                     50000
DEPRECIATION                                       50000
```

*Figure 1. Sample output from the annual report analysis program.*

## Program Results

Program output consists of a table of 13 values. Except for three that are dollar amounts, the values are all financial ratios expressed as percentages. A description of each indicator follows.

Return on equity is a firm's net earnings divided by total stockholder's equity, and indicates a percentage return a stockholder can expect on his investment.

Retention rate is the percentage of net earnings available to the company for reinvestment after it pays stockholder dividends.

Reinvestment Rate is the internal growth potential of a company and equals the return on equity multiplied by the retention rate.

Return on total assets is a company's net income divided by its total assets. This ratio checks the reinvestment rate. When return on equity and return on

*Continued on p. 76*

*Program Listing 1. Annual report analysis program.*

```
2 REM GARY LESLIE  314 VIXEN BLVD., GOOSE CREEK, S.C.,29445
5 REM *** STATEMENT OF USE AND PURPOSE ***
10 CLS:PRINT"DIFFERENT PARTS OF THE ANNUAL REPORT FINANCIAL STATEM
ENT WILL":PRINT"BE DISPLAYED.  ENTER THE REQUESTED VALUES FROM THE
 INDICATED":PRINT"SECTIONS OF THE ANNUAL REPORT."
20 PRINT:PRINT"AFTER ALL ENTRIES ARE MADE ALL ENTRIES WILL BE DISP
LAYED.  AT":PRINT"THIS TIME ANY CORRECTIONS NEEDED CAN BE MADE.":P
RINT
30 PRINT"ALL YES & NO ANSWERS WILL BE DISPLAYED AS Y/N.  Y=YES AND
 N=NO.":GOSUB800
35 REM *** INPUT DATA FROM INCOME STATEMENT ***
40 CLS::CLEAR124:GOSUB820
50 PRINT"NET EARNINGS(NET INCOME)"CHR$(213);:INPUTO:PRINT"OPERATIN
G PROFITS(PROFIT BEFORE TAXES)"CHR$(199);:INPUTS
60 PRINT"SALES"CHR$(232);:INPUTT:PRINT"TOTAL REVENUES"CHR$(223);:I
NPUTM
70 PRINT"TOTAL TAXES(FED,STATE,FOREIGN)"CHR$(207);:INPUTU:PRINT"NU
MBER OF SHARES OUTSTANDING"CHR$(209);:INPUTZ
75 REM *** INPUT DATA FROM BALANCE SHEET ***
80 GOSUB800:CLS:GOSUB830
90 PRINT"TOTAL STOCKHOLDERS EQUITY"CHR$(212);:INPUTP:PRINT"TOTAL C
URRENT ASSETS"CHR$(217);:INPUTR
100 PRINT"TOTAL CURRENT LIABILITIES"CHR$(212);:INPUTV:PRINT"LONG T
ERM DEBT"CHR$(223);:INPUTW
105 REM *** INPUT DATA FROM SOURCE & APPLICATION OF FUNDS STATEMEN
T ***
110 GOSUB800:CLS:GOSUB840:PRINT"DIVIDENDS PAID"CHR$(223);
120 INPUTQ:PRINT"DEPRECIATION"CHR$(225);:INPUTY:GOSUB800
125 REM *** DISPLAY DATA - INCOME STATEMENT ***
130 CLS:GOSUB820:PRINT"NET EARNINGS(NET INCOME)"TAB(45)O:PRINT"OPE
RATING PROFITS(PROFIT BEFORE TAX)"TAB(45)S
140 PRINT"SALES"TAB(45)T:PRINT"TOTAL REVENUES"TAB(45)M:PRINT"TOTAL
 TAXES(FED,STATE,FOREIGN)"TAB(45)U:PRINT"NUMBER OF SHARES OUTSTAND
ING"TAB(45)Z
```

*Listing 1 continued*

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| RAM Expandablity (Internal/External) | To 96K (64K/32K) | To 32K (32K/none) | To 24K (24K/none) |
| Free bundled software | Yes | No | No |
| Function keys | 10 | 8 | 0 |
| RAM cartridges | Yes | No | No |
| Bar Code Reader, RS232, Parallel Port, Cassette Port | Yes | Yes | Not Standard |
| Floppy Disk and SIO Port, Cursor Cluster | Yes | No | Not Standard |

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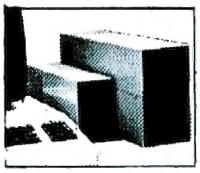

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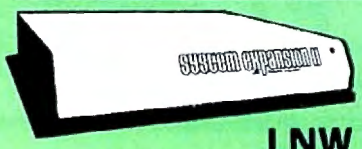


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*Continued from p. 72*

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Equity turnover is equal to total sales divided by average stockholder's equity, and measures a company's sales progress.

## Program Operation

As I describe how the program works, you can refer to Fig. 3 for a flowchart of program set-up. See the Table for a description of program variables.

The program requests input in lines 50–120 (see Listing 1). Lines 130–190 display the entered values for verification.

Lines 200–230 contain the computation formulas, and lines 240–270 display the results. The Print Using instruction displays results in terms of

```
RETURN ON EQUITY                          24.00%
RETENTION RATE                            83.33%
REINVESTMENT RATE                         20.00%
RETURN ON TOTAL ASSETS                    23.08%
OPERATING PROFIT MARGIN                   24.90%
PRETAX PROFIT MARGIN                      23.09%
TAX RATE                                  39.37%
NET PROFIT MARGIN                         11.76%
CURRENT RATIO                            433.33%
CAPITAL STRUCTURE                  $1400000.00
CASH FLOW                           $350000.00
EARNINGS PER SHARE                       $3.00
EQUITY TURNOVER                          204.00%
```

*Figure 2. Sample output for annual report analysis program. The input in Fig. 1 generates these results.*

*Listing 1 continued*

```
150 GOSUB900
155 REM *** DISPLAY DATA - BALANCE SHEET ***
160 CLS:GOSUB830:PRINT"TOTAL STOCKHOLDERS EQUITY"TAB(45)P:PRINT"TO
TAL CURRENT ASSETS"TAB(45)R
170 PRINT"TOTAL CURRENT LIABILITIES"TAB(45)V:PRINT"LONG TERM DEBT"
TAB(45)W:GOSUB900
175 REM *** DISPLAY DATA - SOURCE & APPLICATION OF FUNDS STATEMENT
 ***
180 CLS:GOSUB840:PRINT"DIVIDENDS PAID"TAB(45)Q
190 PRINT"DEPRECIATION"TAB(45)Y:GOSUB900
195 REM *** FORMULAS ***
200 A=O/P:B=(O-Q)/O:C=A*B:D=O/R
210 E=S/T:F=S/M:G=U/S:I=R/V
220 J=W+P:K=O+Y:L=O/Z:N=T/P
230 H=O/T:CLS:D$="####.##%":E$="$$################.##"
235 REM *** DISPLAY VALUES ***
240 PRINT"RETURN ON EQUITY"TAB(45)USINGD$;A*100:PRINT"RETENTION RA
TE"TAB(45)USINGD$;B*100:PRINT"REINVESTMENT RATE"TAB(45)USINGD$;C*1
00:PRINT"RETURN ON TOTAL ASSETS"TAB(45)USINGD$;D*100
250 PRINT"OPERATING PROFIT MARGIN"TAB(45)USINGD$;E*100:PRINT"PRETA
X PROFIT MARGIN"TAB(45)USINGD$;F*100:PRINT"TAX RATE"TAB(45)USINGD$
;G*100:PRINT"NET PROFIT MARGIN"TAB(45)USINGD$;H*100
260 PRINT"CURRENT RATIO"TAB(45)USINGD$;I*100:PRINT"CAPITAL STRUCTU
RE"TAB(33)USINGE$;J:PRINT"CASH FLOW"TAB(33)USINGE$;K:PRINT"EARNING
S PER SHARE"TAB(33)USINGE$;L
270 PRINT"EQUITY TURNOVER"TAB(45)USINGD$;N*100:GOSUB800:CLS
275 REM *** END OR REPEAT ***
280 C$=INKEY$:PRINT@448,"DO YOU WISH TO RERUN THIS PROGRAM? Y/N";:
INPUTC$:IFC$="Y"THEN40ELSEIFC$="N"THEN290ELSE280
290 CLS:PRINTCHR$(23)@476,"THE END":END
795 REM *** SUBROUTINES ***
800 PRINT:INPUT"TO CONTINUE PRESS ENTER";B$:RETURN
820 PRINTTAB(19)"DATA FROM INCOME STATEMENT":PRINT@83,STRING$(26,"
*"):PRINT:RETURN
830 PRINTTAB(21)"DATA FROM BALANCE SHEET":PRINT@85,STRING$(23,"*")
:PRINT:RETURN
840 PRINTTAB(8)"DATA FROM SOURCE & APPLICATION OF FUNDS STATEMENT"
:PRINT@71,STRING$(49,"*"):PRINT:RETURN
900 PRINT:INPUT"ARE ALL VALUES CORRECT? Y/N";A$:IFA$="Y"THENRETURN
ELSEIFA$="N"THEN1000ELSE910
910 PRINT"YOU MUST ANSWER (Y) FOR YES AND (N) FOR NO.":GOTO900
995 REM *** CORRECTION STATEMENT ***
1000 CLS:PRINT"CHOOSE THE INCORRECT VALUE":PRINT"1 NET EARNINGS(NE
T INCOME)":PRINT"2 OPERATING PROFITS(PROFIT BEFORE TAXES)"
1010 PRINT"3 SALES":PRINT"4 TOTAL REVENUES":PRINT"5 TOTAL TAXES(FE
D, STATE,FOREIGN)":PRINT"6 NUMBER OF SHARES OUTSTANDING"
1020 PRINT"7 TOTAL STOCKHOLDERS EQUITY":PRINT"8 TOTAL CURRENT ASSE
TS":PRINT"9 TOTAL CURRENT LIABILITIES"
1030 PRINT"10 LONG TERM DEBT":PRINT"11 DIVIDENDS PAID":PRINT"12 DE
PRECIATION:?
1040 INPUT"THE NUMBER REPRESENTING THE INCORRECT VALUE IS";X:ONXGO
TO1050,1060,1070,1080,1090,1100,1110,1120,1130,1140,1150,1160
1045 REM *** CORRECTING VALUES ***
1050 CLS:PRINT@448,"NET EARNINGS(NET INCOME)";:INPUTO:GOTO130
1060 CLS:PRINT@448,"OPERATING PROFIT(PROFIT BEFORE TAXES)";:INPUTS
:GOTO130
1070 CLS:PRINT@448,"SALES";:INPUTT:GOTO130
1080 CLS:PRINT@448,"TOTAL REVENUES";:INPUTP:GOTO130
1090 CLS:PRINT@448,"TOTAL TAXES(FED, STATE, FOREIGN)";:INPUTU:GOTO
130
1100 CLS:PRINT@448,"NUMBER OF SHARES OUTSTANDING";:INPUTZ:GOTO130
1110 CLS:PRINT@448,"TOTAL STOCKHOLDERS EQUITY";:INPUTP:GOTO160
1120 CLS:PRINT@448,"TOTAL CURRENT ASSETS";:INPUTR:GOTO160
1130 CLS:PRINT@448,"TOTAL CURRENT LIABILITIES";:INPUTV:GOTO160
1140 CLS:PRINT@448,"LONG TERM DEBT";:INPUTW:GOTO160
1150 CLS:PRINT@448,"DIVIDENDS PAID";:INPUTQ:GOTO180
1160 CLS:PRINT@448,"DEPRECIATION";:INPUTY:GOTO180
```

*End*



↙ See List of Advertisers on Page 227

```
5 REM *** MOD 100 CONVERSION BY MARE-ANN
E JARVELA, 80 MICRO STAFF ***
10 CLS:PRINT"DIFFERENT PARTS OF THE ANNU
AL REPORT FINANCIAL STATEMENT WILL":PRIN
T"BE DISPLAYED.  ENTER THE REQUESTED VAL
UES FROM THE INDICATED":PRINT"SECTIONS O
F THE ANNUAL REPORT.":GOSUB 800
20 PRINT:PRINT"AFTER ALL ENTRIES ARE MAD
E ALL ENTRIES WILL BE DISPLAYED.  AT":PR
INT"THIS TIME ANY CORRECTIONS NEEDED CAN
 BE MADE.":GOSUB800:PRINT
50 PRINT"NET EARNINGS(NET INCOME)";:INPU
TO:PRINT"OPERATING PROFITS(PROFIT BEFORE
 TAXES)";:INPUTS
60 PRINT"SALES";:INPUTT:PRINT"TOTAL REVE
NUES";:INPUTM
70 PRINT"TOTAL TAXES(FED,STATE,FOREIGN)"
;:INPUTU:PRINT"NUMBER OF SHARES OUTSTAND
ING";:INPUTZ
90 PRINT"TOTAL STOCKHOLDERS EQUITY";:INP
UTP:PRINT"TOTAL CURRENT ASSETS";:INPUTR
100 PRINT"TOTAL CURRENT LIABILITIES";:IN
PUTV:PRINT"LONG TERM DEBT";:INPUTW
110 GOSUB800:CLS:GOSUB840:PRINT"DIVIDEND
S PAID";
120 INPUTQ:PRINT"DEPRECIATION";:INPUTY:G
OSUB800
```

```
Change all TAB(45) to TAB(30) in lines 1
30,140,160,170,180,190,240
```

```
250 PRINT"OPERATING PROFIT MARGIN"TAB(30
)USINGD$;E*100:PRINT"PRETAX PROFIT MARGI
N"TAB(30)USINGD$;F*100:GOSUB 800:PRINT"T
AX RATE"TAB(30)USINGD$;G*100:PRINT"NET P
ROFIT MARGIN"TAB(30)USINGD$;H*100
260 PRINT"CURRENT RATIO"TAB(30)USINGD$;I
*100:PRINT"CAPITAL STRUCTURE"TAB(20)USIN
GE$;J:PRINT"CASH FLOW"TAB(20)USINGE$;K:P
RINT"EARNINGS PER SHARE"TAB(20)USINGE$;L
:GOSUB 800
270 PRINT"EQUITY TURNOVER"TAB(30)USINGD$
;N*100:GOSUB800:CLS
280 C$=INKEY$:PRINT"DO YOU WISH TO RERUN
 THIS PROGRAM? Y/N";:INPUTC$:IFC$="Y"THE
N40ELSEIFC$="N"THEN290ELSE280
290 CLS:PRINT"THE END":END
820 PRINTTAB(3)"DATA FROM INCOME STATEME
NT":PRINT@83,STRING$(26,"*"):PRINT:RETUR
N
830 PRINTTAB(5)"DATA FROM BALANCE SHEET"
:PRINT@85,STRING$(23,"*"):PRINT:RETURN
840 PRINT"DATA FROM SOURCE & APPLICATION
 OF FUNDS STATEMENT":PRINT@80,STRING$(40
,"*"):PRINT:RETURN

Remove all @448, from lines 1050-1160
```

*Program Listing 2. Program changes for the Model 100.*

```
10 REM *** MOD II CONVERSION BY MARE-ANNE JARVELA, 80 MICRO STAFF ***
50 PRINT"NET EARNINGS(NET INCOME)";:INPUTO:PRINT"OPERATING PROFITS(PROFIT BEFORE
 TAXES)";:INPUTS
60 PRINT"SALES";:INPUTT:PRINT"TOTAL REVENUES";:INPUTM
70 PRINT"TOTAL TAXES(FED,STATE,FOREIGN)";:INPUTU:PRINT"NUMBER OF SHARES OUTSTAND
ING";:INPUTZ
90 PRINT"TOTAL STOCKHOLDERS EQUITY";:INPUTP:PRINT"TOTAL CURRENT ASSETS";:INPUTR
100 PRINT"TOTAL CURRENT LIABILITIES";:INPUTV:PRINT"LONG TERM DEBT";:INPUTW
110 GOSUB800:CLS:GOSUB840:PRINT"DIVIDENDS PAID";
120 INPUTQ:PRINT"DEPRECIATION";:INPUTY:GOSUB800
280 C$=INKEY$:PRINT@400,"DO YOU WISH TO RERUN THIS PROGRAM? Y/N";:INPUTC$:IFC$="
Y"THEN40ELSEIFC$="N"THEN290ELSE280
290 CLS:PRINT@460,"THE END":END
820 PRINTTAB(19)"DATA FROM INCOME STATEMENT":PRINT@83,STRING$(56,"*"):PRINT:RETU
RN
830 PRINTTAB(21)"DATA FROM BALANCE SHEET":PRINT@85,STRING$(53,"*"):PRINT:RETURN
840 PRINTTAB(8)"DATA FROM SOURCE & APPLICATION OF FUNDS STATEMENT":PRINT@81,STRI
NG$(69,"*"):PRINT:RETURN


Remove all @448, from lines 1050-1160
```

*Program Listing 3. Program changes for the Model II.*

*Table. Variables list.*

| Variable | Description |
|---|---|
| A | Return on equity |
| B | Retention rate |
| C | Reinvestment rate |
| D | Return on total assets |
| E | Operating profit margin |
| F | Pretax profit margin |
| G | Tax rate |
| H | Net profit margin |
| I | Current ratio |
| J | Capital structure |
| K | Cash flow |
| L | Earnings per share |
| M | Total revenues |
| N | Equity turnover |
| O | Net earnings (net profit) |
| P | Total stockholder's equity |
| Q | Dividends paid |
| R | Total current assets |
| S | Operating profit (profit before taxes) |
| T | Sales |
| U | Total taxes (federal, state, local) |
| V | Total current liabilities |
| W | Long term debt |
| Y | Depreciation |
| Z | Number of shares outstanding |
| A$ | Lets you enter a yes or no answer |
| C$ | Lets you enter a yes or no answer without referencing a subroutine |
| D$ | Lets you print results as a percent |
| E$ | Lets you print results in dollars and cents |

dollars or as percentages. The program defines the strings to display percentages in the last two statements of line 230.

Lines 280 and 290 contain a routine to end or rerun the program. If you choose to end the program, the CLEAR 50 statement in line 290 returns string storage space to the original amount. This prevents an out-of-memory (OM) error from occurring when you enter a large program that requires no extra storage space. This is especially important if you have a 4K machine.

The program ends by printing THE END. Rerunning the program returns program execution to line 40.

Lines 1000–1030 contain the correction subroutine for inaccurate entries. The routine inputs the number of the value you want to correct in line 1040, then jumps to the appropriate line to correct the variable (lines 1050–1160). Then the program verifies the entries again before calculating the results.

If you want to save computed values, I left room in the program to continue in a logical sequence. You can reserve extra string space by changing the CLEAR 124 statement in line 40.

## Helpful Hints

Formulas and definitions used in this program are from *Understanding Wall Street*, by Jeffrey B. Little and Lucien Rhodes (Liberty Publishing Co.).

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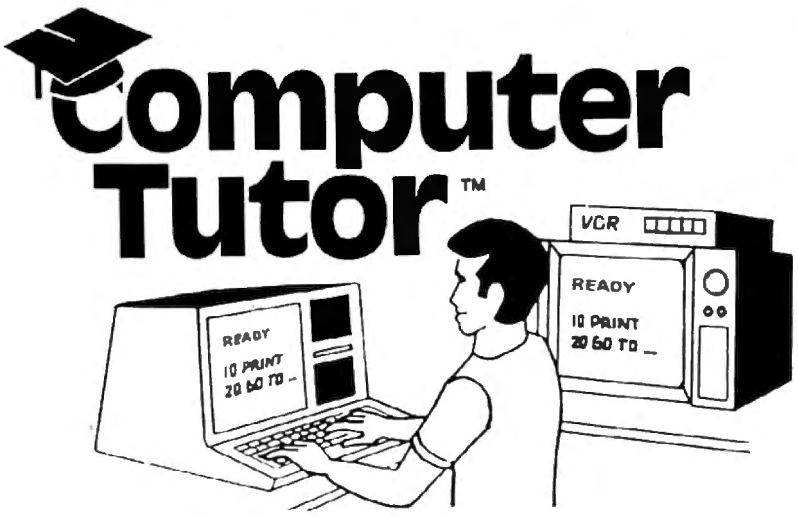


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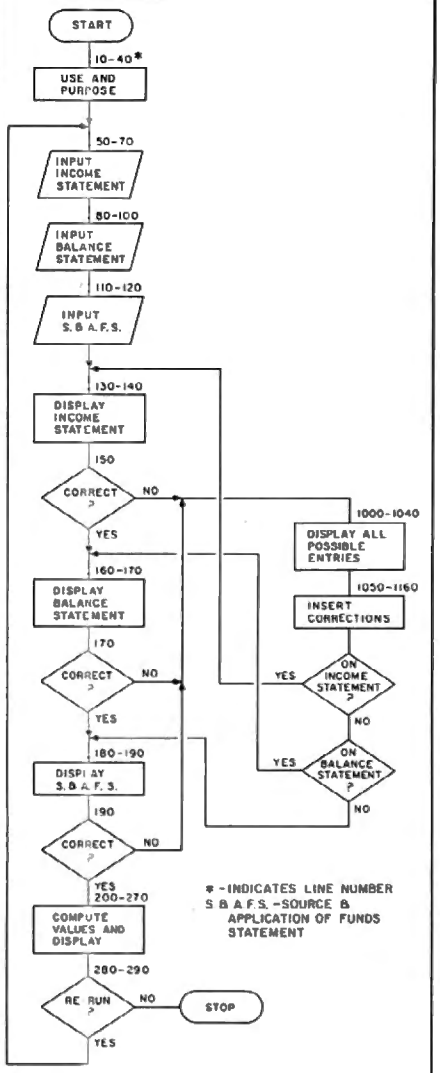


*Figure 3. Flowchart of annual report analysis program.*

When you use this program, remember that you can't obtain all input requests by looking for the input heading in the annual report. You have to calculate some values yourself.

While this program will help you target companies with investment potential, it isn't all-inclusive and you shouldn't rely solely on it when selecting investments. A professional stockbroker can give you a more complete profile of those companies that look like good prospects.

In addition to comparing a company's indicators against those of other corporations, you can compare them to industry averages by checking Dun and Bradstreet's *Key Business Ratios*. You can find it in your local library. ■

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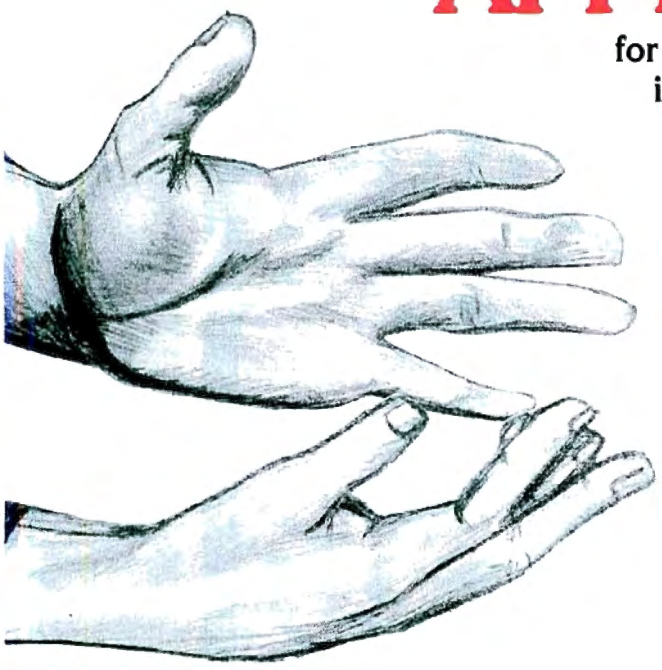

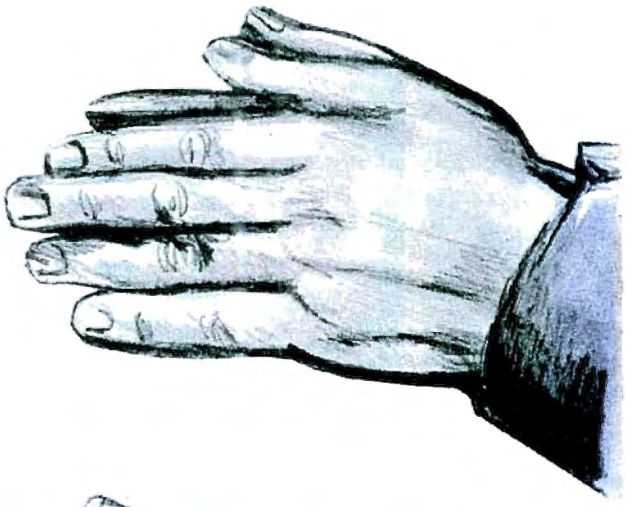

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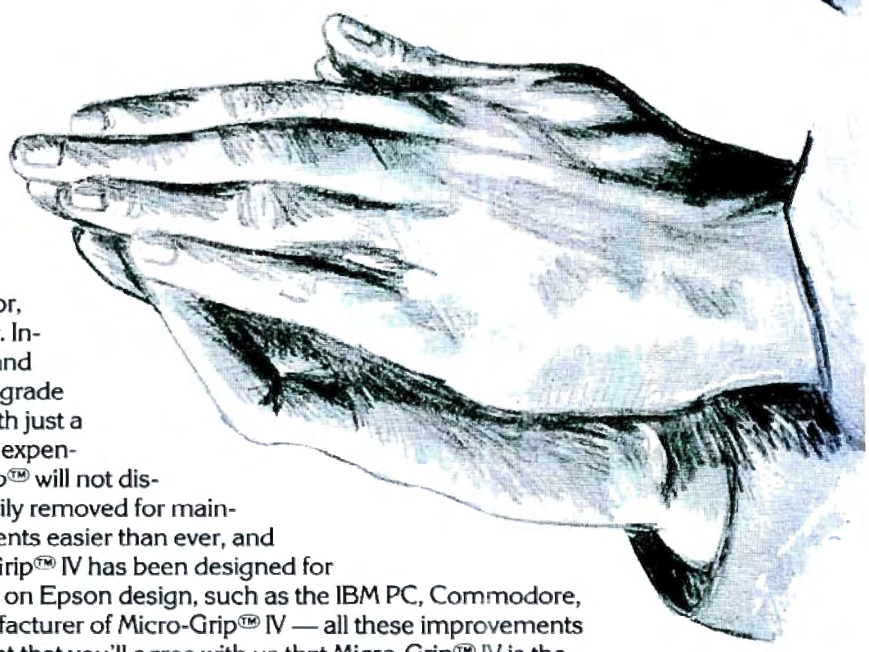

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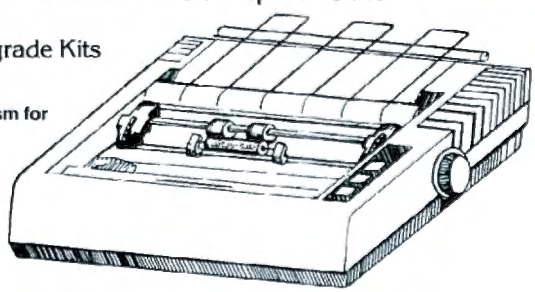

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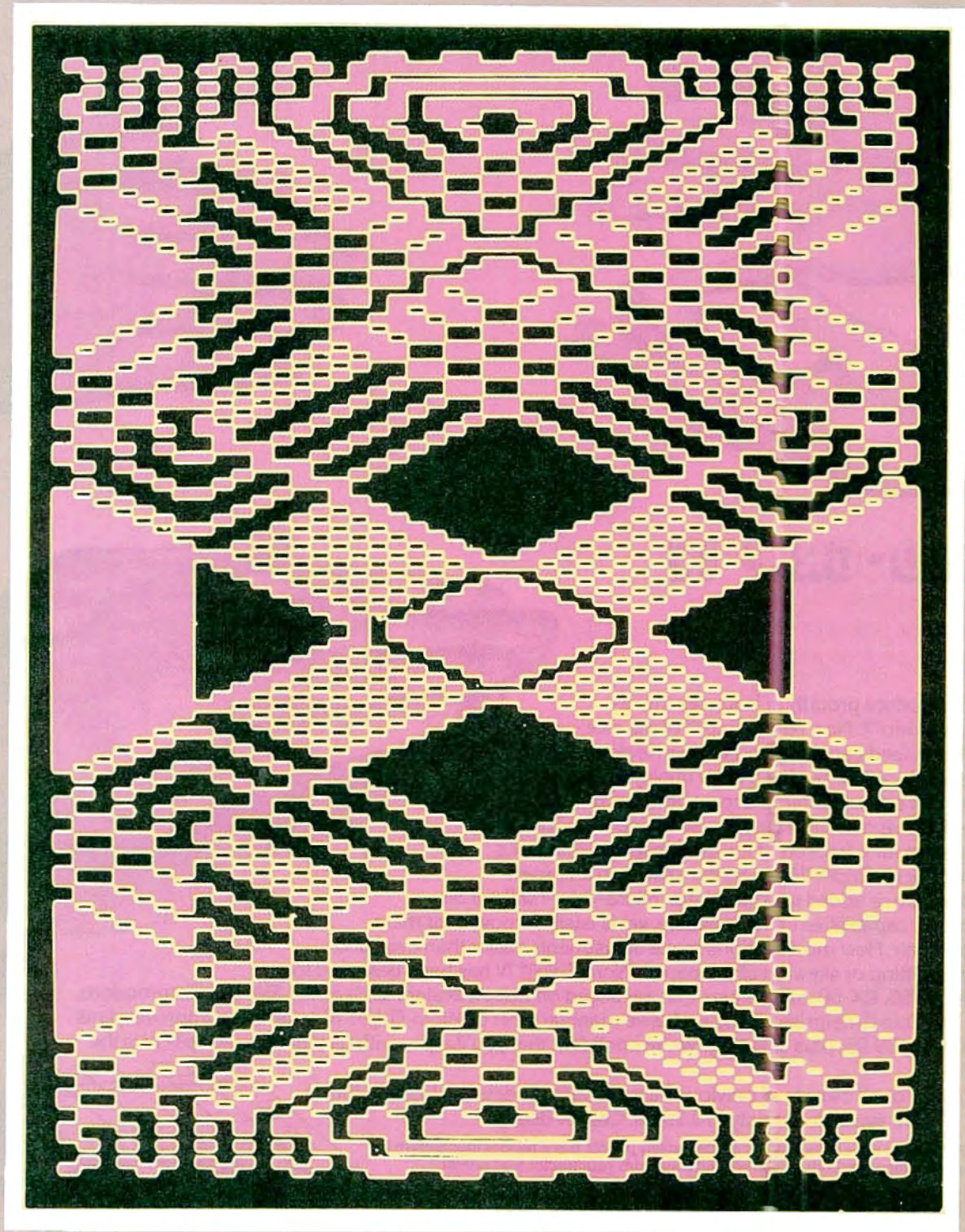


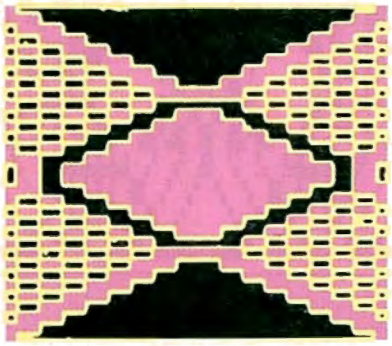
Photography by Suzanne Torsheya

# DESIGNER SCREENS

## Tailor your screen designs to reflect your style. This program generates nearly 6,000 graphics patterns.

by Ken Marks

You can become the Calvin Klein of cursor movement. The Bill Blass of graphics patterns. Or the Pierre Cardin of pixeldom.



I've written a program called Squot that lets you create up to 5,969 different geometric patterns on your 32K Model I or III (see Program Listing). Squot uses four moving cursors to weave its endless patterns. If you see a pattern that you particularly like or might want to use in craftwork, you can freeze the display on the screen and/or print it out on a dot-matrix printer. In addition, you can vary the speed at which the program generates the design.

### Using the Program

Enter Squot directly into memory with T-Bug, NEWBUG, RSM-2D, or any other machine-language monitor, or assemble the object code with EDTASM.

If you use EDTASM, change the origin statement in line 150 to relocate the code so it suits your machine's memory size.

DOSes alter the ROM routines Squot uses. If you have a disk system, clear the DOS by loading the object code into memory and pressing the reset button while holding down the break key.

Then answer the memory size prompt with 32767, type SYSTEM, and press the enter key. When the computer responds with *?, type /32768 (Squot's decimal starting address) and press the enter key to begin the program.

Squot lets you create different designs by defining the cursors' working domains. The program prompts you for the cursors' horizontal (X) limits (1–127) and vertical (Y) limits (1–47) (see Fig. 1). Once you enter the domain limits, Squot begins generating patterns.

The screen's corners are the origins for the cursors' X and Y axes and each cursor is a mirror image of the other three (see Fig. 2). For example, as one cursor moves from the lower left corner of the screen toward the center, the others move from their corners toward the center.

As cursors travel across the screen, they generate designs by determining each pixel's color—black or white—and reversing it.

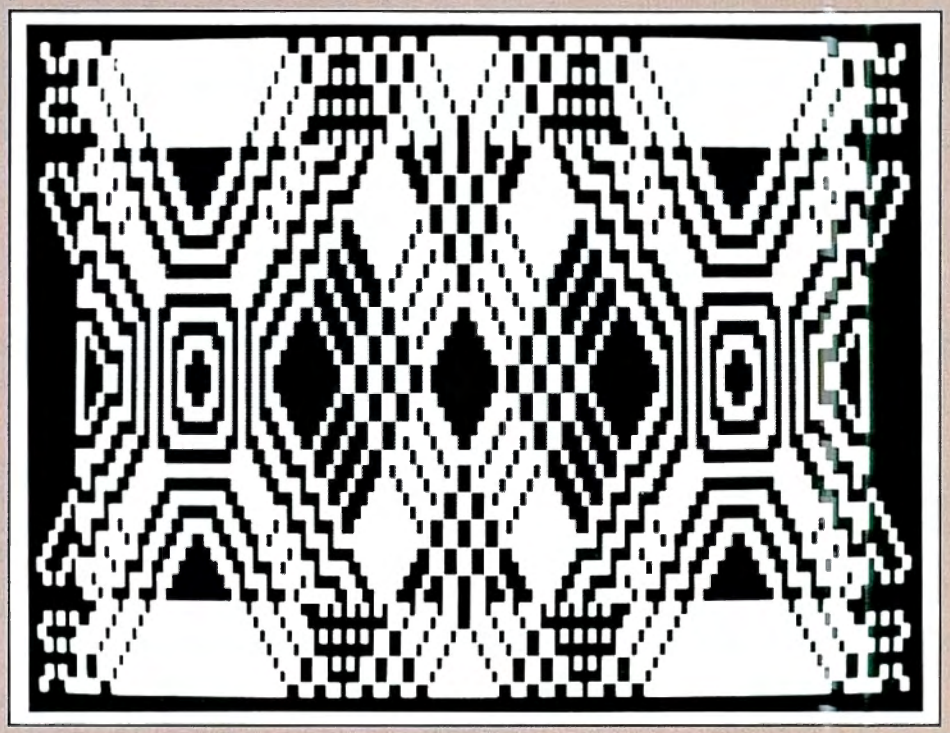
Squot's cursors bounce off the vertical edges of their universes at perfect 45 degree angles (see Fig. 3), but they slide a little on horizontal edges—to turn better in tight corners and add variety to the patterns (see Fig. 4).

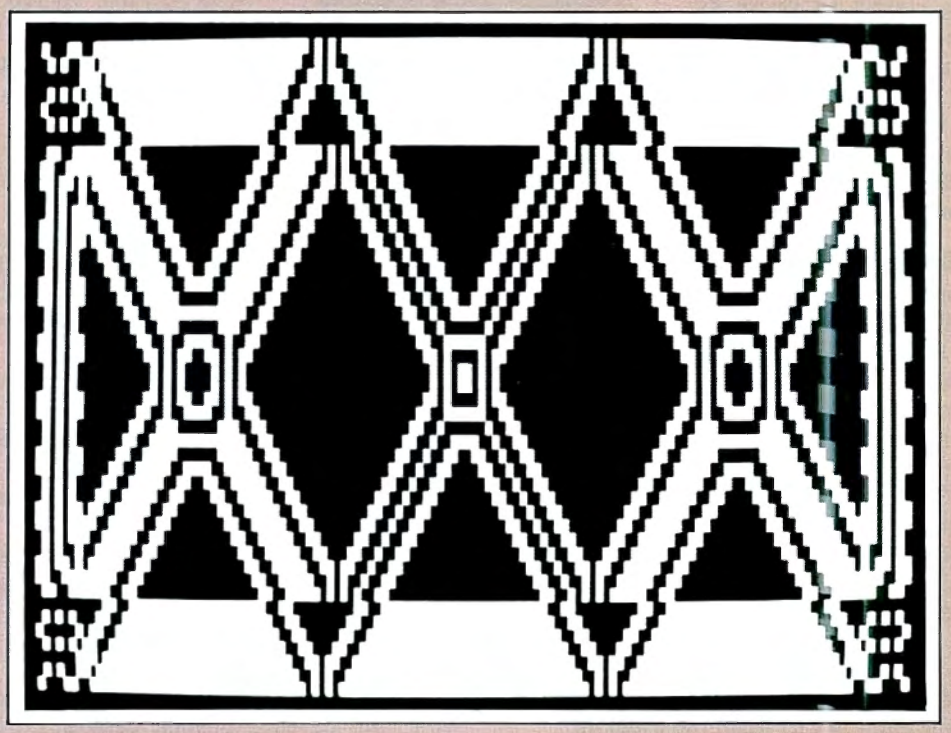
You can change the speed at which the cursors generate graphics by pressing the up- and down-arrow keys. Press shift/down-arrow for Squot's slowest speed, and shift/up-arrow for its fastest speed. Press the control key to make the graphics pause.

The clear key clears the cursors' domains without interrupting their movement and the break key restarts the program.

### Favorite Designs

The dimensions of the cursors' domains give you 5,969 different possible designs. Of course, some are more interesting than others. If you make the four domains overlap by choosing hor-





izontal limits greater than 64 and vertical limits greater than 24, the cursors contribute to each other's work and create one continuous pattern.

I've found that limits close to perfect ratios such as 120,41 and 121,40 produce creative designs. Some of my other favorites are: 25,47; 65,25; 65,31; 93,47; 97,23; 121,44; 124,30; 127,32;

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Easy backup from main menu.

## This is a sample of my mail

"Your PAYROLL program is great — I use it for all my accounts — It's quite a time saver." Hampton, NJ

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**All systems are written for Model III or Model IV in Model III Mode.**

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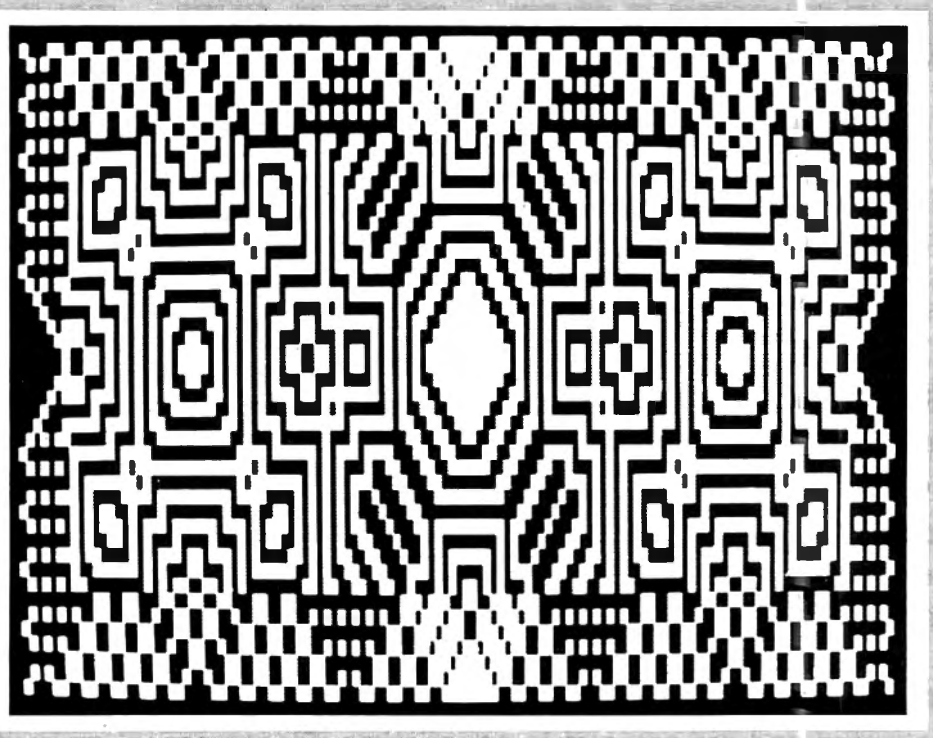

*Program Listing. Squot.*

```
                00100 ;         SQUOT : A KALEIDOSCOPIC GRAPHICS GENERATOR
                00110 ;         MACHINE LANGUAGE VERSION BY KEN MARKS JR.
                00120 ;         VERSION 3.3
                00130 ;
                00140 ;
8000            00150           ORG     8000H   ;CHANGE TO SUIT MEMORY SIZE
8000 AF         00160 START     XOR     A
8001 327E82     00170           LD      (HALT),A        ;SET HALT FLAG TO FALSE
8004 210010     00180           LD      HL,1000H
8007 227C82     00190           LD      (DELAY),HL      ;SET DELAY COUNT TO 1000H
800A CDC901     00200           CALL    01C9H           ;ROM CLS ROUTINE
800D 218382     00210           LD      HL,MESS1        ;POINT TO FIRST MESSAGE
8010 CDA728     00220           CALL    28A7H           ;OUTPUT MESSAGE
8013 211F3C     00230 ERROR1    LD      HL,3C1FH
8016 222040     00240           LD      (4020H),HL      ;CURSOR TO END OF MESSAGE
```

*Listing continued*

127,41; and 127,43.

Squot lets you see the cursors' domain limits during operation if you find a unique pattern but forget its dimensions. When you press and hold down the space bar, the program pauses and displays domain limits in the design's bottom line. Release the space bar to resume operation.

## Printing Designs

I designed Squot to print on an Epson MX-80. To dump a screen to the printer, press shift/P or P (see Fig. 5 for sample printouts). The Epson's standard coding table, which you select by turning off pin 4 of DIP switch 2, lets you use special printing functions, such as emphasized printing and double printing.

If you have an Epson using the TRS-80 coding table, you must make changes in the Listing. In line 2350, replace LD D,12 hexadecimal (hex) with LD D,1E hex. In line 2380, replace LD D,0F hex with LD D,1D hex. And change ADD A,20 hex to NOP in line 2480.

If you have a printer other than an MX-80, consult its operating manual to change the printout option.

You can advance the printer one line between screen dumps by pressing the enter key. This feature won't work with the TRS-80 printer coding table. ■

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*Contact Ken Marks at 913 W. 62nd St., Downers Grove, IL 60516.*

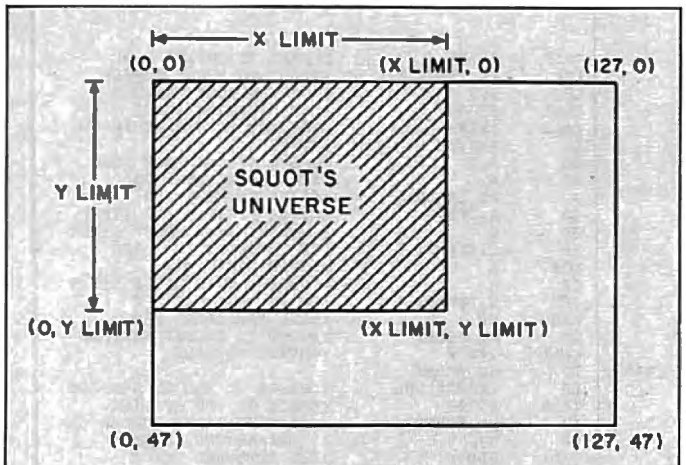


*Figure 1. Single domain layout on the screen.*

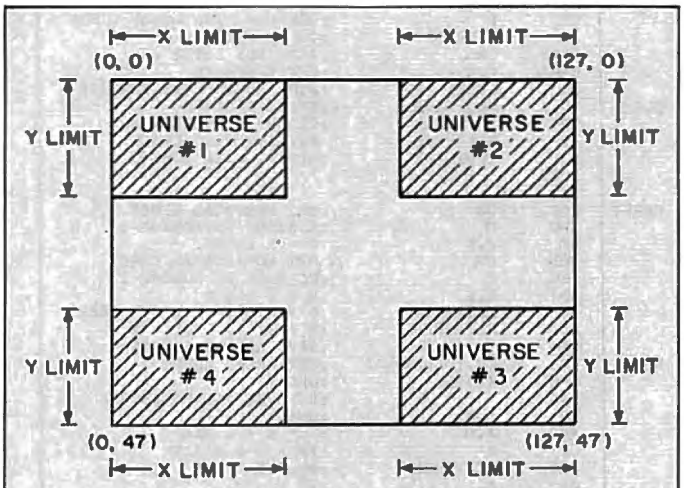


*Figure 2. Complete domain layout on the screen.*

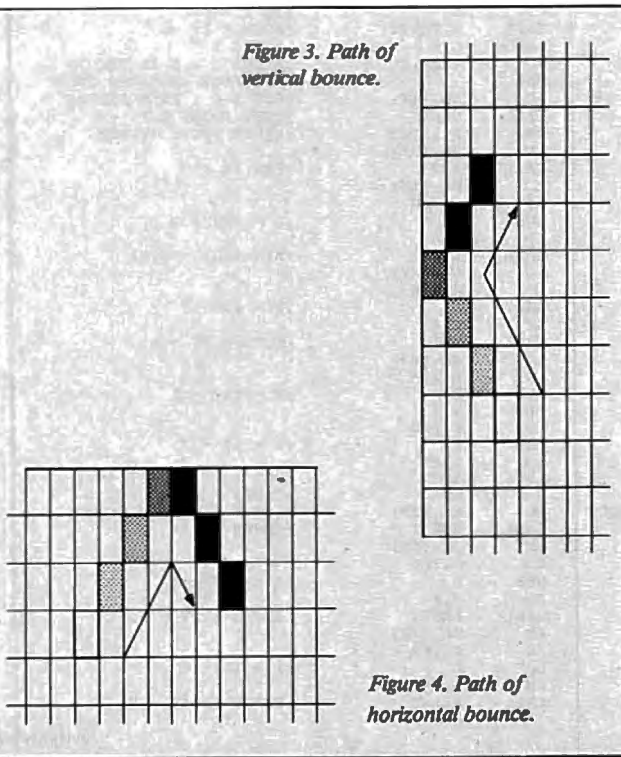

*Figure 3. Path of vertical bounce.*

*Figure 4. Path of horizontal bounce.*



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*Listing continued*

```
8019 CD7305    00250          CALL    0573H           ;ERASE TO END OF LINE
801C 217F82    00260          LD      HL,INBUF        ;POINT TO INPUT BUFFER
801F 0603      00270          LD      B,3             ;3 CHARACTERS MAXIMUM
8021 CDD905    00280          CALL    05D9H           ;GET KEYBOARD INPUT
8024 CD5A1E    00290          CALL    1E5AH           ;CONVERT TO BINARY IN DE
8027 ED537682  00300          LD      (X),DE          ;STORE
802B 7A        00310          LD      A,D             ;CHECK MSB FOR NOT ZERO
802C B7        00320          OR      A               ;MEANING ENTRY > 255
802D 20E4      00330          JR      NZ,ERROR1       ;GO IF ENTRY > 255
802F 3E7F      00340          LD      A,7FH           ;UPPER LIMIT = 127 (7FH)
8031 BB        00350          CP      E               ;COMPARE WITH UPPER LIMIT
8032 38DF      00360          JR      C,ERROR1        ;GO IF ENTRY IS > 7FH
8034 AF        00370          XOR     A               ;LOWER LIMIT = 0
8035 BB        00380          CP      E               ;COMPARE WITH LOWER LIMIT
8036 28DB      00390          JR      Z,ERROR1        ;GO IF ENTRY IS = 0
8038 D5        00400          PUSH    DE              ;SAVE FOR LATER USE
8039 21A3E2    00410          LD      HL,MESS2        ;POINT TO SECOND MESSAGE
803C CDA728    00420          CALL    28A7H           ;OUTPUT MESSAGE
803F 215D3C    00430 ERROR2   LD      HL,3C5DH
8042 222040    00440          LD      (4020H),HL      ;CURSOR TO END OF MESSAGE
8045 CD7305    00450          CALL    0573H           ;ERASE TO END OF LINE
8048 217F82    00460          LD      HL,INBUF        ;POINT TO INPUT BUFFER
804B 0602      00470          LD      B,2             ;2 CHARACTERS MAXIMUM
804D CDD905    00480          CALL    05D9H           ;GET KEYBOARD INPUT
8050 CD5A1E    00490          CALL    1E5AH           ;CONVERT TO BINARY IN DE
8053 ED537C82  00500          LD      (Y),DE          ;STORE
8057 3E2F      00510          LD      A,2FH           ;UPPER LIMIT = 47 (2FH)
8059 BB        00520          CP      E               ;COMPARE WITH UPPER LIMIT
805A 38E3      00530          JR      C,ERROR2        ;GO IF ENTRY IS > 2FH
805C AF        00540          XOR     A               ;LOWER LIMIT = 0
805D BB        00550          CP      E               ;COMPARE WITH LOWER LIMIT
805E 28DF      00560          JR      Z,ERROR2        ;GO IF ENTRY = 0
8060 D5        00570          PUSH    DE              ;SAVE FOR LATER
8061 CD6600    00580          CALL    CLS             ;CLEAR SCREEN
8064 180E      00590          JR      HERE            ;JUMP AROUND CLS ROUTINE
8066 21003C    00600 CLS      LD      HL,3C00H        ;THESE 5 LINES
8069 11013C    00610          LD      DE,3C01H        ;CLEAR THE SCREEN BY
806C 01FF03    00620          LD      BC,03FFH        ;FILLING THE SCREEN
806F 3680      00630          LD      (HL),80H        ;MEMORY WITH 80H
8071 EDB0      00640          LDIR
8073 C9        00650          RET
8074 D1        00660 HERE     POP     DE              ;GET VERTICAL LIMIT
8075 1C        00670          INC     E               ;CORRECT BY ADDING 1
8076 4B        00680          LD      C,E             ;C = Y LIMIT
8077 D1        00690          POP     DE              ;GET HORIZONTAL LIMIT
8078 1C        00700          INC     E               ;CORRECT BY ADDING 1
8079 43        00710          LD      B,E             ;B = X LIMIT
807A 110101    00720          LD      DE,0101H        ;D = X STEP / E = Y STEP
807D 210000    00730          LD      HL,0000H        ;H = X     / L = Y
8080 D9        00740          EXX                     ;SAVE ALL REGISTERS
8081 ED4B7C82  00750 MOVE     LD      BC,(DELAY)      ;GET DELAY COUNT
8085 CD6000    00760          CALL    0060H           ;DELAY
8088 D9        00770          EXX                     ;RESTORE ALL REGISTERS
8089 7C        00780          LD      A,H             ;GET X
808A 82        00790          ADD     A,D             ;X = X + X STEP
808B B8        00800          CP      B               ;IS X > X LIMIT
808C D46782    00810          CALL    NC,TURNX        ;BOUNCE IF SO
808F B7        00820          OR      A               ;IS X = 0
8090 CC6782    00830          CALL    Z,TURNX         ;BOUNCE IF SO
8093 67        00840          LD      H,A             ;STORE X
8094 7D        00850          LD      A,L             ;GET Y
8095 83        00860          ADD     A,E             ;Y = Y + Y STEP
8096 B9        00870          CP      C               ;IS Y > Y LIMIT
8097 D46F82    00880          CALL    NC,TURNY        ;BOUNCE IF SO
809A B7        00890          OR      A               ;IS Y = 0
809B CC6F82    00900          CALL    Z,TURNY         ;BOUNCE IF SO
809E 6F        00910          LD      L,A             ;STORE Y
809F 227A82    00920          LD      (XY),HL         ;STORE X & Y IN MEMORY
80A2 D9        00930          EXX                     ;EXCHANGE REGISTER SETS
80A3 2A7A82    00940          LD      HL,(XY)         ;GET X & Y FROM MEMORY
80A6 CD2782    00950          CALL    TEST            ;TEST POINT X,Y
80A9 202A      00960          JR      NZ,RSET         ;RESET POINT IF SET
80AB 2A7A82    00970          LD      HL,(XY)
80AE CD2B82    00980          CALL    SET             ;SET (X,Y)
80B1 2A7A82    00990          LD      HL,(XY)
80B4 3E7F      01000          LD      A,7FH
80B6 94        01010          SUB     H               ;X = 127 - X
80B7 67        01020          LD      H,A
80B8 CD2B82    01030          CALL    SET             ;SET (127 - X,Y)
80BB 2A7A82    01040          LD      HL,(XY)
80BE 3E2F      01050          LD      A,2FH
80C0 95        01060          SUB     L               ;Y = 47 - Y
80C1 6F        01070          LD      L,A
80C2 CD2B82    01080          CALL    SET             ;SET (X,47 - Y)
80C5 2A7A82    01090          LD      HL,(XY)
80C8 3E7F      01100          LD      A,7FH
80CA 94        01110          SUB     H               ;X = 127 - X
80CB 67        01120          LD      H,A
80CC 3E2F      01130          LD      A,2FH
80CE 95        01140          SUB     L               ;Y = 47 - Y
80CF 6F        01150          LD      L,A
80D0 CD2B82    01160          CALL    SET             ;SET (127 - X,47 - Y)
80D3 1828      01170          JR      KBRD            ;CHECK KEYBOARD
80D5 2A7A82    01180 RSET     LD      HL,(XY)         ;GET X & Y FROM MEMORY
80D8 CD2F82    01190          CALL    RESET           ;RESET (X,Y)
80DB 2A7A82    01200          LD      HL,(XY)
80DE 3E7F      01210          LD      A,7FH
80E0 94        01220          SUB     H               ;X = 127 - X
80E1 67        01230          LD      H,A
80E2 CD2F82    01240          CALL    RESET           ;RESET (127 - X,Y)
80E5 2A7A82    01250          LD      HL,(XY)
80E8 3E2F      01260          LD      A,2FH
80EA 95        01270          SUB     L               ;Y = 47 - Y
80EB 6F        01280          LD      L,A
80EC CD2F82    01290          CALL    RESET           ;RESET (X,47 - Y)
```

*Listing continued*

✓ See List of Advertisers on Page 227

*Listing continued*

```
80EF 2A7A82   01300          LD      HL,(XY)
80F2 3E7F     01310          LD      A,7FH
80F4 94       01320          SUB     H               ;X = 127 - X
80F5 67       01330          LD      H,A
80F6 3E2F     01340          LD      A,2FH
80F8 95       01350          SUB     L               ;Y = 47 - Y
80F9 6F       01360          LD      L,A
80FA CD2F82   01370          CALL    RESET           ;RESET (127 - X,47 - Y)
80FD 2A7C82   01380 KBRD     LD      HL,(DELAY)      ;GET DELAY IN HL
8100 3A4038   01390          LD      A,(3840H)       ;GET KEYBOARD BYTE
8103 CB5F     01400          BIT     3,A             ;TEST FOR UP ARROW
8105 281D     01410          JR      Z,DOWN          ;GO IF NOT
8107 3A8038   01420          LD      A,(3880H)
810A B7       01430          OR      A               ;TEST FOR SHIFT
810B 2012     01440          JR      NZ,SHIFT        ;GO IF SO
810D 54       01450          LD      D,H             ;HL -> DE
810E 5D       01460          LD      E,L
810F 0606     01470          LD      B,6             ;DE = DE / 32
8111 CB3A     01480 DIV1     SRL     D
8113 CB1B     01490          RR      E
8115 10FA     01500          DJNZ    DIV1
8117 13       01510          INC     DE              ;DE = DE + 1
8118 AF       01520          XOR     A               ;CLEAR CARRY
8119 ED52     01530          SBC     HL,DE           ;DECREASE DELAY BY DE
811B 382C     01540          JR      C,MOVE2         ;GO IF PAST LOWER BOUND
811D 1822     01550          JR      PUTDEL          ;STORE NEW DELAY
811F 210100   01560 SHIFT    LD      HL,0001H        ;KINIMUM DELAY
8122 181D     01570          JR      PUTDEL          ;STORE NEW DELAY
8124 CB67     01580 DOWN     BIT     4,A             ;TEST FOR DOWN ARROW
8126 2824     01590          JR      Z,SCAN          ;GO IF NOT
8128 3A8038   01600          LD      A,(3880H)
812B B7       01610          OR      A               ;TEST FOR SHIFT
812C 2010     01620          JR      NZ,SHIFT2       ;GO IF SO
812E 54       01630          LD      D,H             ;HL -> DE
812F 5D       01640          LD      E,L
8130 0606     01650          LD      B,6             ;DE = DE / 32
8132 CB3A     01660 DIV2     SRL     D
8134 CB1B     01670          RR      E
8136 10FA     01680          DJNZ    DIV2
8138 13       01690          INC     DE              ;DE = DE + 1
8139 19       01700          ADD     HL,DE           ;INCREASE COUNT BY DE
813A 380D     01710          JR      C,MOVE2         ;IF PAST UPPER BOUND
813C 1803     01720          JR      PUTDEL          ;STORE NEW DELAY
813E 21FFFF   01730 SHIFT2   LD      HL,0FFFFH       ;MAXIMUM DELAY
8141 7C       01740 PUTDEL   LD      A,H
8142 B5       01750          OR      L               ;IS HL = 0?
8143 2001     01760          JR      NZ,PUT2         ;GO IF NOT
8145 23       01770          INC     HL              ;MAKE HL = 1
8146 227C82   01780 PUT2     LD      (DELAY),HL      ;STORE DELAY COUNT
8149 C38180   01790 MOVE2    JP      MOVE            ;CONTINUE MOVING
814C CD2B00   01800 SCAN     CALL    002BH           ;CALL KEYSCAN ROUTINE
814F B7       01810          OR      A               ;KEY PRESSED?
8150 CA8180   01820          JP      Z,MOVE          ;GO IF NOT
8153 FE01     01830          CP      01E             ;TEST FOR BREAK
8155 CA0080   01840          JP      Z,START         ;RESTART ON BREAK
8158 FE20     01850          CP      20H             ;TEST FOR SPACE
815A 203B     01860          JR      NZ,CLEAR        ;GO IF NOT SPACE
815C 21003C   01870          LD      HL,3C00H        ;START OF VIDEO MEM
815F 11EA82   01880          LD      DE,BUFFER       ;STORAGE BUFFER
8162 014000   01890          LD      BC,40H          ;40H = 1 LINE OF GRAPHICS
8165 222040   01900          LD      (4020H),HL      ;RESTORE CURSOR
8168 EDB0     01910          LDIR                    ;STORE 1ST LINE IN BUFFER
816A 21C182   01920          LD      HL,HMES         ;HORIZONTAL LIMIT MESSAGE
816D CDA728   01930          CALL    28A7H           ;DISPLAY MESSAGE
8170 2A7682   01940          LD      HL,(X)          ;GET VALUE
8173 CDAF0F   01950          CALL    0FAFH           ;DISPLAY VALUE
8176 21D582   01960          LD      HL,VMES         ;VERTICAL LIMIT MESSAGE
8179 CDA728   01970          CALL    28A7H           ;DISPLAY MESSAGE
817C 2A7882   01980          LD      HL,(Y)          ;GET VALUE
817F CDAF0F   01990          CALL    0FAFH           ;DISPLAY VALUE
8182 3A4038   02000 LOOP1    LD      A,(3840H)       ;TEST SPACE BIT
8185 CB7F     02010          BIT     7,A             ;SPACE STILL PRESSED?
8187 20F9     02020          JR      NZ,LOOP1        ;DELAY IF SO
8189 21EA82   02030          LD      HL,BUFFER       ;RESTORE 1ST LINE
818C 11003C   02040          LD      DE,3C00H
818F 014000   02050          LD      BC,40H
8192 EDB0     02060          LDIR
8194 CD2B00   02070          CALL    002BH           ;SCAN KEYBOARD
8197 FE1F     02080 CLEAR    CP      1FH             ;CLEAR FOR CLEAR
8199 2006     02090          JR      NZ,FREEZE       ;GO IF NOT PRESSED
819B CD6680   02100          CALL    CLS             ;CLEAR SCREEN
819E CD2B00   02110          CALL    002BH           ;SCAN KEYBOARD
81A1 FE40     02120 FREEZE   CP      40H             ;CHECK FOR "@"
81A3 2025     02130          JR      NZ,PRINT        ;GO IF NOT PRESSED
81A5 3E01     02140          LD      A,1             ;HALT = TRUE
81A7 327E82   02150          LD      (HALT),A        ;SET HALT FLAG TO TRUE
81AA CD2B00   02160 LOOP2    CALL    002BH           ;SCAN KEYBOARD
81AD FE01     02170          CP      01E             ;TEST FOR BREAK
81AF CA0080   02180          JP      Z,START         ;RESTART IF SO
81B2 FE50     02190          CP      50H             ;TEST FOR "P"
81B4 281B     02200          JR      Z,PRINT2        ;PRINT IF SO
81B6 FE70     02210          CP      70H             ;TEST FOR SHIFT "P"
81B8 2822     02220          JR      Z,COND          ;PRINT CONDENSED IF SO
81BA FE0D     02230          CP      0DH             ;TEST FOR ENTER
81BC CA0882   02240          JP      Z,FEED          ;LINE FEED IF SO
81BF FE40     02250          CP      40H             ;TEST FOR "@"
81C1 20E7     02260          JR      NZ,LOOP2        ;SEARCH AGAIN IF NOT
81C3 AF       02270          XOR     A               ;HALT = FALSE
81C4 327E82   02280          LD      (HALT),A        ;SET HALT FLAG TO FALSE
81C7 C38180   02290          JP      MOVE            ;CONTINUE MOVING
81CA CD2B00   02300 PRINT    CALL    002BH           ;SCAN KEYBOARD
81CD FE70     02310          CP      70H             ;CHECK FOR CONDENSED
81CF 280B     02320          JR      Z,COND          ;GO IF SO
81D1 FE50     02330 PRINT2   CP      50H             ;CHECK FOR NORMAL
81D3 2033     02340          JR      NZ,FEED         ;GO IF NOT
81D5 1612     02350          LD      D,12H           ;80 C/L CODE
```

*Listing continued*

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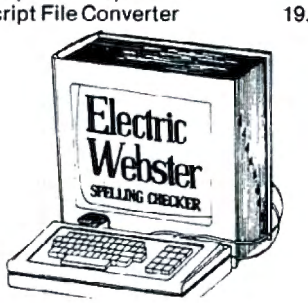


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*Listing continued*

```
81D7 CD1B82   02360          CALL    LPRINT          ;SEND TO PRINTER
81DA 1805     02370          JR      COMMON          ;JUMP TO COMMON POINT
81DC 160F     02380 COND     LD      D,0FH           ;132 C/L CODE
81DE CD1B82   02390          CALL    LPRINT          ;SEND TO PRINTER
81E1 160D     02400 COMMON   LD      D,0DH           ;CARRIAGE RETURN
81E3 CD1B82   02410          CALL    LPRINT          ;SEND TO PRINTER
81E6 21003C   02420          LD      HL,3C00H        ;START OF VIDEO
81E9 011040   02430          LD      BC,4010H        ;B=CHAR / C = LINES
81EC 3AE837   02440 LOOP3    LD      A,(37E8H)       ;TEST PRINTER
81EF CB7F     02450          BIT     7,A
81F1 20F9     02460          JR      NZ,LOOP3
81F3 7E       02470          LD      A,(HL)          ;GET CHARACTER
81F4 C620     02480          ADD     A,20H           ;CORRECT FOR EPSON
81F6 23       02490          INC     HL              ;BUMP POINTER
81F7 32E837   02500          LD      (37E8H),A       ;SEND TO PRINTER
81FA 10F0     02510          DJNZ    LOOP3           ;LOOP 64 TIMES
81FC 160D     02520          LD      D,0DH           ;CARRIAGE RETURN
81FE CD1B82   02530          CALL    LPRINT          ;PRINT 1 LINE
8201 0640     02540          LD      B,40H           ;COUNT = 64 AGAIN
8203 0D       02550          DEC     C               ;DEC LINE COUNT
8204 20E6     02560          JR      NZ,LOOP3        ;IF NOT 16 LINES
8206 1809     02570          JR      STOP            ;SEE IF STILL STOPPED
8208 FE0D     02580 FEED     CP      0DH             ;ENTER?
820A C28180   02590          JP      NZ,MOVE         ;GO IF NOT
820D 57       02600          LD      D,A             ;MOVE INTO D
820E CD1B82   02610          CALL    LPRINT          ;LINE FEED
8211 3A7E82   02620 STOP     LD      A,(HALT)        ;CHECK FLAG
8214 B7       02630          OR      A               ;IS IT ZERO
8215 CA8280   02640          JP      Z,MOVE+1        ;CONTINUE MOVING IF SO
8218 C3AA81   02650          JP      LOOP2           ;CONTINUE HOLD IF NOT
821B 3AE837   02660 LPRINT   LD      A,(37E8H)       ;PRINTER STATUS
821E CB7F     02670          BIT     7,A             ;BUSY?
8220 20F9     02680          JR      NZ,LPRINT       ;GO IF BUSY
8222 7A       02690          LD      A,D             ;GET CHARACTER
8223 32E837   02700          LD      (37E8H),A       ;SEND TO PRINTER
8226 C9       02710          RET
8227 3E46     02720 TEST     LD      A,46H           ;BIT CODE FOR TEST
8229 1806     02730          JR      COMM2           ;GO TO COMMON POINT
822B 3EC6     02740 SET      LD      A,0C6H          ;BIT CODE FOR SET
822D 1802     02750          JR      COMM2           ;GO TO COMMON POINT
822F 3E86     02760 RESET    LD      A,86H           ;BIT CODE FOR RESET
8231 326582   02770 COMM2    LD      (BYTE+1),A      ;STORE BIT CODE
8234 5C       02780          LD      E,H             ;HL -> DE
8235 55       02790          LD      D,L
8236 7A       02800          LD      A,D             ;GET Y
8237 06FF     02810          LD      B,0FFH          ;DIVIDE BY 3 BY REPEATED
8239 04       02820 LOOP4    INC     B               ;SUBTRACTION OF 3
823A D603     02830          SUB     03H             ;PUTTING DIVIDEND IN B
823C 30FB     02840          JR      NC,LOOP4        ;AND REMAINDER IN A
823E C603     02850          ADD     A,3             ;A NOW HAS REMAINDER
8240 CB27     02860          SLA     A               ;MULTIPLY REMAINDER BY 2
8242 4F       02870          LD      C,A             ;STORE REMAINDER * 2 IN C
8243 68       02880          LD      L,B             ;GET DIVIDEND IN L
8244 2600     02890          LD      H,0             ;NOW HL = DIVIDEND
8246 0606     02900          LD      B,6             ;MULTIPLY DIVIDEND BY 64
8248 29       02910 LOOP5    ADD     HL,HL           ;BY DOUBLING 6 TIMES
8249 10FD     02920          DJNZ    LOOP5
824B 1600     02930          LD      D,0             ;DE NOW HAS X
824D CB3B     02940          SRL     E               ;DIVIDE X BY 2
824F 3001     02950          JR      NC,EVEN         ;X WAS EVEN IF NO CARRY
8251 0C       02960          INC     C               ;INC REMAINDER IF ODD
8252 19       02970 EVEN     ADD     HL,DE           ;ADD X / 2 TO REMAINDER
8253 11003C   02980          LD      DE,3C00H        ;ADD START OF SCREEN
8256 19       02990          ADD     HL,DE           ;MEM TO GET ABSOLUTE ADD
8257 CB21     03000          SLA     C               ;MOVE BIT TO PROPER FIELD
8259 CB21     03010          SLA     C
825B CB21     03020          SLA     C
825D 3A6582   03030          LD      A,(BYTE+1)      ;GET INSTRUCTION
8260 81       03040          ADD     A,C             ;ADD BIT FIELD
8261 326582   03050          LD      (BYTE+1),A      ;STORE INSTRUCTION
8264 CB00     03060 BYTE     RLC     B               ;DUMMY INSTRUCTION
8266 C9       03070          RET
8267 08       03080 TURNX    EX      AF,AF'          ;SWITCH AF REGISTERS
8268 AF       03090          XOR     A               ;CLEAR A
8269 92       03100          SUB     D
826A 57       03110          LD      D,A             ;X STEP = -X STEP
826B 08       03120          EX      AF,AF'          ;SWITCH BACK
826C 82       03130          ADD     A,D             ;X = X + X STEP
826D 82       03140          ADD     A,D             ;AGAIN FOR SLIDE
826E C9       03150          RET
826F 08       03160 TURNY    EX      AF,AF'          ;SWITCH AF REGISTERS
8270 AF       03170          XOR     A               ;CLEAR A
8271 93       03180          SUB     E
8272 5F       03190          LD      E,A             ;Y STEP  = -Y STEP
8273 08       03200          EX      AF,AF'          ;SWITCH BACK
8274 83       03210          ADD     A,E             ;Y = Y + Y STEP
8275 C9       03220          RET
8276 0000     03230 X        DEFW    0
8278 0000     03240 Y        DEFW    0
827A 0000     03250 XY       DEFW    0
827C 0100     03260 DELAY    DEFW    1
827E 00       03270 HALT     DEFB    0
0004          03280 INBUF    DEFS    4
8283 57       03290 MESS1    DEFM    'WHAT IS THE HORIZONTAL LIMIT ? '
82A2 00       03300          DEFB    0
82A3 57       03310 MESS2    DEFM    'WHAT IS THE VERTICAL LIMIT ? '
82C0 00       03320          DEFB    0
82C1 48       03330 HMES     DEFM    'HORIZONTAL LIMIT = '
82D4 00       03340          DEFB    0
82D5 20       03350 VMES     DEFM    '   VERTICAL LIMIT = '
82E9 00       03360          DEFB    0
82EA          03370 BUFFER   EQU     $       ;START OF BUFFER
0000          03380          END     START
00000 TOTAL ERRORS
25660  TEXT AREA BYTES LEFT
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# MONTEZUMA MICRO

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| 26-4166 | Model 12, 16 SlimLine 2-Drive Expansion | 1783 |

## FURNITURE

| | | |
|---|---|---|
| 26-1305 | Model 3 System Desk | 152 |
| 26-1308 | Universal Printer Stand | 85 |
| 26-1324 | Computer Table | 60 |
| 26-1325 | Platform | 26 |
| 26-4301 | Model 2 Desk | 299 |
| 26-4303 | Deluxe System Desk | 229 |
| 26-4304 | System Desk Drawer | 111 |
| 26-4306 | Deluxe Printer Stand | 128 |
| 26-4308 | Terminal Stand | 153 |
| 74-0550 | Docu-Rack Stand | 51 |

## PRINTERS & ACCESSORIES

| | | |
|---|---|---|
| 26-1155 | Quick Printer II | 69 |
| 26-1158 | Daisywheel II | 1525 |
| 26-1190 | Plotter | 424 |
| 26-1191 | Multi-Pen Plotter | 1695 |
| 26-1192 | GCP-115 Color Graphics Printer | 169 |
| 26-1193 | Flatbed Plotter/Printer | 845 |
| 26-1195 | Digitizer | 381 |
| 26-1196 | Color Computer Graphics Input Tablet | 297 |
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| 26-1448 | Single Bin Sheet Feeder | 999 |
| 26-1455 | Acoustic Cover | 339 |
| 26-1459 | Bi-Directional Tractor | 204 |
| 26-1401 | Model 1, M3, M4 Printer Cable | 29 |
| 26-1408 | RS-232C Cable | 16 |
| 26-1409 | Model 100 Printer Cable | 13 |
| 26-4401 | Model 2, M12, M16 Printer Cable | 29 |
| 26-1490 | 10' RS-232C Cable | 25 |
| 26-1491 | 25' RS-232C Cable | 33 |
| 26-1492 | 50' RS-232C Cable | 46 |
| 26-1493 | 100' RS-232C Cable | 76 |
| 26-1495 | RS-232C Cable Extender | 25 |
| 26-1496 | RS-232C Null Modem Adapter | 25 |
| 26-1498 | Parallel Printer Switch | 102 |
| 26-1499 | RS-232C Selector Switch | 128 |
| 26-3505 | PC 1 Printer | 108 |
| 26-3591 | PC 3 Printer | 102 |
| 26-3605 | PC 2 Printer | 187 |
| 26-3652 | PC 4 Printer | 68 |

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|---|---|---|
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| 26-0312 | TRSDOS 1.3 For The Model 3 | 12 |
| 26-0313 | TRSDOS 6.0 For The Model 4 | 12 |
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| 26-1510 | Trendex | 51 |
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| 26-1518 | **NEW!** pfs:file for the Model 4 | 107 |
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| 26-1543 | **NEW!** Model 3 Payroll | 169 |
| 26-1552 | General Ledger | 85 |
| 26-1553 | Inventory Control I | 85 |
| 26-1554 | Accounts Payable | 128 |
| 26-1555 | Accounts Receivable | 128 |
| 26-1556 | Disk Payroll | 169 |
| 26-1557 | Concrete Take-Off | 49 |
| 26-1558 | Business Mailing List | 85 |
| 26-1559 | Manufacturing Inventory Control | 169 |
| 26-1560 | Fixed Assets | 68 |
| 26-1562 | Profile | 68 |
| 26-1563 | Scripsit | 85 |
| 26-1564 | Mailgram | 34 |
| 26-1565 | Microfile | 85 |
| 26-1566 | Model 1 VisiCalc | 85 |
| 26-1568 | Medical Office Systems | 254 |
| 26-1569 | Model 3 VisiCalc: Enhanced Version | 169 |
| 26-1579 | Real Estate | 85 |
| 26-1580 | Project Manager | 85 |
| 26-1581 | Personnel Manager | 85 |
| 26-1582 | Time Manager | 85 |
| 26-1584 | Checkwriter 80 | 85 |
| 26-1585 | Business Checkwriter | 127 |
| 26-1588 | Videotex Plus | 42 |
| 26-1589 | MICRO/Courier | 127 |
| 26-1590 | SuperSCRIPSIT | 169 |
| 26-1591 | Scripsit Dictionary | 126 |
| 26-1592 | Profile Plus | 169 |
| 26-1593 | Profile Plus LD/HD Version | 254 |
| 26-1594 | Desktop/Plan-80 | 169 |
| 26-1595 | **NEW!** SuperSCRIPSIT For The Model 4 | 169 |
| 26-1596 | **NEW!** Scripsit For The Model 4 | 85 |
| 26-1597 | Business Graphics Pak | 148 |
| 26-2010 | Mod 3 BASIC Programming Course | 25 |
| 26-2011 | EDAS, Tape Version | 25 |
| 26-2012 | Assembly Language Development Course | 126 |
| 26-2013 | EDAS, Disk Version | 29 |
| 26-2014 | Mod 3 Disk Course | 25 |
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| 26-2022 | **NEW!** Power Tool | 43 |
| 26-2023 | **NEW!** Dot Plot | 17 |
| 26-2150 | Introduction to BASIC | 99 |
| 26-2200-1 | Model 1,Model 3 FORTRAN | 85 |
| 26-2201 | Model 1 FORTRAN | 85 |
| 26-2203 | COBOL | 169 |
| 26-2204 | Compiler BASIC | 126 |
| 26-2205 | PILOT | 85 |
| 26-2208-7 | COBOL Runtime Disk | 25 |
| 26-2208-9 | Compiler BASIC Runtime Disk | 17 |
| 26-2210 | **NEW!** BASCOM | 169 |
| 26-2211 | **PASCAL** | 212 |
| 26-2212 | **NEW!** PASCAL For The Model 4 | 169 |
| 26-2213 | Model 1 LDOS | 109 |
| 26-2214 | Model 3 LDOS | 109 |
| 26-2216 | CP/M Plus For The Model 4 | 126 |
| 26-GOOD | The Good CP/M for the Model 4(MM) | 199 |
| 26-2217 | CBASIC For The Model 4 (Requires CP/M) | 85 |
| 26-2220-23 | Videotex | 26 |
| 26-2224 | Videotex Compuserv Kit | 16 |
| 26 2709 | Color Computer PILOT, Tape | 51 |
| 26-2710 | Color Computer PILOT, Disk | 68 |
| 26-2718 | PILOT III | 101 |
| 26-2721 | Color Computer LOGO, Disk | 85 |
| 26-2722 | LOGO ROM Pack | 43 |
| 26-3019 | Diagnostic ROM Pack | 17 |
| 26-3030 | **NEW!** OS-9 For The Color Computer | 59 |
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| 26-3821 | **NEW!** Model 100 Learning Lab | 25 |

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|---|---|---|
| 26-4501 | General Ledger I | 136 |
| 26-4502 | Inventory Management System I | 135 |
| 26-4503 | Payroll | 270 |
| 26-4504 | Accounts Receivable | 199 |
| 26-4505 | Accounts Payable | 199 |
| 26-4506 | Mailing List | 44 |
| 26-4507 | Mailing List II | 101 |
| 26-4508 | Medical Office Systems | 637 |
| 26-4509 | Manufacturing Inventory Control | 637 |
| 26-4510 | Versafile | 99 |
| 26-4511 | VisiCalc | 254 |
| 26-4512 | Profile II | 152 |
| 26-4513 | Job Costing | 126 |
| 26-4514 | Order Entry | 169 |
| 26-4515 | Profile II Plus | 254 |
| 26-4516 | Profile Training Guide | 58 |
| 26-4517 | Profile Plus Upgrade | 102 |
| 26-4520 | Time Accounting | 254 |
| 26-4521 | VisiCalc | 254 |
| 26-4525 | Electronic Broker | 850 |
| 26-4531 | SCRIPSIT 2.0 | 254 |
| 26-4532 | SCRIPSIT Utility Disk | 109 |
| 26-4534 | SCRIPSIT Dictionary | 169 |
| 26-4536 | SCRIPSIT Plotter Driver | 42 |
| 26-4540 | Statistical Analysis | 85 |
| 26-4545 | Litigation Support | 254 |
| 26-4550 | **NEW!** Business Graphics Anylsis Pak | 212 |
| 26-4554 | Accounts Receivable | 107 |
| 26-4555 | Menu Generator | 33 |
| 26-4556 | Profile Forms | 106 |
| 26-4557 | Profile Archive | 42 |
| 26-4558 | Profile Prosort | 126 |
| 26-4559 | Prolook | 169 |
| 26-4560 | WESTLAW | 211 |
| 26-4580 | MultiPlan, Model 2 & Model 12 Version | 212 |
| 26-4601 | General Ledger | 424 |
| 26-4602 | Inventory Control System | 254 |
| 26-4603 | Payroll | 509 |
| 26-4604 | Accounts Receivable | 424 |
| 26-4605 | Accounts Payable | 424 |
| 26-4607 | Order Entry/ICS | 424 |
| 26-4608 | Sales Analysis | 254 |
| 26-4621 | Personnel Search | 254 |
| 26-4701 | FORTRAN | 254 |
| 26-4702 | EDAS | 169 |
| 26-4703 | COBOL | 254 |
| 26-4704 | COBOL Run-Time Disk | 34 |
| 26-4705 | Compiler BASIC | 169 |
| 26-4706 | Compiler BASIC Run-time Disk | 26 |
| 26-4707 | COBOL Generator | 850 |
| 26-4708 | Report Generator | 254 |
| 26-4710 | Program Editor | 67 |
| 26-4711 | **NEW!** PASCAL MT | 361 |
| 26-4712 | Assembly Language Development System | 211 |
| 26-4713 | EDAS 1 | 43 |
| 26-4714 | Reformat Tier | 212 |
| 26-4716 | DSYNC 3780 | 850 |
| 26-4718 | Term Administration | ??? |
| 26-4721 | Videotex For The Model 2, 12, 16 | 42 |
| 26-4725 | **NEW!** BASCOM BASIC Compiler | 169 |
| 26-4730 | BiSYNC 3270, Version 2 | 1270 |
| 26-4740 | CP/M Plus | 211 |
| 26-4742 | CBASIC | 84 |
| 26-4802 | Inventory for the Hard Disk | 339 |
| 26-4831 | SCRIPSIT for the Hard Disk | 339 |
| 26-4834 | Dictionary for the Hard Disk | 169 |
| 26-4835 | SCRIPSIT for Thinline Drives | 339 |
| 26-4910 | TRSDOS 2.0 | 21 |
| 26-4912 | TRSDOS 4.2 | 21 |
| 26-6100 | COBOL Development System | 254 |
| 26-6101 | COBOL Run time Diskette | 34 |
| 26-6105 | TRSDOS 16 | 34 |
| 26-6201 | General Ledger | 509 |
| 26-6203 | Payroll | 509 |
| 26-6204 | Accounts Receivable | 509 |
| 26-6205 | Accounts Payable | 509 |
| 26-6207 | Order Entry/ICS | 509 |
| 26-6208 | Sales Analysis | 339 |
| 26-6209 | Job Costing | 169 |
| 26-6302 | Inventory | 339 |
| 26-6309 | Manufacturing ICS | 722 |
| 26-6401 | XENIX Development System | 637 |
| 26-6455 | COBOL | 599 |
| 26-6457 | MBASIC | 254 |
| 26-6480 | MultiPlan, Model 16 & XENIX | 296 |
| | Electric Pencil 2.0, M1, M3 | 69 |
| | Blue Pencil, M1, M3 | 69 |
| | Red Pencil, M1, M3 | 69 |
| | HEXSPELL 2 | 80 |
| | HEXMAN | 60 |
| | Modem 80, A Powerful Communications Program | 35 |

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|---|---|---|
| 26-2102 | Model 1 Level II Manual | 5 |
| 26-2103 | Model 1 Technical Manual | 13 |
| 26-2109 | Model 3 Technical Manual | 8 |
| 26-2110 | Model 4 Technical Manual | 21 |
| 26-2111 | Model DOS Manual | 6 |
| 26-2112 | Model 3 BASIC Instruction Manual | 5 |
| 26-2114 | Sourcebook, New Edition | 4 |
| 26-2115 | Newsletter Book 1980 | 4 |
| 26-2117 | Model 4 DOS Manual | 15 |
| 26-2240 | Newsletter Book 1981 | 8 |
| 26-3191 | Color Computer Manual | 5 |
| 26-3192 | Extended Color Computer Manual | |
| 26-4920 | Model 2 Operators Manual | 26 |
| 26-4921 | Model 2 Technical Reference Manual | 26 |
| 26-4922 | Model 12 Operating Manual | 59 |
| 26-6040 | Model 16 Operators Manual | 64 |
| 26-6041 | Model 16B Operating Manual | 72 |
| 62-2084 | TRS-80 Pocket BASIC Handbook | 6 |
| | TRS-80 Disk & Other Mysteries | 18 |
| | Microsoft BASIC Decoded | 24 |
| | BASIC Faster & Better | 24 |
| | BASIC Faster & Better Demonstration Disk | 15 |
| | BASIC Faster & Better Library Disk | 15 |
| | BASIC Disk I/O Faster & Better | 24 |
| | The Custom TRS-80 | 24 |
| | TRSDOS 2.3 Decoded | 24 |
| | Machine Language Disk I/O | 24 |
| | How Do It On The TRS-80 | 24 |
| | TRS-80 Beginners Guide | 19 |

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|---|---|---|
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| | Holmes Mod 1, Mod 3 4Mhz Speedup Mod | 89 |
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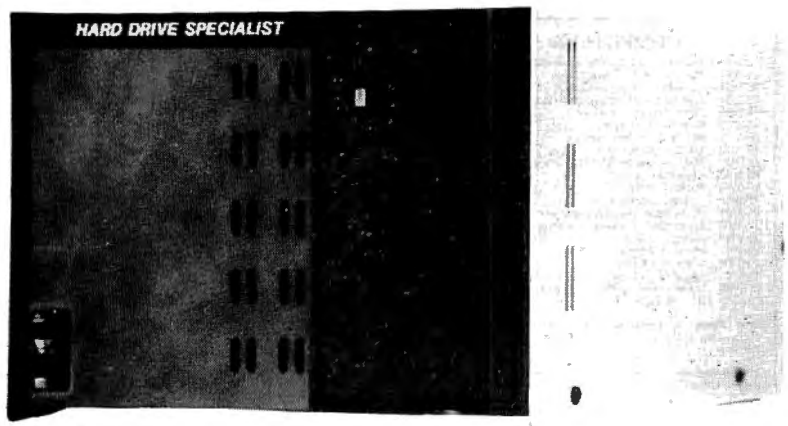


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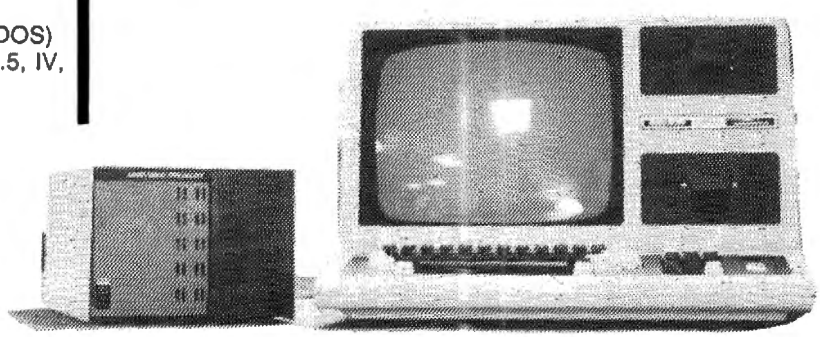

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by Ralph C. Allan

# PROPER ARRANGEMENTS

## Get your string arrays in order with this fast, multidimensional Sort routine.

The poorest machine-language Sort routine is faster than the best Basic one, but even a quick, handy, machine-language sort like TRSDOS's CMD "O" has limitations. When I discovered that CMD "O" couldn't sort the two-dimensional arrays in my mailing-list program, I used it to create a fast Basic/machine-language hybrid routine that meets my needs.

This customized sort uses the Model III TRSDOS machine-language, single-dimension string sort to order a string array of many dimensions. With this method, you can create several indexes using different elements of the array as sorting keys.

For example, say I have a mailing list program I want to sort alphabetically. With a single-dimension array, I can only sort the names in alphabetical order. But with a multidimensional sort, I could sort other array dimensions, like street address and city/state information, along with the names, keeping the entire mailing list entry intact. Not only would the sort list the names in alphabetical order, it would list all the other dimensions of the array, street address and city and state here, with the names.

### Getting There from Here

As stated in the TRSDOS manual, the correct form of the Sort command is CMD "O",n,A$(x) where n is the number of array items you want sorted, A$ is the array name, and x is the point in the array where you want the sort to begin.

CMD "O" provides almost instantaneous single-dimension sorts. It works great on a list of items, so I figured I could fool it into accepting a multidimensional array.

It turns out that the Basic interpreter will accept a more general command format than that listed in the manual. You can use:

CMD "O",n,A$(x,y)

where n still represents the number of array items you want sorted, A$ is the array name, x is the starting point in the array, and y is the dimension of the array that you choose as the sorting key.

Even though the interpreter accepts the command in the above format, the computer sorts only one dimension of the array. This means the data in that dimension is no longer related to the data in the other dimensions. If you use

### *The Key Box*

**Model III**
**32K RAM**
**Disk Basic**
**TRSDOS**

*Program Listing. CMD "O" Sort routine for multidimension arrays.*

```
10 CLEAR 2000 '.....................clear string space
20 DEFSTR A-H:DEFINT I-N '..........define strings & integers
30 DIM A(99,2):DIM IX(99) '.........address & index arrays
40 CLS '.............................enter data
50 INPUT"Enter name...";A(N,0)
60 INPUT"Enter address...";A(N,1)
70 INPUT"Enter city/prov...";A(N,2)
80 PRINT
90 PRINT"More items (y/n)"
100 B = INKEY$
110 IF B = "Y" OR B = "y" THEN N=N+1:GOTO 40
120 IF B = "N" OR B = "n" THEN 135
130 GOTO 100
135 N1 = N + 1 '...................required by CMD"O"
139 '.........................add "*" and number to sort keys
140 FOR J = 0 TO N : A(J,0) = A(J,0)+"*"+STR$(J) : NEXT
150 CMD"O",N1,A(0,0) '.....................Model III  ML sort
160 FOR J = 0 TO N
170 FOR K = 0 TO 10
179 '.....................................find "*" in sort keys
180 IF MID$(A(J,0),LEN(A(J,0))-K,1) = "*" THEN K1=K : K=10
190 NEXT
200 IX(J) = VAL(RIGHT$(A(J,0),K1-1)) '......put number in index
209 '................hack index number from right of sort key
                      and tack it onto the left of the key
210 A(J,0) = STR$(IX(J))+"*"+LEFT$(A(J,0),LEN(A(J,0))-K1-1)
220 NEXT
230 CMD"O",N1,A(0,0) '.................Model III ML sort again
240 FOR J = 0 TO N
250 FOR K = 1 TO 10
260 IF MID$(A(J,0),K,1) = "*" THEN K1=K : K=10 '......find "*"
270 NEXT
280 A(J,0) = RIGHT$(A(J,0),LEN(A(J,0))-K1) '........hack index
                                                    number from left
                                                  of sort key
290 NEXT
300 CLS '..................................display sorted array
310 FOR J = 0 TO N
320 PRINT A(IX(J),0), A(IX(J),1), A(IX(J),2)
330 NEXT
340 PRINT '.......................go back for more if desired
350 PRINT"<A>dd more   <V>iew list again"
360 B = INKEY$
370 IF B = "A" OR B = "a" THEN N=N+1 : GOTO 40
380 IF B = "V" OR B = "v" THEN 300
390 GOTO 360
```

*End*

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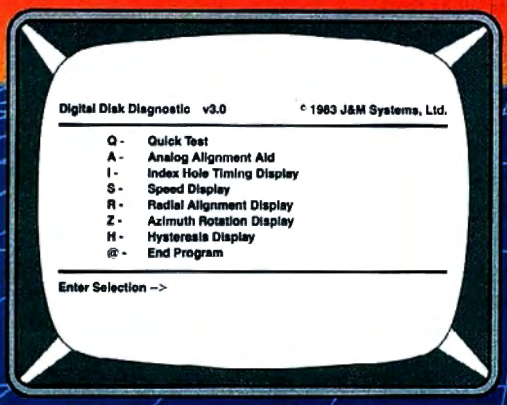


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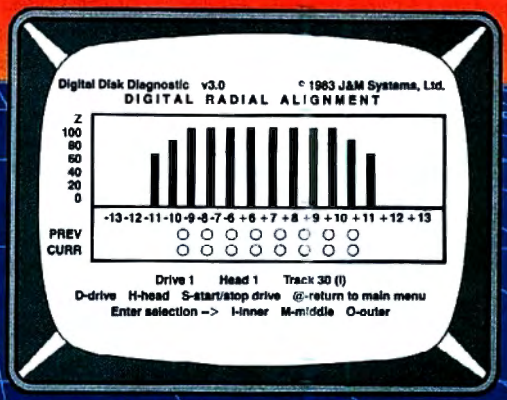


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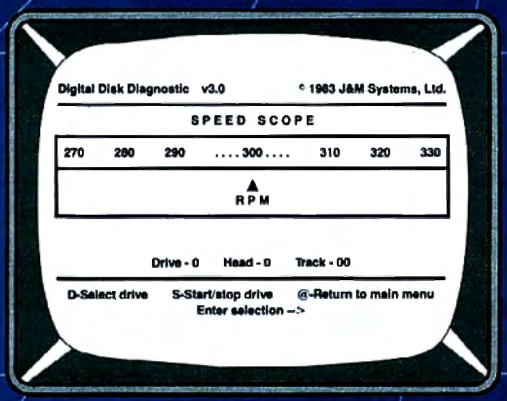


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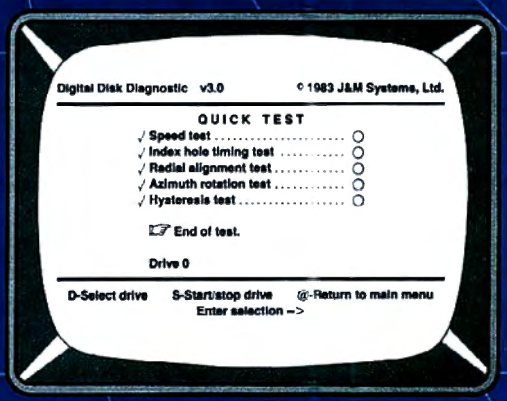


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this command on a mailing list, you might send a letter to the wrong address.

But I found out how to sort the array's key while maintaining the relationships between array elements. I'll explain my method by tracking through the Program Listing.

## Program Description

Line 30 sets aside the string array needed for data (A) and a single-dimension integer array for an index (IX). Lines 40–130 contain the data entry routine, and the sort begins in line 135.

You must set N1 in line 135 because the total number of elements you want sorted is one more than the value of N. This occurs because CMD "O" starts counting from zero.

To keep track of your data locations after the computer sorts one dimension of the array, add a number to each element in the array dimension to use as a sorting key. That number becomes the record or position number in the unsorted array; it denotes the element's position in the array. An asterisk precedes it to separate it from any other numbers that might be to the right of the data.

You must convert the number to a string representation before the program can concatenate it onto the string element in line 140. At this point, if you enter a name into the array as "Jones Pickle Works", it would look like this: "Jones Pickle Works* 22". Then line 150 calls CMD "O" to sort the array dimension.

Next, the program builds the index using the numbers tacked onto the end of the sorted strings. Lines 160–220 find the asterisks and move the numbers and asterisks from the end of the array to the beginning. ("Jones Pickle Works" is now "22*Jones Pickle Works".)

Line 230 calls the CMD "O" sort again, which puts the array back into its original order. This occurs because the left side of all the elements in the array dimension being sorted consists of the original record numbers from the unsorted array.

The final part of the program removes the record numbers and asterisks from the beginning of the string array elements (lines 240–290) and shows off the results by displaying the array in indexed order (lines 300–330).

I used the asterisk as a flag character to separate string data from the record numbers to ensure that lines 210–280 remove all the extra characters. You could use any character, including those the computer won't display, such as CHR$(7). Just replace the asterisk with your chosen character in lines 140, 180, 210, and 260.

Remember that the CMD "O" sort occurs along the array dimension indicated by the first number inside the bracket after the array name.

## Summary

This sort isn't as fast as one written entirely in machine language, but it's faster than other Basic sorts because it only uses Basic for three passes through the array, no matter how large the array.

A bubble sort, on the other hand, might have to pass through the array many times—up to the square of the number of elements. Binary sorts are better, but still require multiple passes.

As long as you're willing to give up a little speed, you can compromise by using this sorting method for multidimension arrays. ■

---

*Write to Ralph C. Allan at 7878 Piedmont Crescent, Prince George, BC V2N 3H9, Canada.*

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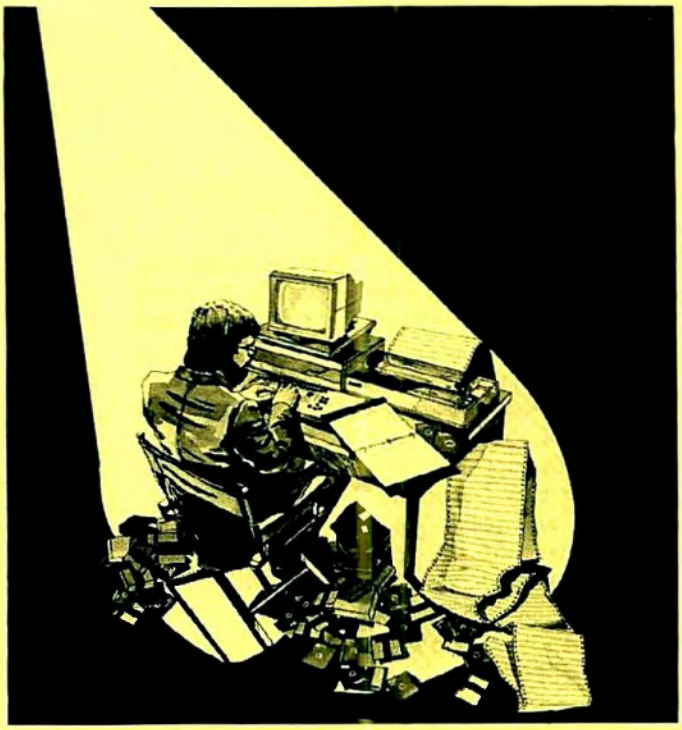

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# Bugs from Outer Space

## In Part IV, the bugs strike back. Deadly attacks and explosions spice up 80's arcade-game tutorial.

All right, so you shot down a lot of bugs last month. Before you get too proud of yourself, let's add two more modules to this expanding machine-language arcade game—and see how you cope when the bugs swoop down and attack, instead of hanging at the top of the screen like sitting ducks.

Also, let's add explosions to get bugs off the screen after you shoot them. Boom is the first routine in Program Listing 1 (TEXT4A). It scans the explosion table, EXPTAB, for active explosions (indicated by a nonzero third byte of the explosion entry). It then displays three random graphics characters at the unlucky bug's location (the first 2 bytes of the entry), and decrements the third byte, which serves as the explosion's duration counter.

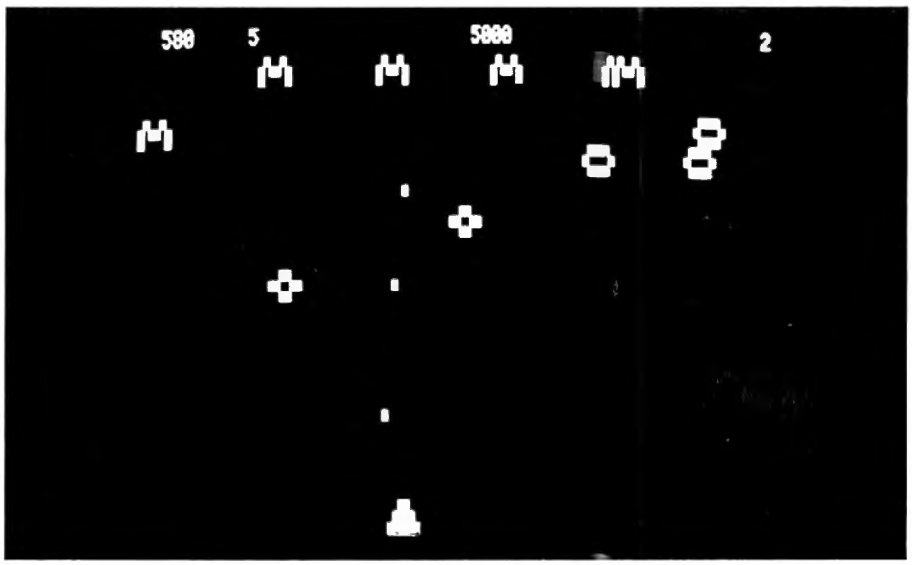


*Photo. Alien insects attacking your base.*

*Editor's note: "Bugs from Outer Space" is a six-part tutorial on writing machine-language games for the Models I and III. Each installment represents a self-contained component or components of the final game. The first installment appeared in March 1984 and the last will appear in August's annual games issue.*

### *The Key Box*

LOAD 80

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

*Program Listing 1. TEXT4A, explosion and level module.*

```
                00100 ;**** PART 4A
69E9            00110         ORG     69E9H
6590            00120 EXPTAB  EQU     6590H
6719            00130 RND     EQU     6719H
                00140 ;**** BOOM ROUTINE DISPLAYS EXPLOSIONS
69E9 DD3519     00150 BOOM    DEC     (IX+25)         ;DECREMENT COUNTER
69EC C0         00160         RET     NZ              ;RETURN IF ZERO
69ED DD7E1A     00170         LD      A,(IX+26)       ;RESET COUNTER
69F0 DD7719     00180         LD      (IX+25),A
69F3 FD219065   00190         LD      IY,EXPTAB       ;IY==>EXPLOSION TABLE
69F7 0610       00200         LD      B,16            ;B=MAX # OF EXPLOSIONS
69F9 C5         00210 BOOM10  PUSH    BC              ;SAVE COUNTER
69FA FD6601     00220         LD      H,(IY+1)        ;HL=ADDRESS
69FD FD6E00     00230         LD      L,(IY)
6A00 FD7E02     00240         LD      A,(IY+2)        ;A=TIME TO END
6A03 B7         00250         OR      A               ;IF ZERO THEN SKIP
6A04 2811       00260         JR      Z,BOOM20
6A06 0603       00270         LD      B,3             ;ELSE B=3 CHARACTERS
6A08 CD1967     00280 BOOM15  CALL    RND             ;CREATE RND GRAPHICS
6A0B E63F       00290         AND     3FH
6A0D F680       00300         OR      80H
6A0F 77         00310         LD      (HL),A          ;AND STORE
6A10 E603       00320         AND     3
6A12 D3FF       00330         OUT     (255),A         ;SOUND
6A14 23         00340         INC     HL              ;NEXT LOCATION
6A15 10F1       00350         DJNZ    BOOM15          ;LOOP
6A17 FD23       00360 BOOM20  INC     IY              ;IY=IY+3
6A19 FD23       00370         INC     IY
6A1B FD23       00380         INC     IY
6A1D C1         00390         POP     BC              ;RESTORE COUNT
6A1E 10D9       00400         DJNZ    BOOM10          ;AND LOOP
6A20 FD219065   00410         LD      IY,EXPTAB       ;RESET IY
6A24 0610       00420         LD      B,16            ;B=MAX. # OF EXPLOSIONS
```

*Listing 1 continued*

*Listing 1 continued*

```
6A26 C5          00430 BOOM30  PUSH    BC              ;SAVE BC
6A27 FD6601      00440         LD      H,(IY+1)        ;HL=ADDRESS
6A2A FD6E00      00450         LD      L,(IY)
6A2D FD7E02      00460         LD      A,(IY+2)        ;GET TIME
6A30 B7          00470         OR      A               ;SKIP IF ZERO
6A31 2813        00480         JR      Z,BOOM60
6A33 FE01        00490         CP      1               ;ALMOST DONE?
6A35 200C        00500         JR      NZ,BOOM50       ;SKIP IF NOT
6A37 DD361701    00510         LD      (IX+23),1       ;SET REDRAW FLAG
6A3B 3680        00520         LD      (HL),80H        ;ERASE EXPLOSION
6A3D 23          00530         INC     HL
6A3E 3680        00540         LD      (HL),80H
6A40 23          00550         INC     HL
6A41 3680        00560         LD      (HL),80H
6A43 FD3502      00570 BOOM50  DEC     (IY+2)          ;DECREMENT COUNT
6A46 C1          00580 BOOM60  POP     BC              ;RESTORE COUNTER
6A47 FD23        00590         INC     IY              ;IY=IY+3
6A49 FD23        00600         INC     IY
6A4B FD23        00610         INC     IY
6A4D 10D7        00620         DJNZ    BOOM30          ;AND LOOP
6A4F C9          00630         RET
6A50 0000        00640 LEVEL   DEFW    0               ;LEVEL NUMBER
6A52 0000        00650         DEFW    0
                 00660 ;**** LEVEL PARAMETERS FOLLOW
6A54 08          00670 LEVEL1  DEFB    8       ;LEVEL 1 PARAMS  # OF BUG 1
6A55 08          00680         DEFB    8               ;# OF BUG 2
6A56 01          00690         DEFB    1               ;# OF BUG 3
6A57 00          00700         DEFB    0               ;INC TO ATTACK PARAM
6A58 00          00710         DEFB    0               ;INC TO BOMBS PARAM
6A59 00          00720         DEFB    0               ;INC TO BUG 1 SPEED
6A5A 00          00730         DEFB    0               ;  BUG 2
6A5B 00          00740         DEFB    0               ;  BUG 3
6A5C 00          00750         DEFB    0               ;RND ENTRY POINTS FLAG
6A5D 00          00760         DEFB    0               ;NZ IF ADD BUG 2 FIRST
6A5E 08          00770 LEVEL2  DEFB    8
6A5F 08          00780         DEFB    8
6A60 04          00790         DEFB    4
6A61 00          00800         DEFB    0
6A62 01          00810         DEFB    1
6A63 01          00820         DEFB    1
6A64 01          00830         DEFB    1
6A65 01          00840         DEFB    1
6A66 01          00850         DEFB    1
6A67 01          00860         DEFB    1
6A68 10          00870 LEVEL3  DEFB    16
6A69 00          00880         DEFB    0
6A6A 04          00890         DEFB    4
6A6B 00          00900         DEFB    0
6A6C 00          00910         DEFB    0
6A6D 02          00920         DEFB    2
6A6E 01          00930         DEFB    1
6A6F 02          00940         DEFB    2
6A70 00          00950         DEFB    0
6A71 00          00960         DEFB    0
6A72 0C          00970 LEVEL4  DEFB    12
6A73 0C          00980         DEFB    12
6A74 04          00990         DEFB    4
6A75 00          01000         DEFB    0
6A76 00          01010         DEFB    0
6A77 02          01020         DEFB    2
6A78 03          01030         DEFB    3
6A79 01          01040         DEFB    1
6A7A 00          01050         DEFB    0
6A7B 01          01060         DEFB    1
6A7C 00          01070 LEVEL5  DEFB    0
6A7D 10          01080         DEFB    16
6A7E 08          01090         DEFB    8
6A7F 03          01100         DEFB    3
6A80 01          01110         DEFB    1
6A81 00          01120         DEFB    0
6A82 00          01130         DEFB    0
6A83 00          01140         DEFB    0
6A84 01          01150         DEFB    1
6A85 01          01160         DEFB    1
6A86 10          01170 LEVEL6  DEFB    16
6A87 10          01180         DEFB    16
6A88 04          01190         DEFB    4
6A89 02          01200         DEFB    2
6A8A 01          01210         DEFB    1
6A8B 00          01220         DEFB    0
6A8C 00          01230         DEFB    0
6A8D 00          01240         DEFB    0
6A8E 00          01250         DEFB    0
6A8F 00          01260         DEFB    0
6A90 08          01270 LEVEL7  DEFB    8
6A91 08          01280         DEFB    8
6A92 10          01290         DEFB    16
6A93 03          01300         DEFB    3
6A94 00          01310         DEFB    0
6A95 00          01320         DEFB    0
6A96 00          01330         DEFB    0
6A97 01          01340         DEFB    1
6A98 01          01350         DEFB    1
6A99 00          01360         DEFB    0
6A9A 08          01370 LEVEL8  DEFB    8
6A9B 08          01380         DEFB    8
6A9C 08          01390         DEFB    8
6A9D 03          01400         DEFB    3
6A9E 01          01410         DEFB    1
6A9F 02          01420         DEFB    2
6AA0 01          01430         DEFB    1
6AA1 02          01440         DEFB    2
6AA2 00          01450         DEFB    0
6AA3 01          01460         DEFB    1
6AA4 546A        01470 LEVTAB  DEFW    LEVEL1          ;ADDRESSES OF PARAMS
6AA6 5E6A        01480         DEFW    LEVEL2
```

*Listing 1 continued*

Next in the Listing come the level parameters, with the Level routine storing the level number in binary coded decimal format. These parameters control the number of each type of bug added and how much the attack parameter (which determines how often bugs attack) increases with each level.

The level parameter table also includes increments to change the bugs' speeds. Two flags control whether the bugs enter at random locations and which type of bug appears first.

## Heads Up!

Program Listing 2 (TEXT4B) begins with the Attack routine, which compares the attack parameter to a random number. If the random number is greater, control returns to the main program; if it's smaller, the direction code changes to 10 or 11, sending the bug into a homicidal dive.

The Test routine compares your current score with the high score, moving it to the high score location if you break the record and setting a flag for the SOUND2 routine. This routine makes a beeping sound when you set a high score.

TEST2 determines whether your base has been hit. If so, an explosion appears over the base and the routine decrements the base hit flag. When the flag reaches zero, another flag is set to signal that the bugs have destroyed the base.

TEST3 makes sure you finish a level before going on to the next one. TEST5 awards a bonus base every 20,000 points, and SOUND3 makes a congratulatory noise for the occasion.

## The Battle Continues

Program Listing 3 (MAIN4) is, of course, the fourth version of the Bugs from Outer Space main program. Once again, you needn't type in the whole listing; just remove some semicolons from last month's main source code to match.

After you assemble the listings, load all the previous modules' and the latest main program's object code files, then execute the code. Once you see the introduction and press the clear key, you'll be battling bugs again. But now they'll explode when you hit them, and attack if you don't.

Oh, I forgot to mention one parameter in Listing 1. It's the bomb parameter, which controls how often bugs drop—well, never mind. You'll see next month. ■

*Contact Roger Smith at 267 Seminole Trail, Crestview, FL 32536.*

*Listing 1 continued*

```
6AA8 686A     01490          DEFW    LEVEL3
6AAA 726A     01500          DEFW    LEVEL4
6AAC 7C6A     01510          DEFW    LEVEL5
6AAE 866A     01520          DEFW    LEVEL6
6AB0 906A     01530          DEFW    LEVEL7
6AB2 9A6A     01540          DEFW    LEVEL8
6AB4 0100     01550 ONE      DEFW    1               ;ONE CONSTANT
6AB6 0000     01560          DEFW    0
6AB8          01570 NEXT1    EQU     $
0000          01580          END
00000 TOTAL ERRORS
31788  TEXT AREA BYTES LEFT


BOOM    69E9 00150
BOOM10  69F9 00210    00400
BOOM15  6A08 00280    00350
BOOM20  6A17 00360    00260
BOOM30  6A26 00430    00620
BOOM50  6A43 00570    00500
BOOM60  6A46 00580    00480
EXPTAB  6590 00120    00190 00410
LEVEL   6A50 00640
LEVEL1  6A54 00670    01470
LEVEL2  6A5E 00770    01480
LEVEL3  6A68 00870    01490
LEVEL4  6A72 00970    01500
LEVEL5  6A7C 01070    01510
LEVEL6  6A86 01170    01520
LEVEL7  6A90 01270    01530
LEVEL8  6A9A 01370    01540
LEVTAB  6AA4 01470
NEXT1   6AB8 01570
ONE     6AB4 01550
RND     6719 00130    00280
```

*Program Listing 2. TEXT4B, attack and score module.*

```
                00100 ;**** PART 4B
6AB8            00110          ORG     6AB8H
6359            00120 BUG1     EQU     6359H
6389            00130 BUG2     EQU     6389H
63B9            00140 BUG3     EQU     63B9H
6719            00150 RND      EQU     6719H
6253            00160 SCORE    EQU     6253H
624F            00170 HIGH     EQU     624FH
6203            00180 DISSCR   EQU     6203H
618A            00190 SOUNDX   EQU     618AH
6257            00200 BASE     EQU     6257H
673D            00210 TEST3A   EQU     673DH
6568            00220 SHIPS    EQU     6568H
6AB4            00230 ONE      EQU     6AB4H
6235            00240 INCSCR   EQU     6235H
                00250 ;**** ATTACK ROUTINE CAUSE BUGS TO ATTACK
6AB8 CD1967     00260 ATTACK   CALL    RND             ;A=RND(256)-1
6ABB DDBE18     00270          CP      (IX+24)         ;COMPARE TO ATTACK
6ABE D8         00280          RET     NC              ;RETURN IF NOT ATTACK
6ABF CD1967     00290          CALL    RND             ;TEST AGAIN
6AC2 DDBE18     00300          CP      (IX+24)
6AC5 D8         00310          RET     NC              ;RETURN IF NOT ATTACK
6AC6 DD7E1F     00320          LD      A,(IX+31)       ;IF ADDING BUG 1
6AC9 DDB620     00330          OR      (IX+32)         ;  OR ADDING BUG 2
6ACC C8         00340          RET     NZ              ;THEN RETURN
6ACD CD1967     00350          CALL    RND
6AD0 E61F       00360          AND     1FH             ;BUG ATTACK?
6AD2 2824       00370          JR      Z,BUGATK        ;JUMP IF SO
6AD4 0610       00380          LD      B,16            ;MAX # OF BUGS
6AD6 FD21B963   00390          LD      IY,BUG3         ;IY==>BUG3
6ADA FD7E01     00400 LOOPA1   LD      A,(IY+1)        ;TEST MSB
6ADD B7         00410          OR      A
6ADE 280F       00420          JR      Z,SKIPA1        ;SKIP IF 0
6AE0 FD7E02     00430          LD      A,(IY+2)        ;GET DIRECTION
6AE3 FD36020A   00440          LD      (IY+2),10       ;STORE NEW DIRECTION
6AE7 FE08       00450          CP      8               ;OLD DIR = 8?
6AE9 C8         00460          RET     Z               ;RETURN IF SO
6AEA FD36020B   00470          LD      (IY+2),11       ;ELSE DIR = 11
6AEE C9         00480          RET
6AEF FD23       00490 SKIPA1   INC     IY              ;IY=IY+3
6AF1 FD23       00500          INC     IY
6AF3 FD23       00510          INC     IY
6AF5 10E3       00520          DJNZ    LOOPA1          ;LOOP UNTIL B=0
6AF7 C9         00530          RET
6AF8 0620       00540 BUGATK   LD      B,32            ;MAX # OF BUGS
6AFA FD215963   00550          LD      IY,BUG1         ;IY==>BUG 1 TABLE
6AFE FD7E01     00560 LOOPB1   LD      A,(IY+1)        ;TEST MSB
6B01 B7         00570          OR      A
6B02 2813       00580          JR      Z,SKIPB1        ;SKIP IF 0
6B04 FE3E       00590          CP      3EH             ;3CH OR 3DH?
6B06 300F       00600          JR      NC,SKIPB1       ;SKIP IF NOT
6B08 FD36020A   00610          LD      (IY+2),10       ;STORE NEW DIRECTION
6B0C CD1967     00620          CALL    RND             ;A=RND
6B0F E601       00630          AND     1               ;TEST BIT 0
6B11 C8         00640          RET     Z               ;RETURN IF NOT SET
6B12 FD36020B   00650          LD      (IY+2),11       ;ELSE NEW DIRECTION
6B16 C9         00660          RET
6B17 FD23       00670 SKIPB1   INC     IY              ;IY=IY+3
6B19 FD23       00680          INC     IY
6B1B FD23       00690          INC     IY
6B1D 10DF       00700          DJNZ    LOOPB1          ;LOOP
6B1F C9         00710          RET
```

*Listing 2 continued*

See List of Advertisers on Page 227

*Listing 2 continued*

```
                00720 ;**** TEST ROUTINE TESTS FOR HIGH SCORE
6B20 DD7E1B     00730 TEST      LD      A,(IX+27)       ;A=DELAY BETWEEN SHOTS
6B23 FE02       00740           CP      2               ;=2?
6B25 C0         00750           RET     NZ              ;RETURN IF NOT
6B26 115562     00760           LD      DE,SCORE+2      ;DE==>MSB OF SCORE
6B29 215162     00770           LD      HL,HIGH+2       ;HL==>MSB OF HIGH SCORE
6B2C 0603       00780           LD      B,3
6B2E 1A         00790 TEST10    LD      A,(DE)
6B2F BE         00800           CP      (HL)            ;COMPARE SCORES
6B30 D8         00810           RET     C               ;RETURN IF NOT HIGH SCORE
6B31 2004       00820           JR      NZ,TEST20       ;JUMP IF NOT EQUAL
6B33 1B         00830           DEC     DE              ;DECREMENT POINTERS
6B34 2B         00840           DEC     HL
6B35 10F7       00850           DJNZ    TEST10          ;LOOP UNTIL B=0
6B37 DD7E1C     00860 TEST20    LD      A,(IX+28)       ;GET HIGH SCORE FLAG
6B3A B7         00870           OR      A               ;0?
6B3B 2004       00880           JR      NZ,TEST30       ;SKIP IF NOT
6B3D DD361C10   00890           LD      (IX+28),10H     ;ELSE STORE HIGH FLAG
6B41 215362     00900 TEST30    LD      HL,SCORE        ;MOVE SCORE TO
6B44 114F62     00910           LD      DE,HIGH         ;  HIGH SCORE
6B47 010400     00920           LD      BC,4
6B4A EDB0       00930           LDIR
6B4C 214F62     00940           LD      HL,HIGH         ;DISPLAY HIGH SCORE
6B4F 113E3C     00950           LD      DE,3C1EH        ;DE==>VIDEO
6B52 CD0362     00960           CALL    DISSCR
6B55 C9         00970           RET
                00980 ;**** SOUND2 ROUTINE IS HIGH SCORE SOUND
6B56 DD7E03     00990 SOUND2    LD      A,(IX+3)        ;DOES TIME TO MOVE
6B59 FE01       01000           CP      1               ;  BASE=1?
6B5B C0         01010           RET     NZ              ;RETURN IF NOT
6B5C DD7E1C     01020           LD      A,(IX+28)       ;HIGH SCORE FLAG
6B5F B7         01030           OR      A               ;0?
6B60 C8         01040           RET     Z               ;RETURN IF SO
6B61 FE01       01050           CP      1               ;1?
6B63 C8         01060           RET     Z               ;RETURN IF SO
6B64 DD351C     01070           DEC     (IX+28)         ;ELSE DECREMENT
6B67 0E10       01080           LD      C,10H           ;DURATION=16
6B69 0660       01090 LOOP88    LD      B,60H           ;FREQUENCY=60
6B6B CD8A61     01100           CALL    SOUNDX          ;SOUND
6B6E 10FE       01110           DJNZ    $
6B70 0D         01120           DEC     C               ;LOOP UNTIL
6B71 20F6       01130           JR      NZ,LOOP88       ;  C=0
6B73 C9         01140           RET
                01150 ;**** TEST2 ROUTINE EXPLODES BASE IF HIT
6B74 DD7E1E     01160 TEST2     LD      A,(IX+30)       ;BASE HIT?
6B77 B7         01180           OR      A
6B78 C8         01190           RET     Z               ;RETURN IF NOT
6B79 DD7E19     01200           LD      A,(IX+25)       ;TIME TO EXPLOSION
6B7C FE01       01210           CP      1               ;=1?
6B7E C0         01220           RET     NZ              ;RET IF NOT
6B7F 0603       01230           LD      B,3             ;B=3
6B81 2A5762     01240           LD      HL,(BASE)       ;HL=BASE LOCATION
6B84 CD1967     01250 TEST22    CALL    RND             ;A=RND
6B87 E63F       01260           AND     3FH
6B89 F680       01270           OR      80H
6B8B 77         01280           LD      (HL),A          ;STORE RND GRAPHIC
6B8C CD8A61     01281           CALL    SOUNDX          ;SOUND
6B8F 23         01290           INC     HL              ;NEXT
6B90 10F2       01300           DJNZ    TEST22          ;LOOP
6B92 DD351E     01310           DEC     (IX+30)         ;DECREMENT COUNT
6B95 C0         01320           RET     NZ              ;RETURN IF COUNT > 0
6B96 DD3629@1   01330           LD      (IX+41),1       ;SET FLAG
6B9A C9         01340           RET
                01350 ;**** TEST3 ROUTINE TESTS FOR END OF LEVEL
6B9B DD7E1F     01360 TEST3     LD      A,(IX+31)       ;ADD BUG 1 FLAG
6B9E DDB620     01370           OR      (IX+32)         ;OR ADD BUG 2 FLAG
6BA1 C0         01380           RET     NZ
6BA2 DD7E11     01390           LD      A,(IX+17)       ;TEST IF SHOT JUST MOVED
6BA5 DDBE12     01400           CP      (IX+18)
6BA8 C0         01410           RET     NZ              ;RETURN IF NOT
6BA9 DD7E27     01420           LD      A,(IX+39)       ;LEVEL ALREADY DONE?
6BAC B7         01430           OR      A
6BAD 2009       01440           JR      Z,TEST3B        ;SKIP IF NOT
6BAF DD3527     01450           DEC     (IX+39)         ;ELSE DEC COUNTER
6BB2 C0         01460           RET     NZ
6BB3 DD362A01   01470           LD      (IX+42),1       ;SET FLAG
6BB7 C9         01480           RET
6BB8 CD3D67     01490 TEST3B    CALL    TEST3A          ;ANYTHING ON SCREEN
6BBB C0         01500           RET     NZ              ;RETURN IF SO
6BBC DD362710   01510           LD      (IX+39),10H     ;ELSE SET LEVEL DONE FLAG
6BC0 C9         01520           RET
                01530 ;**** TEST5 ROUTINE TESTS FOR BONUS
6BC1 3A5562     01540 TEST5     LD      A,(SCORE+2)     ;TEST FOR BONUS
6BC4 E6FE       01550           AND     0FEH            ;  EVERY 20,000 POINTS
6BC6 DDBE28     01560           CP      (IX+40)
6BC9 C8         01570           RET     Z               ;RETURN IF NOT
6BCA DD7728     01580           LD      (IX+40),A       ;SET BONUS COMPARE
6BCD 216865     01590           LD      HL,SHIPS        ;INC NUMBER OF BASES
6BD0 11B46A     01600           LD      DE,ONE
6BD3 CD3562     01610           CALL    INCSCR
6BD6 11063C     01620           LD      DE,3C06H        ;DISPLAY BASES LEFT
6BD9 216865     01630           LD      HL,SHIPS
6BDC CD0362     01640           CALL    DISSCR
6BDF DD362E30   01650           LD      (IX+46),30H     ;SET BONUS FLAG 2
6BE3 C9         01660           RET
                01670 ;**** SOUND3 ROUTINE IS BONUS SOUND
6BE4 DD7E2E     01680 SOUND3    LD      A,(IX+46)       ;BONUS REACHED?
6BE7 B7         01690           OR      A
6BE8 C8         01700           RET     Z               ;RETURN IF NOT
6BE9 DD7E2B     01710           LD      A,(IX+43)       ;GET BONUS FLAG 2
6BEC E6C8       01720           AND     0C8H            ;MASK SOME BITS
6BEE C48A61     01730           CALL    NZ,SOUNDX       ;SOUND IF A=0
6BF1 DD7E11     01740           LD      A,(IX+17)       ;TIME TO MOVE SHOT
6BF4 FE08       01750           CP      8               ;  < 8?
6BF6 D0         01760           RET     NC              ;RETURN IF NOT
6BF7 DD352E     01770           DEC     (IX+46)         ;ELSE DEC COUNTER
```

*Listing 2 continued on p. 109*

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*Listing 2 continued from p. 104*

```
6BFA C9        01780          RET                        ;AND RETURN
6BFB           01790 NEXT1    EQU     $
0000           01800          END
00000 TOTAL ERRORS
30096  TEXT AREA BYTES LEFT

ATTACK 6AB8 00260
BASE   6257 00200   01240
BUG1   6359 00120   00550
BUG2   6389 00130
BUG3   63B9 00140   00390
BUGATK 6AF8 00540   00370
DISSCR 6203 00180   00960 01640
HIGH   624F 00170   00770 00910 00940
INCSCR 6235 00240   01610
LOOP88 6B69 01090   01130
LOOPA1 6ADA 00400   00520
LOOPB1 6AFE 00560   00700
NEXT1  6BFB 01790
ONE    6AB4 00230   01600
RND    6719 00150   00260 00290 00350 00620 01250
SCORE  6253 00160   00760 00900 01540
SHIPS  6568 00220   01590 01630
SKIPA1 6AEF 00490   00420
SKIPB1 6B17 00670   00580 00600
SOUND2 6B56 00990
SOUND3 6BE4 01680
SOUNDX 618A 00190   01100 01281 01730
TEST   6E20 00730
TEST10 6B2E 00790   00850
TEST2  6B74 01160
TEST20 6B37 00860   00820
TEST22 6B84 01250   01300
TEST3  6B9B 01360
TEST30 6B41 00900   00880
TEST3A 673D 00210   01490
TEST3B 6BB8 01490   01440
TEST5  6BC1 01540
```

*Program Listing 3. MAIN4, this month's main program.*

```
               00100 ;***** MAIN PROGRAM
               00110 ;      VERSION 4
6DDD           00120          ORG     6DDDH
65C0           00130 ADD1     EQU     65C0H
663A           00140 ADD2     EQU     663AH
66B4           00150 ADD3     EQU     66B4H
6BFB           00160 ADDBMB   EQU     6BFBH
6AB8           00170 ATTACK   EQU     6AB8H
6463           00180 BASEM    EQU     6463H
63EB           00190 BOMBS    EQU     63EBH
69E9           00200 BOOM     EQU     69E9H
6359           00210 BUG1     EQU     6359H
6389           00220 BUG2     EQU     6389H
63B9           00230 BUG3     EQU     63B9H
6203           00240 DISSCR   EQU     6203H
690D           00250 DRAW     EQU     690DH
6590           00260 EXPTAB   EQU     6590H
624F           00270 HIGH     EQU     624FH
6235           00280 INCSCR   EQU     6235H
62D9           00290 INIT     EQU     62D9H
61BC           00300 INTRO    EQU     61BCH
6A50           00310 LEVEL    EQU     6A50H
6AA4           00320 LEVTAB   EQU     6AA4H
640D           00330 MBASE    EQU     640DH
6C57           00340 NBOMB    EQU     6C57H
656C           00350 MINUS1   EQU     656CH
695D           00360 MOVEB1   EQU     695DH
6970           00370 MOVEB2   EQU     6970H
6983           00380 MOVEB3   EQU     6983H
6494           00390 MSHOT    EQU     6494H
6AB4           00400 ONE      EQU     6AB4H
6259           00410 PARAMS   EQU     6259H
6253           00420 SCORE    EQU     6253H
6568           00430 SHIPS    EQU     6568H
63E9           00440 SHOT     EQU     63E9H
6487           00450 SOUND1   EQU     6487H
6B56           00460 SOUND2   EQU     6B56H
6BE4           00470 SOUND3   EQU     6BE4H
6CAB           00480 SOUND4   EQU     6CABH
618A           00490 SOUNDX   EQU     618AH
640B           00500 TEMPW    EQU     640BH
6B20           00510 TEST     EQU     6B20H
6B74           00520 TEST2    EQU     6B74H
6B9B           00530 TEST3    EQU     6B9BH
6BC1           00540 TEST5    EQU     6BC1H
6CB6           00550 TEST6    EQU     6CB6H
64DF           00560 TEST7    EQU     64DFH
6CCD           00570 FLASH    EQU     6CCDH
6CF4           00580 SOUND1   EQU     6CF4H
6D1B           00590 START    EQU     6D1BH
               00600 ;***** ENTRY POINT
6DDD CDBC61    00610 ENTRY    CALL    INTRO          ;INTRODUCTION
6DE0 21D962    00620 GAME     LD      HL,INIT        ;INITIALIZE PARAMETERS
6DE3 115962    00630          LD      DE,PARAMS
6DE6 017F00    00640          LD      BC,127
6DE9 EDB0      00650          LDIR
6DEB 210000    00660          LD      HL,0
6DEE 22506A    00670          LD      (LEVEL),HL     ;LEVEL = 0
6DF1 22526A    00680          LD      (LEVEL+2),HL
6DF4 225362    00690          LD      (SCORE),HL     ;SCORE = 0
6DF7 225562    00700          LD      (SCORE+2),HL
6DFA 226A65    00710          LD      (SHIPS+2),HL
6DFD 210500    00720          LD      HL,5
6E00 226865    00730          LD      (SHIPS),HL     ;BASES = 5
6E03 DD215962  00740          LD      IX,PARAMS      ;IX==>PARAMETER TABLE
6E07 110000    00750          LD      DE,0
6E0A CD6364    00760          CALL    BASEM          ;DISPLAY BASE
6E0D 11003C    00770          LD      DE,3C00H
6E10 215362    00780          LD      HL,SCORE
6E13 CD0362    00790          CALL    DISSCR         ;DISPLAY SCORE
6E16 11063C    00800          LD      DE,3C06H
6E19 216865    00810          LD      HL,SHIPS
6E1C CD0362    00820          CALL    DISSCR         ;DISPLAY BASES LEFT
6E1F 111E3C    00830          LD      DE,3C1EH
6E22 214F62    00840          LD      HL,HIGH
6E25 CD0362    00850          CALL    DISSCR         ;DISPLAY HIGH SCORE
6E28 DD7E06    00860          LD      A,(IX+6)       ;STORE SPEEDS
6E2B DD7721    00870          LD      (IX+33),A
6E2E DD7E08    00880          LD      A,(IX+8)
6E31 DD7722    00890          LD      (IX+34),A
6E34 DD363000  00900          LD      (IX+48),0      ;NEW LEVEL FLAG
6E38 215963    00910 NEXT     LD      HL,BUG1        ;CLEAR BUG TABLE
6E3B 115A63    00920          LD      DE,BUG1+1
6E3E 018F00    00930          LD      BC,48+48+48-1
6E41 3600      00940          LD      (HL),0
6E43 EDB0      00950          LDIR
6E45 219065    00960          LD      HL,EXPTAB      ;CLEAR EXPLOSION TABLE
6E48 119165    00970          LD      DE,EXPTAB+1
6E4B 012F00    00980          LD      BC,47
6E4E 3600      00990          LD      (HL),0
6E50 EDB0      01000          LDIR
6E52 21EB63    01010          LD      HL,BOMBS       ;CLEAR BOMBS TABLE
6E55 11EC63    01020          LD      DE,BOMBS+1
6E58 011F00    01030          LD      BC,31
6E5B 3600      01040          LD      (HL),0
6E5D EDB0      01050          LDIR
6E5F 210000    01060          LD      HL,0
6E62 22E963    01070          LD      (SHOT),HL      ;CLEAR SHOT LOCATION
6E65 220B64    01080          LD      (TEMPW),HL
6E68 DD362900  01090          LD      (IX+41),0      ;RESET FLAGS
6E6C DD362A00  01100          LD      (IX+42),0
```

*Listing 3 continued*

*Listing 3 continued*

```
                01110 ;         LD      (IX+31),0
                01120 ;         LD      (IX+32),0
     6E7B DD362F00 01130        LD      (IX+47),0
     6E7F DD7E21   01140        LD      A,(IX+33)       ;RESTORE SPEEDS
     6E82 DD7706   01150        LD      (IX+6),A
     6E85 DD7E22   01160        LD      A,(IX+34)
     6E88 DD7708   01170        LD      (IX+8),A
                01180 ;         CALL    FLASH           ;FLASH AND CLS
                01190 ;         CALL    SOUND1          ;SOUND AND INC LEVEL
                01200 ;         CALL    START           ;INITIALIZE
     6E8B 0610     01210 LOOPMN  LD      B,16    ;***** B=16 FOR MAIN 3 & 4 ONLY
     6E8D C5       01220 LOOPX0  PUSH    BC
     6E8E CD5D69   01230         CALL    MOVEB1
     6E91 CD7069   01240         CALL    MOVEB2
     6E94 CD8369   01250         CALL    MOVEB3
     6E97 CD0D69   01260         CALL    DRAW
     6E9A CD3C6F   01270         CALL    TEST8
                01280 ;         CALL    MBOMB
     6E9D DD7E1E   01290         LD      A,(IX+30)       ;BASE HIT?
     6EA0 B7       01300         OR      A
     6EA1 CC0D64   01310         CALL    Z,MBASE         ;MOVE IT IF NOT
                01320 ;         CALL    ADDBMB
                01330 ;         CALL    SOUND4
     6EA4 CD9464   01340         CALL    MSHOT
     6EA7 CD8764   01350         CALL    SOUND1
     6EAA CD206B   01360         CALL    TEST
     6EAD CD566B   01370         CALL    SOUND2
     6EB0 CDE969   01380         CALL    BOOM
     6EB3 CD746B   01390         CALL    TEST2
     6EB6 CD9B6B   01400         CALL    TEST3
     6EB9 CDE46B   01410         CALL    SOUND3
     6EBC CDC16B   01420         CALL    TEST5
                01430 ;         CALL    TEST6
     6EBF C1       01440         POP     BC
     6EC0 DD7E2A   01450         LD      A,(IX+42)       ;NEXT LEVEL?
     6EC3 B7       01460         OR      A
     6EC4 C2386E   01470         JP      NZ,NEXT
     6EC7 DD7E29   01480         LD      A,(IX+41)
     6ECA B7       01490         OR      A
     6ECB C2DE6E   01500         JP      NZ,CONT         ;JP IF BASE HIT
     6ECE 10BD     01510         DJNZ    LOOPX0
     6ED0 CDB86A   01520         CALL    ATTACK
     6ED3 DD342B   01530         INC     (IX+43)
     6ED6 CDC065   01540         CALL    ADD1
     6ED9 CD3A66   01550         CALL    ADD2
     6EDC CDB466   01560         CALL    ADD3
     6EDF 3A0438   01570         LD      A,(3804H)       ;CHECK FOR 'P'
     6EE2 E601     01580         AND     1
     6EE4 C44D6F   01590         CALL    NZ,PAUSE        ;PAUSE IF SO
     6EE7 18A2     01600         JR      LOOPMN          ;LOOP
     6EE9 DD3523   01610 CONT    DEC     (IX+35)         ;DECREMENT LEVEL
     6EEC DD363001 01620         LD      (IX+48),1       ;SET FLAG
     6EF0 216865   01630         LD      HL,SHIPS        ;TEST IF 0 LEFT
     6EF3 0603     01640         LD      B,3
     6EF5 AF       01650         XOR     A
     6EF6 B6       01660 CONT10  OR      (HL)            ;OR # SHIPS
     6EF7 23       01670         INC     HL
     6EF8 10FC     01680         DJNZ    CONT10          ;LOOP UNTIL B=0
     6EFA C2386E   01690         JP      NZ,NEXT         ;JP IF NOT GAME OVER
     6EFD 216770   01700         LD      HL,MESS10       ;DISPLAY MESSAGE
     6F00 119B3C   01710         LD      DE,3CA0H-5
     6F03 010B00   01720         LD      BC,11
     6F06 EDB0     01730         LDIR
     6F08 213170   01740         LD      HL,MESS20       ;DISPLAY SECOND LINE
     6F0B 11D33C   01750         LD      DE,3CE0H-13
     6F0E 011D00   01760         LD      BC,29
     6F11 EDB0     01770         LDIR
     6F13 1E0A     01780         LD      E,0AH           ;SOUND
     6F15 0E10     01790 OVER05  LD      C,10H
     6F17 0640     01800 OVER10  LD      B,40H
     6F19 C5       01810 OVER20  PUSH    BC
     6F1A 10FE     01820         DJNZ    $
     6F1C C1       01830         POP     BC
     6F1D CD8A61   01840         CALL    SOUNDX
     6F20 10F7     01850         DJNZ    OVER20
     6F22 0D       01860         DEC     C
     6F23 20F2     01870         JR      NZ,OVER10
     6F25 010003   01880         LD      BC,300H
     6F28 CD6000   01890         CALL    60H
     6F2B 1D       01900         DEC     E
     6F2C 20E7     01910         JR      NZ,OVER05
     6F2E 3A4038   01920 OVER30  LD      A,(3840H)
     6F31 10FE     01930         DJNZ    $
     6F33 E602     01940         AND     2
     6F35 28F7     01950         JR      Z,OVER30        ;LOOP UNTIL <CLEAR>
     6F37 21003C   01960         LD      HL,3C00H        ;CLEAR SCREEN
     6F3A 11013C   01970         LD      DE,3C01H
     6F3D 3680     01980         LD      (HL),128
     6F3F 01FF03   01990         LD      BC,1023
     6F42 EDB0     02000         LDIR
     6F44 C3E06D   02010         JP      GAME            ;DO IT
     6F47 DD7E2F   02020 TEST8   LD      A,(IX+47)       ;BUG HIT?
     6F4A B7       02030         OR      A
     6F4B C8       02040         RET     Z               ;RETURN IF NOT
     6F4C DD362F00 02050         LD      (IX+47),0       ;RESET FLAG
     6F50 3A0C64   02060         LD      A,(TEMPW+1)     ;SHOT FIRED?
     6F53 B7       02070         OR      A
     6F54 C8       02080         RET     Z               ;RETURN IF NOT
     6F55 C3DF64   02090         JP      TEST7           ;BUG HIT SUB
     6F58 1E20     02100 PAUSE   LD      E,20H
     6F5A 0E40     02110 PAUSEA  LD      C,40H           ;SOUND
     6F5C 43       02120 PAUSEB  LD      B,E
     6F5D CD8A61   02130         CALL    SOUNDX
     6F60 10FE     02140         DJNZ    $
     6F62 0D       02150         DEC     C
     6F63 20F7     02160         JR      NZ,PAUSEB
     6F65 43       02170         LD      B,E
     6F66 10FE     02180         DJNZ    $
     6F68 1D       02190         DEC     E
     6F69 20EF     02200         JR      NZ,PAUSEA
     6F6B 21803C   02210         LD      HL,3C80H        ;STORE LINE
     6F6E 11A76F   02220         LD      DE,BUFFER
     6F71 014000   02230         LD      BC,64
     6F74 EDB0     02240         LDIR
     6F76 21E76F   02250         LD      HL,MESS         ;DISPLAY MESSAGE
     6F79 11803C   02260         LD      DE,3C80H
     6F7C 014000   02270         LD      BC,64
     6F7F EDB0     02280         LDIR
     6F81 3A4038   02290 PAUSE1  LD      A,(3840H)
     6F84 10FE     02300         DJNZ    $
     6F86 E602     02310         AND     2
     6F88 28F7     02320         JR      Z,PAUSE1        ;LOOP UNTIL <CLEAR>
     6F8A 21A76F   02330         LD      HL,BUFFER       ;RESTORE LINE
     6F8D 11803C   02340         LD      DE,3C80H
     6F90 014000   02350         LD      BC,64
     6F93 EDB0     02360         LDIR
     6F95 010020   02370         LD      BC,2000H        ;DELAY
     6F98 CD6000   02380         CALL    60H
     6F9B 1E20     02390         LD      E,20H           ;MORE SOUND
     6F9D 0E20     02400 PAUSE2  LD      C,20H
     6F9F 7B       02410 PAUSE3  LD      A,E
     6FA0 ED44     02420         NEG
     6FA2 47       02430         LD      B,A
     6FA3 CD8A61   02440         CALL    SOUNDX
     6FA6 10FE     02450         DJNZ    $
     6FA8 0D       02460         DEC     C
     6FA9 20F4     02470         JR      NZ,PAUSE3
     6FAB 43       02480         LD      B,E
     6FAC 10FE     02490         DJNZ    $
     6FAE 1D       02500         DEC     E
     6FAF 20EC     02510         JR      NZ,PAUSE2
     6FB1 C9       02520         RET
     0040          02530 BUFFER  DEFS    64
     6FF2 2A       02540 MESS    DEFM    '* * * * * * * * PAUSE --- Press <CLEAR> to pl
ay * * * * * * * *'
     7026 20       02550 MESS10  DEFM    ' GAME OVER '
     7031 20       02560 MESS20  DEFM    ' Press <CLEAR> to play again '
     6DDD          02570         END     ENTRY
```

*Listing 3 continued*

```
00000 TOTAL ERRORS
29350 TEXT AREA BYTES LEFT

ADD1      65C8 00130  01540
ADD2      663A 00140  01550
ADD3      66B4 00150  01560
ADDBMB    6BFB 00160
ATTACK    6AB8 00170  01520
BASEM     6463 00180  00760
BOMBS     63EB 00190  01010 01020
BOOM      6959 00200  01380
BUFFER    6FA7 02530  02220 02330
BUG1      6359 00210  00910 00920
BUG2      6389 00220
BUG3      63B9 00230
CONT      6EDE 01610  01500
CONT10    6EEB 01660  01680 00790 00820 00850
DISSCR    6203 00240  01260
DRAW      690D 00250  02570
ENTRY     6DDD 00610  00960 00970
EXPTAB    6590 00260
FLASH     6CCD 00570  02010
GAME      6DE0 00620  00840
HIGH      624F 00270
INCSCR    6235 00280
INIT      62D9 00290  00620
INTRO     61BC 00300  00610
LEVEL     6A50 00310  00670 00680
LEVTAB    6AA4 00320
LOOPMN    6E80 01210  01600
LOOPX0    6E82 01220  01510
MBASE     640D 00330  01310
MBOMB     6C57 00340
MESS      6FE7 02540  02250
MESS10    7026 02550  01700
MESS20    7031 02560  01740
MINUS1    656C 00350
MOVEB1    695D 00360  01230
MOVEB2    6970 00370  01240
MOVEB3    6983 00380  01250
MSHOT     6494 00390  01340
NEXT      6E38 00910  01470 01690
ONE       6AB4 00400
OVER05    6F0A 01790  01910
OVER10    6F0C 01800  01870
OVER20    6F0E 01810  01850
OVER30    6F23 01920  01950
PARAMS    6259 00410  00630 00740
PAUSE     6F4D 02100  01590
PAUSE1    6F76 02290  02320
PAUSE2    6F92 02400  02510
PAUSE3    6F94 02410  02470
PAUSEA    6F4F 02110  02200
PAUSEB    6F51 02120  02160
SCORE     6253 00420  00690 00700 00780
SHIPS     6568 00430  00710 00730 00810 01630
SHOT      63B9 00440  01070
SOUND1    6487 00450  01350
SOUND2    6B56 00460  01370
SOUND3    6BE4 00470  01410
SOUND4    6CAB 00480
SOUNDI    6CF4 00580
SOUNDX    618A 00490  01840 02130 02440
START     6D1B 00590
TEMPW     640B 00500  01680 02060
TEST      6B20 00510  01360
TEST2     6B74 00520  01390
TEST3     6B9B 00530  01400
TEST5     6BC1 00540  01420
TEST6     6CB6 00550
TEST7     64DF 00560  02090
TEST8     6F3C 02020  01270
```

*Listing 3 continued*

# OMNITERM COMMUNICATIONS

## Award Winning Software!


Reader's Choice Awards
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**80 Micro Jan, 1984**


Top Rated
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"OMNITERM is a beautifully designed program..."
**Software Review March, 1983**

"It has become the standard for TRS-80 terminal software."
**80 Micro June/July, 1982**

"The documentation is excellent."
**80 Microcomputing April, 1982**

"OMNITERM [is] a contender for the title of best in its class."
**Byte Feb, 1982**

"I have to applaud the craftsmanship evident in the OMNITERM package."
**Infoworld Oct, 1981**

"OMNITERM has my vote as the top TRS-80 program available today."
**Microcomputing June, 1981**

**OMNITERM, the professional communications package, has been winning top ratings from reviewers and users since 1981. We think we know why.**

**SMART TERMINAL EMULATION AND FILE TRANSFER**
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.

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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 |
|---|---|---|---|

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

See your dealer or call Lindbergh Systems,
49 Beechmont Street, Worcester, MA 01609, Telephone:
(617) 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.

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# Double Vision

## Customize your Basic or machine-language programs with split-screen displays.

Split-screen displays are an effective addition to just about any program. For instance, you can use a split screen in games to provide space at the bottom of the screen for input while the main display appears at the top of the screen. Some terminal programs display serial input on the top half of the screen and keyboard input (which becomes the serial output) on the bottom.

I'll describe how to write split-screen routines you can use in either Basic or machine-language Model I or III programs. I'll also give you some general routines you can incorporate into your programs.

### Video Memory

Model I/III video memory is much like the rest of RAM—programs can read from and write to it. In addition, the computer's video refresh circuitry reads video memory periodically and converts its contents to the dot-matrix images you see on the screen. For convenience, you can imagine the screen as being loaded with a character each time we load a character anywhere in video memory.

The video memory addresses and their corresponding locations on the screen are shown in Table 1. The first location on the screen is column zero, line zero (the top left corner) and the video memory address is 3C00 hexadecimal (hex); the last location on the screen is column 63, line 15 (the bottom right corner) and the video memory address is 3FFF hex. We can verify this quickly by typing the following two direct commands from the keyboard:

```
POKE 15360,65
POKE 16383,90
```

The number 15360 is the decimal value of 3C00 hex, 16383 is the decimal value of 3FFF hex, 65 is the decimal value for the ASCII character A, and 92 for the character Z. The two commands load the character A to the first screen location and the character Z to the last screen location.

### Scrolling

The screen supports various kinds of scrolling, but typically scrolling on the TRS-80 means that when the bottom line of the screen is filled the contents of each line are moved to the line above, with the top line moving off the screen and a new blank line brought in on the bottom. The effect is much the same as that on a typewriter—when you type a carriage return, the page moves up one line and the typewriter prints new characters on a blank line.

### Block Move Instruction

The Z80 instruction set contains an instruction that makes the scrolling operation described above very simple. The instruction is the LDIR (load, increment, and repeat). If you load register pair DE with the destination address, register pair HL with the source address, and register pair BC with #Bytes, the LDIR instruction moves a block of #Bytes starting at the source address to a block starting at the destination address.

The four lines of Z80 code shown here accomplish the move part of the scrolling operation:

```
1  LD    DE,3C00H
2  LD    HL,3C40H
3  LD    BC,03C0H
4  LDIR
```

Lines 1–3 initialize the move and line 4 gives the block move instruction. In this case, the instructions load the destination address as 3C00 hex, the first location in video memory. They load the source address as 3C40 hex, the first column of the second line. Then the instructions load the number of bytes they move as 3C0 hex, which is 960 decimal (15 lines times 64 columns per line). Because the 15 lines occupy an unbroken block of locations in video memory, the code shown is all that's required for the move part of the scroll operation. You can complete the scroll by writing blanks to the bottom line on the screen.

### Clear Screen

A simple subroutine to clear any consecutive block of memory is shown below:

```
1  CLRSCR  LD    A,D
2          LD    (HL),A
3          INC   HL
4          DEC   BC
5          LD    A,B
6          OR    C
7          JR    NZ,CLRSCR
8          RET
```

The entry conditions for the routine are: Register pair HL contains the starting address of the block you want to clear, register pair BC contains the number of bytes you want to clear, and register D contains the ASCII space (blank) character. The subroutine loads the contents of register D to the memory block so we

*The Key Box*

LOAD 80

**Models I and III**
**32K RAM**
**Assembly Language**

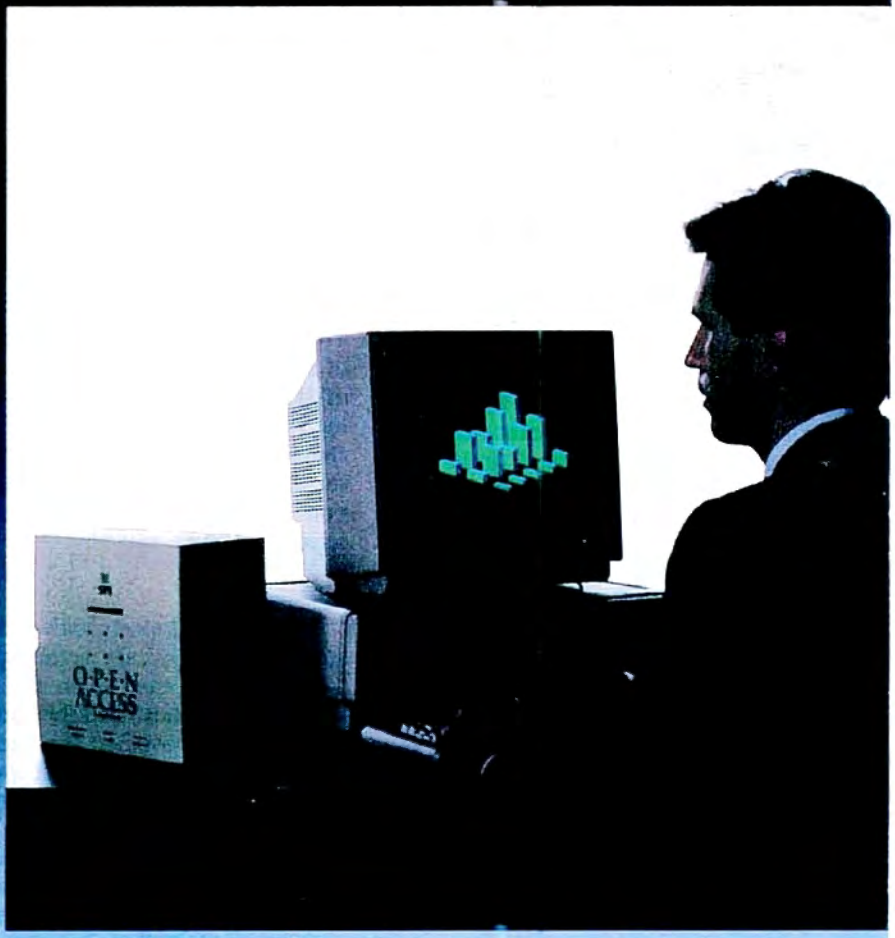
# It Reads, Writes and It Paints in 3-D, Keeps and Talks to

It's called "OPEN ACCESS," and it's the result of 60 man-years of effort to create a truly do-it-all, super-program—one that can perform virtually every task you're ever likely to encounter.

The beauty of it is, all that capability resides on a single program. You don't have to re-enter data. Or spend time trying to get unmatched programs to work together.

OPEN ACCESS takes its name from the source of its power—a relational data-base manager that gives you access to more data in more ways than any comparable software.

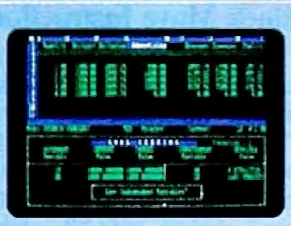
OPEN ACCESS includes an electronic spreadsheet, 3-D graphics, word processor, appointment scheduler and telecommunications module—all revolving around the powerful information manager.




1

**INFORMATION MANAGEMENT—THE MASTERMIND.** This advanced data-base manager stores and retrieves multiple files quickly, easily and reliably. What's more, it shares all information with the other programs, so you never have to re-enter the same data twice.

2



**ELECTRONIC SPREADSHEET—NUMBER CRUNCHING AND GOAL SEEKING.** It helps you produce forecasts, cost estimates and "break-even" points—in seconds, instead of hours or days. Best of all, it allows "goal seeking." Ask, for example, "What sales must I have the rest of the year to net $1 million?," and OPEN ACCESS will figure it out!

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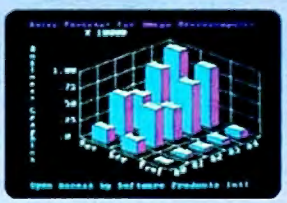

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# does Arithmetic. Your Appointments the World.

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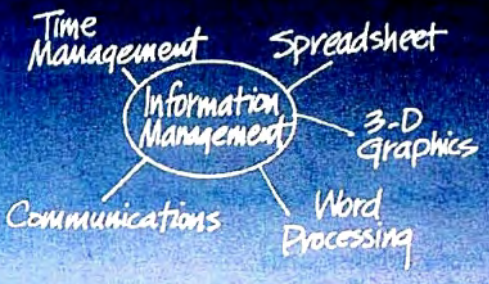


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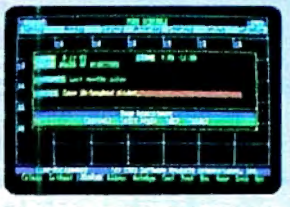

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| Video Memory Address | | Screen Location |
|---|---|---|
| Decimal | Hexadecimal | Line,Column |
| 15360 | 3C00 | 0,0 |
| 15424 | 3C40 | 1,0 |
| 15488 | 3C80 | 2,0 |
| 15552 | 3CC0 | 3,0 |
| 15616 | 3D00 | 4,0 |
| 15680 | 3D40 | 5,0 |
| 15744 | 3D80 | 6,0 |
| 15808 | 3DC0 | 7,0 |
| 15872 | 3E00 | 8,0 |
| 15936 | 3E40 | 9,0 |
| 16000 | 3E80 | 10,0 |
| 16064 | 3EC0 | 11,0 |
| 16128 | 3F00 | 12,0 |
| 16192 | 3F40 | 13,0 |
| 16256 | 3F80 | 14,0 |
| 16320 | 3FC0 | 15,0 |

*Table 1. Video memory/screen location map.*

```
WRTSCR
  IF CHAR=FF THEN GOTO FORMFEED FUNCTION
  IF CHAR=CR THEN GOTO LINEFEED FUNCTION
  IF CHAR=LF THEN GOTO LINEFEED FUNCTION
  IF CHAR=BKSPC THEN GOTO BACKSPACE FUNCTION
  IF CHAR NOT DISPLAYABLE THEN SET CHAR=PERIOD
  DISPLAY CHARACTER
  RETURN
FORMFEED FUNCTION
  CLEAR SCREEN
  DISPLAY CURSOR
  RETURN
LINEFEED FUNCTION
  MOVE CURSOR TO START OF NEXT LINE AND DISPLAY
  RETURN
BACKSPACE FUNCTION
  DISPLAY SPACE AT CURSOR POSITION
  MOVE CURSOR LEFT ONE POSITION AND DISPLAY
  RETURN
```

*Figure 1. Top-level program.*

*Figure 2. Second-level program.*

```
DISPLAY CHARACTER
  LOAD CHARACTER TO CURRENT POSITION
  INCREMENT COLUMN COUNTER
  IF COLUMN COUNTER=OR < END COLUMN
      THEN GOTO LDCURSOR
  SET COLUMN COUNTER=START COLUMN
  INCREMENT LINE COUNTER
  IF LINE COUNTER=OR < END LINE
      THEN GOTO LDCURSOR
  SCROLL SCREEN UP ONE LINE
  CLEAR BOTTOM LINE
  SET LINE COUNTER=END LINE
  GOTO LDCURSOR
LINEFEED FUNCTION
  INCREMENT LINE COUNTER
  IF LINE COUNTER > END LINE THEN GOTO LDCURSOR
  SCROLL SCREEN UP ONE LINE
  CLEAR BOTTOM LINE
  SET LINE COUNTER=END LINE
  GOTO LDCURSOR
```

*Figure 2 continued*

can actually write any character to the entire screen, or any part of it.

Line 1 moves the contents of register D to register A. Line 2 writes the contents of register A to the memory location whose address is in register pair HL. Line 3 increments the contents of register pair HL to point to the next higher memory address. Line 4 decrements the contents of register pair BC by one to indicate the number of bytes left to load. At lines 5 and 6 you want to test BC to see if it's zero, indicating all characters are loaded. Decrementing BC doesn't set the Z flag, so we load register A with B and then OR C, which sets the Z flag if BC equals 0. Line 7 holds the actual test. If the Z flag isn't set, go back to line 1 and do it again. If the Z flag is set, the operation is over, so go on to line 8. Line 8 returns to the program at the point just after this subroutine was called.

A sample calling sequence for the subroutine is:

```
LD    BC,1024
LD    HL,3C00H
LD    D,' '
CALL CLRSCR
```

When called from this code the subroutine clears all of the screen. If we only want to clear the bottom line of the screen to complete the scrolling operation, the calling sequence should be:

```
LD    BC,64
LD    HL,15360+960
LD    D,' '
CALL CLRSCR
```

When called from this code, CLRSCR loads 64 spaces to video memory starting at address 15360+960=16320, the first column of the bottom line of the screen. In both examples I used both hexadecimal and decimal values. Since the assembler accepts either notation you can avoid conversion from one to the other as you write the program.

The assembler can also do simple arithmetic; the expression 15360+960 produced the address of the first column of the bottom line of the screen. (With a more powerful assembler I could make it even easier by using the expression 3C00 hex+(15*64). This tells the assembler to calculate the desired address as the sum of the first location of the screen, 3C00 hex, and the product of the number of lines and the number of columns per line.)

Also note that in some assemblers we can use the notation 'x' to represent the

*Figure 2 continued*

```
BACKSPACE FUNCTION
  IF COLUMN COUNTER=START COLUMN THEN GOTO LDCURSOR
  DISPLAY BLANK AT CURRENT POSITION
  DECREMENT COLUMN COUNTER
  GOTO LDCURSOR

FORMFEED FUNCTION
  CLEAR SCREEN
  SET COLUMN COUNTER=START COLUMN
  SET LINE COUNTER=START LINE
  GOTO LDCURSOR

LDCURSOR
  DISPLAY CURSOR AT CURRENT POSITION
  RETURN
```

*Hiding details to provide a simpler interface to the next higher level is a common theme in computer software.*

value of any ASCII character X. For instance, ' ' (single quote, space, single quote) converts to 20 hex. If your assembler doesn't allow this you'll have to provide the value 20 hex.

## Writing to the Screen

One of the primary reasons for having utility subroutines is to isolate the main program from the nitty-gritty details of the operation. When a main program wants the text to begin on the next line it shouldn't have to calculate the memory address of the next line; it should simply pass a carriage return (CR) character to the screen write routine, which then writes any following characters starting at the beginning of the next line.

This notion of hiding details to provide a simpler interface to the next higher level is a common theme throughout computer software (and hardware). For instance, Assembly language hides some of the details of computer operation to provide a simpler interface to the programmer, just as Basic hides some of the details of Assembly language to provide a simpler interface to the programmer.

Some personal bias and judgment is involved in selecting which details to hide and what interface to provide to the higher level. I prefer that the interface be a single subroutine with a small set of control codes passed to the subroutine, in lieu of displayable characters, to activate the control functions.

The control codes I include are: form feed (FF), carriage return (CR), line feed (LF), and backspace (BKSPC). The subroutine, called WRTSCR, provides automatic line feed at the end of a line and automatic scrolling at the bottom line. The program displays a cursor character on the screen at the position where the next displayable character goes. A character received by WRTSCR that is not a displayable character and not one of the four defined control codes is converted to a period character before the program displays it.

When the program receives an FF control code, WRTSCR clears the screen and displays the cursor symbol at the top left position on the screen. Either a CR or an LF moves the cursor to the beginning of the next line. If the cursor is currently on the bottom line an automatic scroll occurs. A BKSPC code puts a space at the current cursor position and moves the cursor left one position, overwriting the character at that position. The program ignores BKSPC when the cursor is at the beginning of a line.

You can start your program design by writing a description of program flow using a combination of high-level language statements and English text as shown in Fig. 1. Using statements similar to Basic instructions may ease the transition from writing Basic programs to writing Z80 programs. If we now replace the statements with Z80 language instructions, adding some necessary detail, we'll arrive at a subroutine for writing to the screen. Consider some of the differences that may be necessary to deal with split screens and write a more general subroutine that handles both full and split screens.

## Split Screen

Consider the case of splitting the

| Line Number | Function |
|---|---|
| 100–310 | Heading |
| 320 | Origin setting |
| 350–430 | Program constants definitions |
| 440–490 | Program variables definitions |
| 500–1290 | Main program |
| 1300–2450 | Program subroutines |

*Figure 3. Program map.*

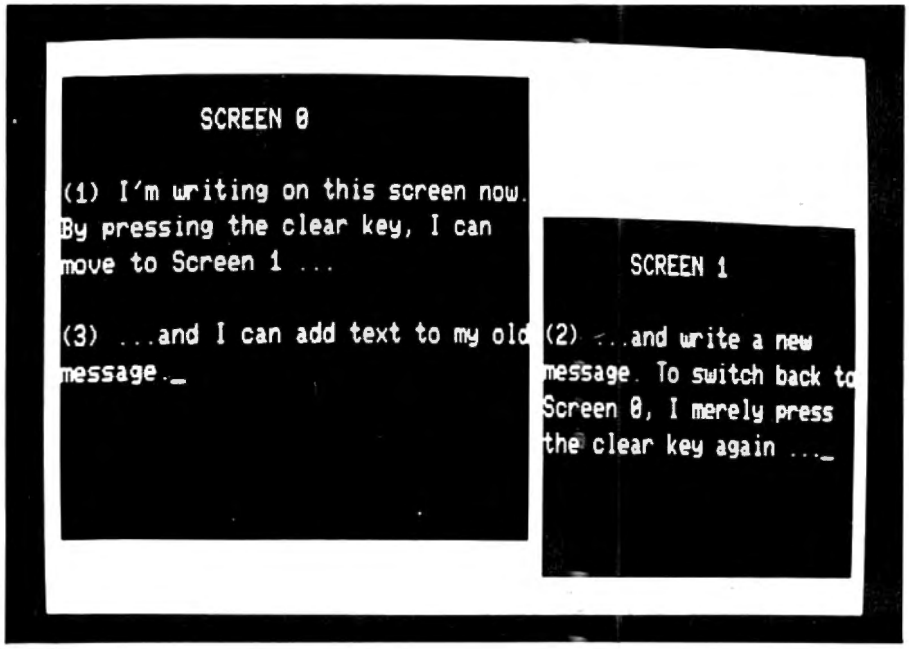


*Photo. Sample split-screen routine in action.*

screen vertically in half. Lines of the left screen consist of columns 0–31 and lines of the right screen consist of columns 32–63. The first 32 bytes of your video memory make up line zero of left screen, the next 32 bytes line zero of right screen, the next 32 bytes line 1 of left screen, and so on. Because the lines for a screen are no longer adjacent in video memory, you no longer get an automatic line feed at the end of a line, and you won't be able to scroll with a single block move.

This means you'll test for the end of line as the computer generates each character and update the cursor position to the next line when the program reaches the end of a line. When scrolling, you'll have to move each line independently rather than en masse as in the single-screen case. A convenient way to manage the subroutine is to use a process control block containing the current column number, the starting column number, and the ending column number.

As you consider other possible split-screen arrangements, it becomes apparent that you also need the current line number, the starting line number, and the ending line number.

Adding more detail and incorporating the line and column counters and their end points leads us to the second-level program shown in Fig. 2. Anyplace I didn't want to get bogged down in detail I simply used a descriptive phrase for the function. On more elaborate programs you might have several more layers of increasing detail before finally getting to a Z80 language program. That won't be necessary for this simple program. If this is your first try at Z80 programming you may want to type these statements as comments in your program and fill in between them with Z80 instructions.

If you maintain a separate process control block for each screen and tell the subroutine which screen you're using each time you call it, you can use the same subroutine for any number of screens. The only restrictions on screens are that they must be rectangles, and they may not overlap.

## Write Screen Program

The structure of a program is important for several reasons: It makes the task of writing the program a lot smoother than a disorganized approach, and it makes the job of understanding the program much easier for someone else (or for yourself later on). An outline of the structure of the Write

*Program Listing 1. Write Screen program.*

```
                00100 ;*********************************************
                00110 ;
                00120 ;SPLIT SCREEN SUBROUTINE
                00130 ;    HUGH COTTLE   NOVEMBER 1981
                00140 ;*********************************************
                00150 ;
                00160 ;LEVEL II AND MODEL III TRS-80
                00170 ;
                00180 ;ENTER WITH CHARACTER TO BE DISPLAYED OR A SCREEN
                00190 ;CONTROL CHARACTER IN REGISTER A. REGISTERS WILL BE
                00200 ;SAVED AND RESTORED ON RETURN.
                00210 ;REGISTER IX POINTS TO PROCESS CONTROL BLOCK:
                00220 ;          IX+0 = COLUMN COUNTER
                00230 ;          IX+1 = START COLUMN
                00240 ;          IX+2 = END COLUMN
                00250 ;          IX+3 = LINE COUNTER
                00260 ;          IX+4 = START LINE
                00270 ;          IX+5 = END LINE
                00280 ;CONTROL CODES ARE: CR  LF  FF   BKSPC
                00290 ;DISPLAYABLE CHARACTERS ARE: UPPER AND LOWER CASE ASCII
                00300 ;AND THE TRS-80 GRAPHIC CHARACTERS.
                00310 ;NON-DISPLAYABLE CHARACTERS ARE DISPLAYED AS A PERIOD
                00320 ;************ ORIGIN SETTING ********************
B800            00330          ORG     0B800H          ;NEAR TOP OF 32K SYSTEM
                00340 ; ENTRY POINT IS AT WRTSCR
                00350 ;****** CONSTANTS **************
                00360 ;
000C            00370 FF       EQU     0CH     ;FORMFEED
000D            00380 CR       EQU     0DH     ;CARRIAGE RETURN
000A            00390 LF       EQU     0AH     ;LINEFEED
0008            00400 BKSPC    EQU     08H     ;BACKSPACE
002E            00410 PERIOD   EQU     02EH    ;PERIOD
0020            00420 BLANK    EQU     20H     ;SPACE
005F            00430 CURSOR   EQU     5FH     ;CURSOR SYMBOL
                00440 ;
                00450 ;****** VARIABLES ****************
                00460 ;
B800 0000       00470 STORN    DEFW    0       ;TEMP STOR #COLS/LINE
B802 0000       00480 STRPTR   DEFW    0       ;TEMP STOR LINE POINTER
B804 00         00490 TMPBYT   DEFB    0       ;TEMP BYTE STORAGE
                00500 ;*********************************************
                00510 ;
                00520 ;  MAIN PROGRAM
                00530 ;
                00540 ;*********************************************
B805 F5         00550 WRTSCR   PUSH    AF
B806 C5         00560          PUSH    BC
B807 D5         00570          PUSH    DE
B808 E5         00580          PUSH    HL              ;SAVE REGISTERS
B809 FE0C       00590          CP      FF
B80B CA5BB8     00600          JP      Z,FRMFED
B80E FE0D       00610          CP      CR
B810 CA6DB8     00620          JP      Z,LINFED
B813 FE0A       00630          CP      LF
B815 CA6DB8     00640          JP      Z,LINFED
B818 FE08       00650          CP      BKSPC
B81A CA90B8     00660          JP      Z,BAKSPC
                00670 ;TEST FOR DISPLAYABLE CHARACTER
                00680 ;BETWEEN 20H AND 0BFH OK
B81D FE20       00690          CP      20H
B81F 3836       00700          JR      C,NONDSP        ;JIF CHAR < 20H
B821 FEC0       00710          CP      0C0H
B823 3032       00720          JR      NC,NONDSP       ;JIF CHAR > 0BFH


B825 CDC5B8     00730          CALL    DSPCHR          ;DISPLAY CHARACTER
B828 DD7E00     00740          LD      A,(IX+0)
B82B 3C         00750          INC     A
B82C DD7700     00760          LD      (IX+0),A
B82F DD4602     00770          LD      B,(IX+2)
B832 04         00780          INC     B
B833 B8         00790          CP      B
B834 2017       00800          JR      NZ,WRTLP0       ;JIF NOT END OF LINE
B836 DD7E01     00810          LD      A,(IX+1)
B839 DD7700     00820          LD      (IX+0),A
B83C DD7E03     00830          LD      A,(IX+3)
B83F 3C         00840          INC     A
B840 DD7703     00850          LD      (IX+3),A
B843 DD4605     00860          LD      B,(IX+5)
B846 04         00870          INC     B
B847 B8         00880          CP      B
B848 2003       00890          JR      NZ,WRTLP0       ;JIF NOT BOTTOM OF SCRN
B84A CDCCB8     00900          CALL SCROLL
B84D 3E5F       00910 WRTLP0   LD      A,CURSOR
B84F CDC5D8     00920 WRTLP1   CALL DSPCHR
B852 E1         00930          POP     HL
B853 D1         00940          POP     DE
B854 C1         00950          POP     BC
B855 F1         00960          POP     AF
B856 C9         00970          RET
B857 3E2E       00980 NONDSP   LD      A,PERIOD
B859 18F4       00990          JR      WRTLP1
B85B CD1BB9     01000 FRMFED   CALL    SSCCLR
B85E DD7E01     01010          LD      A,(IX+1)
B861 DD7700     01020          LD      (IX+0),A
B864 DD7E04     01030          LD      A,(IX+4)
B867 DD7703     01040          LD      (IX+3),A
B86A C34DB8     01050          JP      WRTLP0
B86D CDA9B8     01060 LINFED   CALL    ABSADD
```

*Listing 1 continued*

*Listing 1 continued*

```
B870 3E20      01070          LD      A,BLANK
B872 CDC5B8    01080          CALL    DSPCHR
B875 DD7E01    01090          LD      A,(IX+1)
B878 DD7700    01100          LD      (IX+0),A        ;COL CTR=START COL
B87B DD7E03    01110          LD      A,(IX+3)
B87E 3C        01120          INC     A
B87F DD7703    01130          LD      (IX+3),A
B882 47        01140          LD      B,A
B883 DD7E05    01150          LD      A,(IX+5)
B886 B8        01160          CP      B
B887 D24DB8    01170          JP      NC,WRTLP0       ;JIF LINE CTR<OR=END LINE
B88A CDCCB8    01180          CALL    SCROLL
B88D C34DB8    01190          JP      WRTLP0
B890 DD7E00    01200 BAKSPC   LD      A,(IX+0)
B893 DD4601    01210          LD      B,(IX+1)
B896 B8        01220          CP      B
B897 CA4DB8    01230          JP      Z,WRTLP0
B89A 3E20      01240          LD      A,BLANK
B89C CDC5B8    01250          CALL    DSPCHR
B89F DD7E00    01260          LD      A,(IX+0)
B8A2 3D        01270          DEC     A
B8A3 DD7700    01280          LD      (IX+0),A
B8A6 C34DB8    01290          JP      WRTLP0
               01300 ;*******************************
               01310 ;
               01320 ;SUBROUTINES USED BY WRTSCR
               01330 ;
               01340 ;*******************************
               01350 ;***************************************
               01360 ;
               01370 ;ABSADD - CALCULATE ABSOLUTE ADDRESS
               01380 ;
               01390 ;***************************************
               01400 ;
               01410 ;ABSADD - CALCULATES ABSOLUTE ADDRESS FOR CURRENT
               01420 ;POSITION GIVEN BY COLUMN AND LINE COUNTERS
               01430 ;ENTER WITH IX POINTING TO PCB,EXIT WITH
               01440 ;ABSOLUTE ADDRESS IN HL
               01450 ;ABS ADDR=3C00H+64*(LINE COUNT)+(COLUMN COUNT)
B8A9 DD7E03    01460 ABSADD   LD      A,(IX+3)
B8AC E60F      01470          AND     0FH
B8AE 2600      01480          LD      H,0
B8B0 6F        01490          LD      L,A
B8B1 29        01500          ADD     HL,HL   ;HL=2*LINE COUNT
B8B2 29        01510          ADD     HL,HL   ;HL=4*LINE COUNT
B8B3 29        01520          ADD     HL,HL   ;HL=8*LINE COUNT
B8B4 29        01530          ADD     HL,HL   ;HL=16*LINE COUNT
B8B5 29        01540          ADD     HL,HL   ;HL=32*LINE COUNT
B8B6 29        01550          ADD     HL,HL   ;HL=64*LINE COUNT
B8B7 11003C    01560          LD      DE,3C00H
B8BA 19        01570          ADD     HL,DE   ;HL=3C00H+64*LINE COUNT
B8BB DD7E00    01580          LD      A,(IX+0)
B8BE E63F      01590          AND     3FH
B8C0 1600      01600          LD      D,0
B8C2 5F        01610          LD      E,A
B8C3 19        01620          ADD     HL,DE   ;HL=ABSOLUTE ADDRESS
B8C4 C9        01630          RET
               01640 ;*******************************************
               01650 ;
               01660 ;DSPCHR - DISPLAY CHAR IN A AT CURRENT
               01670 ;LINE AND COLUMN POSITION
               01680 ;
               01690 ;***************************************
B8C5 F5        01700 DSPCHR   PUSH    AF
B8C6 CDA9B8    01710          CALL    ABSADD
B8C9 F1        01720          POP     AF
B8CA 77        01730          LD      (HL),A
B8CB C9        01740          RET
               01750 ;***************************************
               01760 ;
               01770 ;SCROLL - SCROLL SCREEN UP FROM BOTTOM
               01780 ;
               01790 ;***************************************
B8CC DD7E02    01800 SCROLL   LD      A,(IX+2)
B8CF DD9601    01810          SUB     (IX+1)
B8D2 3C        01820          INC     A
B8D3 0600      01830          LD      B,0
B8D5 4F        01840          LD      C,A             ;BC=#COLUMNS PER LINE
B8D6 ED4300B8  01850          LD      (STORN),BC      ;SAVE FOR LATER USE
B8DA DD7E01    01860          LD      A,(IX+1)
B8DD DD7700    01870          LD      (IX+0),A        ;COL CTR = START COL
B8E0 DD7E04    01880          LD      A,(IX+4)
B8E3 DD7703    01890          LD      (IX+3),A        ;LINE CTR = START LINE
B8E6 CDA9B8    01900          CALL    ABSADD
B8E9 2202B8    01910          LD      (STRPTR),HL
B8EC 2A02B8    01920 SCRLP1   LD      HL,(STRPTR)
B8EF 114000    01930          LD      DE,64
B8F2 19        01940          ADD     HL,DE
B8F3 ED5B02B8  01950          LD      DE,(STRPTR)
B8F7 2202B8    01960          LD      (STRPTR),HL
B8FA ED4B00B8  01970          LD      BC,(STORN)
B8FE EDB0      01980          LDIR


B900 DD7E03    01990          LD      A,(IX+3)
B903 3C        02000          INC     A
B904 DD7703    02010          LD      (IX+3),A
B907 DD9605    02020          SUB     (IX+5)
B90A 20E0      02030          JR      NZ,SCRLP1       ;JIF MORE LINES TO MOVE
B90C 2A02B8    02040          LD      HL,(STRPTR)
B90F ED4B00B8  02050          LD      BC,(STORN)
B913 41        02060          LD      B,C
B914 3E20      02070          LD      A,BLANK
B916 77        02080 SCRLP2   LD      (HL),A
B917 23        02090          INC     HL
B918 10FC      02100          DJNZ    SCRLP2          ;JIF MORE COLS IN LINE
B91A C9        02110          RET
               02120 ;***************************************
               02130 ;
               02140 ;SSCCLR - CLEAR INDIVIDUAL SCREEN
               02150 ;
               02160 ;***************************************
B91B DD7E02    02170 SSCCLR   LD      A,(IX+2)
B91E DD9601    02180          SUB     (IX+1)
B921 3C        02190          INC     A
B922 47        02200          LD      B,A             ;B=#COLS PER LINE
B923 3204B8    02210          LD      (TMPBYT),A      ;SAVE FOR LATER USE
B926 DD7E01    02220          LD      A,(IX+1)
B929 DD7700    02230          LD      (IX+0),A        ;COL CTR=START COL
B92C DD7E04    02240          LD      A,(IX+4)
B92F DD7703    02250          LD      (IX+3),A        ;LINE CTR=START LINE
B932 CDA9B8    02260          CALL    ABSADD
B935 2202B8    02270 SSCLP2   LD      (STRPTR),HL
B938 3A04B8    02280          LD      A,(TMPBYT)
B93B 47        02290          LD      B,A
B93C 3E20      02300          LD      A,BLANK
B93E 77        02310 SSCLP1   LD      (HL),A
B93F 23        02320          INC     HL
B940 10FC      02330          DJNZ    SSCLP1
B942 DD7E03    02340          LD      A,(IX+3)
B945 3C        02350          INC     A
B946 DD7703    02360          LD      (IX+3),A
B949 DD7E05    02370          LD      A,(IX+5)
B94C DDBE03    02380          CP      (IX+3)
B94F 3809      02390          JR      C,SSCLP3        ;JIF LINE CTR > END LINE
B951 2A02B8    02400          LD      HL,(STRPTR)
B954 114000    02410          LD      DE,64
B957 19        02420          ADD     HL,DE
B958 18DB      02430          JR      SSCLP2
B95A C9        02440 SSCLP3   RET
0000           02450          END
00000 Total Errors
```

See List of Advertisers on Page 227

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Screen program (WRTSCR) is shown in Fig. 3.

The Write Screen program is given in Program Listing 1. I've added substantial detail in going from the second-level description of Fig. 2 to the final program. One significant function added to the program is the Absolute Address (ABSADD) subroutine. Loading a character to video memory requires a memory address rather than the line, column address so convenient for the rest of the program. You don't need to concern yourself with this fact in the first- or second-level description of the program, but it is required in the final code. Similar details are filled in throughout the program.

As a beginning Z80 programmer you might wish to use at least one more level of description between the second-level description and the final code. Your goal should be to have the program design firmly in hand before writing the Z80 instructions. Don't make the mistake of rushing to write instructions before you finish the design; it only leads to poor programs and frustration. Also, don't try to optimize the code at this point. Clear and simple code makes debugging easier. If you're really concerned about efficiency or execution time, you can refine it once the program is checked out. The importance of efficiency and execution speed for most micro programs is greatly overestimated. Don't make life hard for yourself by falling into this trap.

## Test Driver

You can make debugging utility subroutines like WRTSCR much simpler by writing short driver programs to exercise key functions. Keep test drivers simple so you don't have to spend a lot of time checking them out; they are just tools for testing the real program and you'll discard them when this is done.

The driver program I used to check out WRTSCR is in Program Listing 2. It allows you to define two screens and direct keyboard input to either of them. The screen definitions are stored in PCBPT0 and PCBPT1 (lines 340–450). The program switches keyboard input between the two screens through the clear key. The right-arrow key is a form feed; the left arrow is backspace; the down arrow is line feed; and the enter key is carriage return. The alphanumeric keys have their usual meanings.

When started, the driver whites out the full screen and loop while waiting

for keyboard input. Initially, Screen zero accepts the keyboard input. Entering a form feed (right arrow) clears Screen zero and places the cursor at the top left position. Subsequent characters will be entered to this screen. Pressing the clear key switches keyboard input to Screen 1. After you have WRTSCR working for these two screens modify PCBPT0 and PCBPT1 to check out other split-screen combinations. ■

---

*Contact Hugh Cottle at 242 Mousen Road, Concord, MA 01742.*

---

*Program Listing 2. Test driver for Write Screen program.*

```
                00100 ;***********************************************
                00110 ;
                00120 ;       TEST DRIVER PROGRAM
                00130 ;               USE TO TEST SPLIT SCREEN SUBROUTINE
                00140 ;     HUGH COTTLE   NOVEMBER 1981
                00150 ;***********************************************
                00160 ;PROGRAM STARTS BY SETTING ENTIRE SCREEN TO THE
                00170 ;GRAPHIC CHARACTER 191 (ALL WHITE)
                00180 ;THEN A KEYBOARD INPUT LOOP IS ENTERED
                00190 ;DISPLAYABLE CHARACTERS ARE DISPLAYED ON ONE
                00200 ;OF TWO SCREENS
                00210 ;CONTROL KEYS ARE:
                00220 ;               ENTER   =       CR
                00230 ;               DOWN ARROW  = LF
                00240 ;               LEFT ARROW  = BKSPC
                00250 ;               RIGHT ARROW = FF
                00260 ;               CLEAR TOGGLES BETWEEN THE TWO SCREENS
                00270 ;********** ORIGIN SETTING *********************
6000            00280         ORG     6000H
6000 C31060     00290         JP      TSTDRV
                00300 ;********* CONSTANTS ****************************
3C00            00301 VIDEO   EQU     3C00H   ;START OF VIDEO MEMORY
001F            00302 CLEAR   EQU     01FH    ;CLEAR KEY
B805            00303 WRTSCR  EQU     0B805H  ;SPLIT SCREEN PROGRAM
                00310 ;****** ROM ENTRY POINTS ***********************
0049            00320 KBD     EQU     49H     ;CHAR FROM KYBD TO A REG
                00330 ;******** VARIABLES ****************************
6003 00         00340 PCBPT0  DEFB    0       ;COL CTR
6004 01         00350         DEFB    1       ;START COL
6005 23         00360         DEFB    35      ;END COL
6006 00         00370         DEFB    0       ;LINE CTR
6007 01         00380         DEFB    1       ;START LINE
6008 0D         00390         DEFB    13      ;END LINE
6009 00         00400 PCBPT1  DEFB    0       ;COL CTR
600A 25         00410         DEFB    37      ;START COL
600B 3E         00420         DEFB    62      ;END COL
600C 00         00430         DEFB    0       ;LINE CTR
600D 05         00440         DEFB    5       ;START LINE
600E 0E         00450         DEFB    14      ;END LINE
600F 00         00460 SW      DEFB    0       ;SWITCH BETWEEN SCREENS
                00470 ;***********************************************
                00480 ;
                00490 ;    MAIN PROGRAM
                00500 ;
                00510 ;***********************************************
6010 21003C     00520 TSTDRV  LD      HL,VIDEO
6013 010004     00530         LD      BC,1024
6016 16BF       00540         LD      D,191
6018 CD4C60     00550         CALL    CLRSCR
601B CD4900     00560 TDRLP1  CALL    KBD
601E FE1F       00570         CP      CLEAR
6020 2009       00580         JR      NZ,TDRLP2
6022 3A0F60     00590         LD      A,(SW)
6025 2F         00600         CPL
6026 320F60     00610         LD      (SW),A
6029 18F0       00620         JR      TDRLP1
602B FE09       00630 TDRLP2  CP      9
602D 2002       00640         JR      NZ,TDRLP3
602F 3E0C       00650         LD      A,0CH
6031 4F         00660 TDRLP3  LD      C,A
6032 3A0F60     00661         LD      A,(SW)
6035 B7         00670         OR      A
6036 200A       00680         JR      NZ,TDRLP4

6038 DD210360 00690           LD      IX,PCBPT0
603C 79         00691         LD      A,C
603D CD05B8     00700         CALL    WRTSCR
6040 18D9       00710         JR      TDRLP1
6042 DD210960 00720 TDRLP4    LD      IX,PCBPT1
6046 79         00721         LD      A,C
6047 CD05B8     00730         CALL    WRTSCR
604A 18CF       00740         JR      TDRLP1
                00750 ;
                00760 ;******* SUBROUTINES **********
                00770 ;
604C 7A         00780 CLRSCR  LD      A,D
604D 77         00790         LD      (HL),A
604E 23         00800         INC     HL
604F 0B         00810         DEC     BC
6050 78         00820         LD      A,B
6051 B1         00830         OR      C
6052 20F8       00840         JR      NZ,CLRSCR
6054 C9         00850         RET
6010            00860         END     TSTDRV
00000 Total Errors
```





✓ See List of Advertisers on Page 227

by Dennis Allen

# The (Single) Key to Scripsit And TRSDOS Commands

## Invoke Scripsit commands and TRSDOS system commands with a single keystroke using this auto-load utility.

If you're a Scripsit fan who gets annoyed jumping back to TRSDOS every time you want to execute a software or system command, this Model III program is the elixir for which you've been waiting.

Scripal automatically boots up Scripsit and provides single-key access to the Backup, Format, List, Rename, Duplicate, and End commands, as well as commands to initialize a printer, change the master drive designation, and write-protect a disk (see the Program Listing). Scripal also features an easy escape route should you hit the wrong command key.

Scripal is a Basic enhancement to Scripsit 3.2 under TRSDOS 1.3, and it uses fewer than 5K of random-access memory.

If you own a different version of Scripsit, check with your Radio Shack store for an update of your present disk.

### Using the Program

Enter the Program Listing and save it on your Scripsit disk. Use the file name SCRIPAL:0; the program uses this name later.

*The Key Box*

LOAD '80

**Model III**
**32K RAM, Disk Basic**
**Scripsit 3.2**
**TRSDOS 1.3**

To prepare your disk to run Scripal automatically, create a build file when your screen displays TRSDOS READY by typing:

```
BUILD STARTUP
CLS
MASTER (DRIVE=1)
BASIC:0 SCRIPAL:0
```

Then hit the break key.

Please note the third line, which contains the drive number. Radio Shack recommends that you don't store documents on your Scripsit disk—this third step eliminates the worry. By naming drive 1 as master, your computer doesn't read from or write to drive zero, which contains the TRSDOS disk, unless you specifically tell it to do so. If you have a one-drive system, eliminate this line. If you have two or more drives you may want to name another drive as master.

Keep in mind a couple of important points when assigning the master status. The Model III disk drive numbers begin with the lower disk drive in the console as zero, the upper drive as 1, and the two additional drives as 2 and 3. Also, when you designate a drive other than drive zero as master, your computer ignores all lower-numbered drives unless you specifically assign a drive number in your file name.

For example, if you assign drive 1 as the master drive and you want to save a Scripsit document named Letter on drive zero, you must enter the Scripsit Save command by hitting the break key and typing SAVE LETTER:0. If you use an extension on your file name, hit the break key and type in LETTER/TXT:0.

Adding a colon and the desired drive number overrides the master designation for that one command. You should also use this method when loading a previously created document located on a drive with a number lower than that of the master drive.

Now your start-up file is complete. Use it by typing DO STARTUP while in TRSDOS or have the computer automatically execute your start-up file by entering one more command. At the TRSDOS READY prompt, type in

```
AUTO DO STARTUP
```

This command instructs your computer to automatically execute your start-up file, which in turn loads Scripal after you boot up and enter the date and time. Your computer is now locked into this sequence, and your screen quickly

| Variable | Description |
|---|---|
| A$ | INKEY$ |
| D$ | Disk drive number |
| ST% | Line printer status address |
| CO$ | Command string |
| SF$ | Current file name |
| NF$ | New file name |
| SD$ | Source drive |
| DD$ | Destination drive |
| PW$ | Password |
| DM$ | Disk name |

*Table 1. Variables list.*

displays a menu of options each time you load Scripsit.

If you ever want to disengage the auto feature, hold the enter key down on boot-up. Instead of going into Scripal, you'll remain in TRSDOS.

Enter the second build file by typing in the following when your screen displays TRSDOS READY:

```
BUILD MASTER:0
MASTER (DRIVE=0)
```

This command makes your computer return the master designation to drive zero once you end a session with Scripal.

Use the ATTRIB command to clean up the program. The two new files and the new program on your Scripsit disk add unnecessary clutter to the screen every time you call a directory. At TRSDOS READY, type:

```
ATTRIB SCRIPAL:0 (I)
ATTRIB STARTUP/BLD:0 (I)
ATTRIB MASTER/BLD:0 (I)
```

## Running Scripal

You are now ready to transfer to automatic pilot. With your enhanced Scripsit disk in drive zero, press the reset button. The date prompt appears. Hit the enter key twice and the auto function engages. After some flickering and flashing of control messages, a display of options with the title Scripsit Utilities appears.

## Commands

Figure 1 is an illustration of the Scripal menu. This menu handles single-key entries, so there's no need to press the enter key after you hit a command key.

Your computer only accepts the 10 commands listed in the menu. Once you initiate a command, follow all subsequent entries with the enter key. To escape a function and return to the menu, answer any question with END and press the enter key. Also, Scripal disables the break key.

The Backup Disk command (B) makes a duplicate of any disk containing your documents. Press the B key, and you'll see the following questions:

```
SOURCE Drive Number?
DESTINATION Drive Number?
SOURCE Disk Master Password?
```

Answer these questions in the same manner as during a normal back-up in TRSDOS. The first two questions accept drive numbers zero to 3. If you are backing up a disk in drive zero to a disk in drive 1, for example, you would answer the first question with a zero, and the second question with a 1. Answer the last question with the password originally assigned to the source disk.

Scripal assumes the destination disk contains data (see back-up procedures in Scripsit manual). Therefore, your computer doesn't prompt for your approval to continue a back-up. However, Scripal automatically reformats the destination disk to check for possible flawed tracks. If the destination disk is suspect, you should clean it with a bulk eraser and use the Format command before backing it up.

Scripal proceeds with the back-up as you watch various messages display on your screen. When the back-up is complete, it prompts you with a pause message. Press the enter key to continue.

This pause gives you an opportunity to check the display for any unusual errors, such as read errors, before clearing the screen and returning to the menu. Should an unexpected error occur, your computer returns to TRSDOS. You may then take whatever action is necessary (see your TRSDOS manual), and return to Scripal by pressing the reset button.

The Format Blank Disk command (F) prepares a blank disk for use with Scripsit. Scripal only formats a blank

*Program Listing. Scripal.*

```
0 'SCRIPAL   ver.1.3
1 '  by Dennis Allen  2/19/82
10 CMD"B","OFF"
20 CLS
30 CLEAR1000
40 ON ERROR GOTO 9170
50 PRINT@76,"S C R I P S I T    ";
60 PRINT"U T I L I T I E S";
70 PRINT@128,STRING$(64,95);
80 PRINT@276,"<B>ackup Diskette";
90 PRINT@340,"<F>ormat Blank Diskette";
100 PRINT@404,"<L>ist Directories";
110 PRINT@468,"<I>nitialize Line Printer";
120 PRINT@532,"<S>cripsit";
130 PRINT@596,"<R>ename File";
140 PRINT@660,"<C>hange Master Drive";
150 PRINT@724,"<W>rite Protect Disk Drive";
160 PRINT@788,"<D>uplicate File";
170 PRINT@916,"<E>nd Session";
180 A$=""
190 A$=INKEY$:IFA$=""THEN190
200 IFA$="B"THEN6000
210 IFA$="F"THEN7000
220 IFA$="L"THEN1000
230 IFA$="I"THEN2000
240 IFA$="S"THENCMD"I","SCRIPSIT:0"
250 IFA$="C"THEN3000
260 IFA$="W"THEN4000
270 IFA$="D"THEN5000
280 IFA$="R"THEN8000
290 IFA$="E"THENPOKE16916,0:CLS:CMD"I","DO MASTER:0"
300 GOTO180
1000 'List Directory
1010 POKE16916,0:CLS:POKE16916,3
1020 PRINT@84,"Scripsit Directory"
1030 PRINT@128,STRING$(64,95);
1040 PRINT
1050 INPUT"Which Drive";D$
1060 IFD$="END"THEN20
1070 IFVAL(D$)<0ORVAL(D$)>3THEN1050
1080 ON VAL(D$)+1GOTO1090,1100,1110
1090 CMD"D:0":GOTO1120
1100 CMD"D:1":GOTO1120
1110 CMD"D:2":GOTO1120
1120 GOTO9110
2000 'Initialize Line Printer
2010 POKE16916,0:CLS:POKE16916,3
2020 PRINT @82,"Line Printer Initialization";
2030 PRINT@128,STRING$(64,95);
2040 ST%=PEEK(14312)AND240
2050 IFST%<>48THENPRINT@343,"PRINTER NOT READY";:GOTO2040
2060 PRINT@343,"                ";
2070 LPRINT CHR$(27);CHR$(17)
2080 PRINT@325,"Line Printer Initialized for Proportional Characte
rs";
2090 GOTO9110
3000 'Change Master Drive
3010 POKE16916,0:CLS:POKE16916,3
3020 PRINT@87,"Change Master Drive";
3030 PRINT@128,STRING$(64,95);
3040 PRINT:PRINT
3050 INPUT"Which DRIVE";D$
3060 IFD$="END"THEN20
3070 IFD$<>"0"ANDD$<>"1"ANDD$<>"2"ANDD$<>"3"THEN3050
```

*Listing continued*

*Listing continued*

```
3080 CO$="MASTER (DRIVE="+D$+")"+CHR$(13)+"BASIC:0 SCRIPAL:0"+CHR$
(13)
3090 GOSUB 9000
3100 GOTO20
4000 'Write Protect Disk Drive
4010 POKE16916,0:CLS:POKE16916,3
4020 PRINT@85,"Write Protect Disk Drive";
4030 PRINT@128,STRING$(64,95);
4040 PRINT:PRINT
4050 INPUT"Which DRIVE (1-3 only)";D$
4060 IFD$="END"THEN20
4070 IFD$<>"1"ANDD$<>"2"ANDD$<>"3"THEN4050
4080 CO$="WP (DRIVE="+D$+")"+CHR$(13)+"BASIC:0 SCRIPAL:0" +CHR$(13
)
4090 GOSUB9000
4100 GOTO20
5000 'Duplicate File
5010 POKE16916,0:CLS:POKE16916,3
5020 PRINT@88,"Duplicate File";
5030 PRINT@128,STRING$(64,95);
5040 PRINT:PRINT
5050 LINEINPUT"Filename? ";SF$
5060 IFSF$="END"THEN20
5070 ONERRORGOTO9160:OPEN"I",1,SF$:CLOSE:ONERRORGOTO9170
5080 INPUT"NEW Filename";NF$:IFNF$="END"THEN20
5090 IFLEN(NF$)>21THEN5080
5100 INPUT"Destination Drive";D$:IFD$="END"THEN20
5110 IFD$<>"0" AND D$<>"1" AND D$<>"2" AND D$<>"3"THEN 5100
5120 CO$="COPY "+SF$+" TO "+NF$+":"+D$+CHR$(13)+"BASIC:0 SCRIPAL:0
"+CHR$(13)
5130 GOSUB9000
5140 GOTO20
6000 'Backup Diskette
6010 POKE16916,0:CLS:POKE16916,3
6020 PRINT@89,"Scripsit Backup";
6030 PRINT@128,STRING$(64,95);
6040 PRINT:PRINT
6050 INPUT"SOURCE Drive Number";SD$:IFSD$="END"THEN20
6060 IFSD$<>"0"ANDSD$<>"1"ANDSD$<>"2"ANDSD$<>"3"THEN 6050
6070 INPUT"DESTINATION Drive Number";DD$:IFDD$="END"THEN20
6080 IFDD$<>"0"ANDDD$<>"1"ANDDD$<>"2"ANDDD$<>"3"THEN6070
6090 INPUT"SOURCE Disk Master Password";PW$:IFPW$="END" THEN20
6100 IFLEN(PW$)>8THEN6090
6110 CO$="BACKUP :"+SD$+" :"+DD$+CHR$(13)+PW$+CHR$(13)+"Y" +CHR$(1
3)+"Y"+CHR$(13)+"PAUSE"+CHR$(13)+"BASIC:0 SCRIPAL:0" +CHR$(13)
6120 GOSUB9000
6130 GOTO20
7000 'Format Diskette
7010 POKE16916,0:CLS:POKE16916,3
7020 PRINT@89,"Format Diskette";
7030 PRINT@128,STRING$(64,95);
7040 PRINT:PRINT
7050 INPUT"Which Drive";D$:IFD$="END"THEN20
7060 IFD$<>"0"AND D$<>"1"AND D$<>"2"AND D$<>"3"THEN7050
7070 INPUT"Diskette Name";DM$:IFDM$="END"THEN20
7080 IFLEN(DM$)>8THEN7070
7090 INPUT"Master Password";PW$:IFPW$="END"THEN20
7100 IFLEN(PW$)>8THEN7090
7110 CO$="FORMAT :"+D$+CHR$(13)+DM$+CHR$(13)+PW$+CHR$(13) +"PAUSE"
+CHR$(13)+"BASIC:0 SCRIPAL:0"+CHR$(13)
7120 GOSUB9000
7130 GOTO20
8000 'Rename File
8010 POKE16916,1:CLS:POKE16916,3
8020 PRINT@89,"Rename File";
8030 PRINT@128,STRING$(64,95);
8040 PRINT:PRINT
8050 LINEINPUT"Filename? ";SF$:IFSF$="END"THEN20
8060 ONERRORGOTO9200 :OPEN"I",1,SF$:CLOSE:ONERRORGOTO9170
8070 INPUT"New Filename";NF$:IFNF$="END"THEN20
8080 IFLEN(NF$)>21THEN8070
8090 CO$="RENAME "+SF$+" "+NF$+CHR$(13)+"BASIC:0 SCRIPAL:0" +CHR$(
13)
8100 GOSUB9000
8110 GOTO20
9000 'Build DO File
9010 OPEN"O",1,"COMMAND/BLD:0"
9020 PRINT#1,CO$
9030 CLOSE
9040 CMD"I","DO COMMAND:0"
9050 RETURN
9100 'Continue Operation
9110 PRINTCHR$(15);:PRINT@980,"Press <ENTER> to continue";
9120 A$=""
9130 A$=INKEY$:IFA$=""THEN9130
9140 POKE16916,0
9150 GOTO20
9160 PRINT"Bad Filename":RESUME5040
9170 PRINT:PRINT"Unexpected ERROR #";ERR/2+1;" in Line ";ERL
9180 INPUT"Press <ENTER> to Continue";A$
9190 RESUME20
9200 PRINT"Bad Filename":RESUME8040
```

*End*

disk. You must clean a previously used disk with a bulk eraser before formatting. Press the F key, and answer questions:

Which Drive?
Diskette Name?
Master Password?

The first question accepts drive numbers of zero to 3. The disk name may consist of any group of letters up to eight characters long. Likewise, the password may consist of any group of letters up to eight characters long. Be careful when assigning the master password; you must use the same password every time you purge or back up that disk. I suggest using PASSWORD as the master password. This command uses normal TRSDOS parameters. For an explanation of these parameters see your TRSDOS manual.

Scripal now proceeds with the formatting and displays various messages on the screen. After it formats the disk, it pauses. Press the enter key to continue.

**Scripsit Utilities**

<B>ackup disk
<F>ormat blank disk
<L>ist directories
<I>nitialize line printer
<S>cripsit
<R>ename file
<C>hange master drive
<W>rite-protect disk drive
<D>uplicate file
<E>nd

*Figure 1. Scripal menu.*

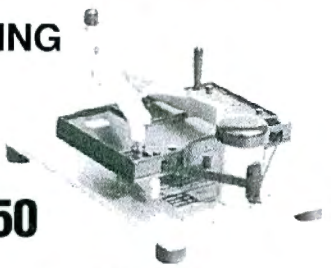
Just as before, the pause gives you an opportunity to check the display for any errors (such as flawed tracks) before clearing the screen and returning to the menu. If an unexpected error occurs, your computer returns to TRSDOS. You can then take whatever action necessary (see your TRSDOS manual) and return to Scripal by pressing the reset button.

The List Directories command (L) allows you to easily view the directory on any disk without manually returning to TRSDOS. I find this command useful whenever I forget the abbreviated name I give a document. Press the L key, and it asks you for a drive number.

Again, the drive number can be zero to 3. Enter the number of the drive containing the disk you want to in-

# E-ZEE INKER

## STOP THROWING AWAY FABRIC RIBBONS



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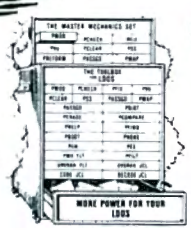

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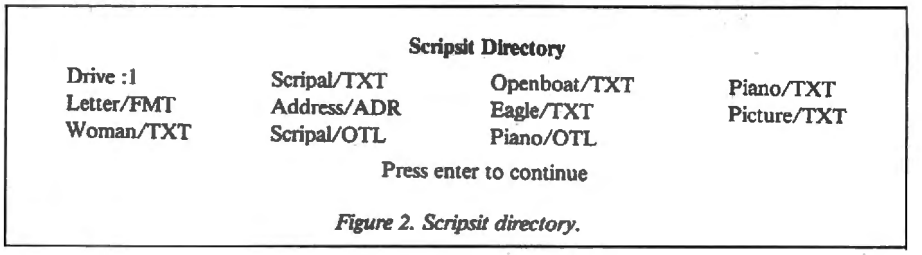


*Figure 2. Scripsit directory.*

spect, and your screen displays a directory like the one in Fig. 2. You may view the display for as long as you like, then press the enter key to return to the menu.

The Initialize Line Printer command (I) selects the proportional space mode for any Radio Shack line printer with proportional capabilities. Press the I key, and your computer makes the adjustment automatically. The computer displays PRINTER NOT READY if you turn off the printer or switch to off-line status. Once you make the adjustment, you must press the enter key to return to the menu.

The Scripsit command (S) transfers control to the Scripsit word processor. To end Scripsit and return to the Scripal menu, press the break key, and type in END.

The Rename File command (R) lets you change the name of an existing document. Press the R key, and it asks you the following questions:

```
Filename?
New Filename?
```

Answer the first question by entering the current document name. If you enter an improper name, or one not found on the disk in use, your computer asks a second time. Enter the new document name for "New Filename?"

The Change Master Drive command (C) reassigns the master drive status. Remember, your computer automatically assigns drive 1 as the master drive. Press the C key, and it asks you: "Which DRIVE?" Acceptable drive numbers are zero to 3. Enter the appropriate drive number, and your computer makes the change and returns to the menu automatically.

The Write Protect Disk Drive command (W) protects a disk from an overwrite. Press the W key, and it asks you "Which DRIVE (1–3 only)?" Drive zero is not an acceptable entry. Scripal must write to that drive during its operation—only drives 1–3 are acceptable. Once you enter the appropriate drive, your computer write-protects that disk and returns to the menu automatically.

The Duplicate File command (D) makes a copy of any file on any disk not write-protected. Press the D key, and it asks you the following:

```
Filename?
NEW Filename?
Destination Drive?
```

Answer "Filename" with the current document name, including drive specification. For an example, a document named Letter on the disk in drive 1 you enter as LETTER:1. If you enter an improper file name, your computer asks again.

Answer "NEW Filename" with any name you choose—up to eight characters in length. Do not give the drive specification; the next question requires that. Remember, you can't have two files with the same name, even if the files are duplicates, on the same disk.

After you answer all three questions, your computer copies the document and returns to the menu.

The End command (E) is the last, and it returns control to TRSDOS. Press the E key, and your computer reassigns drive zero as the master and displays TRSDOS READY.

## How Scripal Works

Scripal is a Basic program capable of passing lengthy commands to TRSDOS. Normal Basic doesn't allow this function. Scripal overcomes this limitation by creating a build file while in Basic, entering TRSDOS to execute the file, and returning to Basic and reloading the program.

To create a working build file, Scripal writes a command string, CO$, to a sequential file. CO$ contains all necessary commands for the function requested, each separated by a carriage return (CHR$(13)). Therefore, CO$ requires the same syntax as when you created the Build command in TRS-



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DOS. For example, line 3080 defines CO$ as

```
"MASTER (DRIVE = " + D$ + ")" +
CHR$(13) + "BASIC:0 SCRIPAL:0" +
CHR$(13)
```

Remove all the quotation marks and plus symbols, and convert all the CHR$(13) into hard carriage returns to make the line read:

```
MASTER (DRIVE = D$)
BASIC:0 SCRIPAL:0
```

The instruction now looks familiar. The command contains one variable, D$, that stores the disk drive number. However, the value of D$, such as 1 or 2, is actually saved to the file. Now you have two legal TRSDOS commands to execute. The first reassigns the master drive, and the second loads Basic and runs Scripal. CO$ always contains instructions to return to Scripal. The string is sent to the subroutine beginning at line 9000.

Line 9010 opens the sequential file called Command/BLD. The BLD extension is of particular importance because it allows execution of the file by passing a Do command from Basic to TRSDOS. Line 9020 writes CO$ to the disk and line 9030 closes the file. Line 9040 transfers control to TRSDOS with the instruction to execute Command/BLD.

Two subroutines handle error trapping—one is specific and the other is general. The general subroutine begins on line 9170. This trap identifies the error and the line in which it occurs, and allows continuation of the program if you desire. You can find the other trap twice—in line 5070 and line 8060. This trap checks to determine the existence of a file before continuing with the Rename or Duplicate commands. If an error occurs in either case, Scripal requests a new file name.

*If you use Scripsit, Scripal will make your life easier.*

Scripal also takes advantage of the Model III's video scroll protection. Each new screen displays a command that protects the top three lines of the video. A good example is in line 1010. The first POKE statement removes the protection by POKEing a zero into memory address 16916. This statement clears the screen, and engages the protection again by POKEing a 3 in the same address.

Scripal accommodates a four-drive system. You must alter lines 1070, 3070, 4070, 5110, 6060, 6080, and 7060 to permit Scripal to function properly with fewer drives. This is done easily in line 1070; change the 3 to the number of your highest disk drive. The other lines require more effort; each of these lines requires the deletion of the logical AND operators which correspond with drive numbers your system does not use.

If you use Scripsit, Scripal will make your life easier. ■

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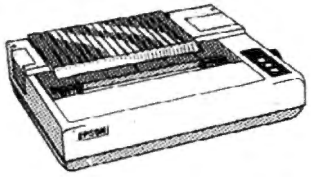

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by Richard E. Glorvigen

# Of Limited Values

## Define the limits of data input with this Assembly-language subroutine.

When I was writing my personal accounting program, I needed a good method of displaying input prompts and a reliable means of accepting input data. I wrote a general Model I/III routine to display the input field following the prompt. It tells at a glance how long the input will be and it limits the length of the inputs.

The routine eliminates the question-mark prompt and the blinking cursor as well. This subroutine is in Basic rather than Assembly language to avoid having to load in another file (or POKE it in) and set memory size to protect it.

### Subroutine Description

In order to avoid conflicts with the variables in any Basic program that might use this subroutine, I chose the most unlikely variable names that I could think of. They all begin with the letter Q. You can choose any variable names you like.

Before calling the subroutine, you must initialize three variables. QC$ contains your prompt message. QP contains the decimal value that indicates where you want your prompt message to begin on the video screen. QL contains the decimal value that indicates the maximum length that you want allowed for the input itself (see Table 1).

When you call the subroutine, the prompt message you set into variable QC$ is displayed starting at the position that you specified in QP. Following your prompt message will be a space, followed by a series of dots (periods). A flashing block cursor appears on the first dot.

This string of dots is your input field; it is as long as the value that you specified in QL. When you input data, the field begins filling up. You cannot input more than the field length allows. The only arrow key that is active is the left arrow (used to back up for corrections). Press the enter key to complete the input subroutine and cause the return to occur. Any dots remaining in the field disappear.

| Variable | Usage in the Subroutine |
|---|---|
| Q | Used in For...Next loop. |
| QC$ | Used for the character prompt message. |
| QD$ | Represents the input field. (The dots.) |
| QI$ | Used for the input string character. |
| QL | Used for the expected (or maximum) field length. |
| QP | Used for video starting print position. |
| QQ | The input character count. |
| QR | Upon return, the input string numeric value. |
| QR$ | Upon return, contains the complete input string. |
| QZ | Upon return, starting position of input field. |

*Table 1. Variables functions.*

*Program Listing 1. User input program.*

```
65501 PRINT @QP,QC$; :QD$=STRING$(QL,".") :QQ=0
65502 QR$="" :QZ=QP :IF QC$="" THEN QZ=QZ-1
65503 QZ=QZ+LEN(QC$)+1 :PRINT @QZ,QD$; :PRINT @QZ,"";
65504 PRINT CHR$(143); :PRINT CHR$(8);
65505 QI$=INKEY$ :IF QI$=CHR$(13) OR QL=0 THEN QR=VAL(QR$) :PRIN
TSTRING$(QL-QQ," "); :RETURN
65506 IF QI$="" THEN 65504 ELSE IF QI$=CHR$(8) THEN 65509
65507 IF ASC(QI$)<32 OR ASC(QI$)>90 THEN 65504
65508 IF QQ=QL THEN 65504 ELSE QQ=QQ+1 :GOTO 65512
65509 IF QQ=0 THEN 65504 ELSE QQ=QQ-1 :QR$=LEFT$(QR$,LEN(QR$)-1)

65510 PRINTQI$; :PRINT @QZ+QQ,RIGHT$(QD$,QL-QQ);
65511 PRINT @QZ+QQ,""; :GOTO 65504
65512 PRINTQI$; :QR$=QR$+QI$ :GOTO 65504
```

*End*

### *The Key Box*

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When you return from the subroutine, several variables contain data. QR$ contains your input response in string format, and QR contains the numeric value of QR$. The variables QC$, QP, and QL are left as you had originally initialized them. Also, the variable QZ contains the video position of the start of your input field in decimal.

At this point, you would save the value of QR$ (and perhaps QR) in an array, then prepare the input variables for another call to the subroutine for more input data.

*Program Listing 2. Address program.*

```
1 '     FILENAME - EXAMPLE
10 CLEAR1000
20 '...  YOUR BASIC PROGRAM
90 '            ..
100 CLS:I=0
110 QC$="ENTER THE FOLLOWING WHEN CALLED FOR:"
120 QP=14:QL=0:GOSUB65501
130 QC$="NAME:":QP=128:QL=24:GOSUB65501:GOSUB200
140 QC$="STREET:":QP=192:QL=22:GOSUB65501:GOSUB200
150 QC$="CITY:":QP=256:QL=15:GOSUB65501:GOSUB200
160 QC$="STATE:":QP=278:QL=2:GOSUB65501:GOSUB200
170 QC$="TELEPHONE NUMBER:":QP=320:QL=8:GOSUB65501:GOSUB200
180 '...  CONTINUE YOUR BASIC PROGRAM...
190 END
200 I=I+1:A$(I)=QR$:RETURN
```

*End*

*Program Listing 3. Prompt program.*

```
100 CLEAR 1000
110 CLS: QL=0
120 QC$="PERSONAL FINANCIAL STATUS - 1981": QP=16: GOSUB 65501
130 QC$=STRING$(32,"="): QP=80: GOSUB 65501
140 QC$="<< BALANCE SHEET >>      ( ENTER DATA AS IT IS CALLED F
OR...)"
150 QP=130: GOSUB 65501
160 QC$="LIQUID ASSETS": QP=192: GOSUB 65501
170 QC$="LIABILITIES": QP=224: GOSUB 65501
180 QC$=STRING$(30,"-"): QP=256: GOSUB 65501: QP=288: GOSUB 6550
1
190 '
200 '    - ASSETS -
210 '
220 QC$="CASH-": QP=320: GOSUB 65501
230 QC$="CASH ON HAND:     $ .........": QP=386: GOSUB 65501
240 QC$="CHECKING ACCT:    $ .........": QP=450: GOSUB 65501
250 QC$="SAVINGS ACCT:     $ .........": QP=514: GOSUB 65501
260 QC$="INVESTMENTS-": QP=576: GOSUB 65501
270 QC$="STOCKS & BONDS:   $ .........": QP=642: GOSUB 65501
280 QC$="MUTUAL FUNDS:     $ .........": QP=706: GOSUB 65501
290 QC$="CASH VALUE OF": QP=770: GOSUB 65501
300 QC$=" INSUR. POLICY:   $ .........": QP=834: GOSUB 65501
310 '
320 '   - LIABILITIES -
330 '
340 QC$="UNPAID BILLS-": QP=352: GOSUB 65501
350 QC$="TAXES:            $ .........": QP=418: GOSUB 65501
360 QC$="INSUR. PREMIUMS: $ .........": QP=482: GOSUB 65501
370 QC$="CHARGE ACCTS:     $ .........": QP=546: GOSUB 65501
380 QC$="INSTALLMENT LOANS-": QP=608: GOSUB 65501
390 QC$="AUTOMOBILE:       $ .........": QP=674: GOSUB 65501
400 QC$="OTHER...          $ .........": QP=738: GOSUB 65501
410 QC$="LOANS (BALANCE DUE)-": QP=800: GOSUB 65501
420 QC$="BANK:             $ .........": QP=866: GOSUB 65501
430 QC$=STRING$(61,"="): QP=960: GOSUB 65501
440 QC$=" PAGE 1 ": QP=988: GOSUB 65501
450 FOR I=403 TO 531 STEP 64
460   QC$="$": QP=I: QL=9:GOSUB 65501
470 NEXT I
480 FOR I=435 TO 563 STEP 64
490   QC$="$": QP=I: QL=9:GOSUB 65501
500 NEXT I
510 FOR I=659 TO 723 STEP 64
520   QC$="$": QP=I: QL=9:GOSUB 65501
530 NEXT I
540 FOR I=691 TO 755 STEP 64
550   QC$="$": QP=I: QL=9:GOSUB 65501
560 NEXT I
570 QC$="$": QP=851: QL=9: GOSUB 65501
580 QC$="$": QP=883: QL=9: GOSUB 65501
590 GOTO590
600 END
```

*End*

## How to Use the Subroutine

I numbered the subroutine in the 65500 area so it would be out of the way of most Basic program line numbers. If you already have a Basic program and want to include this subroutine, you will have to key the subroutine into the end of your existing program.

You can also key in only the subroutine and save it on tape or disk. You can then merge (concatenate) it onto any existing Basic program by using the Disk Basic Merge command.

Use this subroutine when you are writing a Basic program and you expect the user to input some data into the program. Refer to Program Listing 1. Suppose you would like the user to enter his name, street address, city, state, and phone number. Program Listing 2 shows you how to do it using the input subroutine.

Line 110 creates the first prompt message. Line 120 sets QP (the starting point) to 14 and QL to zero. Since QL, the input field length, is set to zero, the subroutine will display the prompt message and return immediately.

Line 130 begins the next input prompt by setting the message Name into QC$. Also, QP is set to 128 (the third line of the video screen) and the field length QL is set to 24. Next, a call to the subroutine is made. When returning, the input string is saved in an array.

Lines 140–170 are similar. Note that lines 150 and 160 generate prompts for input on the same video line. Also, note the way the data is stored in the A$ (array).

You can also use this subroutine to fill the video screen with prompts and then request inputs to each prompt, one at a time. Refer to Program Listing 3. This program not only displays all the prompts before actually requesting the inputs, but it requests the inputs in a rather interesting sequence.

Program Listing 4 is an example of how you might set up the screen for typing data into a checking-account program. The program sections off the screen to separate the display area from the input area. You enter data (on video line 16) one column entry at a time and then display it in the appropriate row as you enter it.

Program Listing 5 is an amusement program. It asks the user to input various words via the input subroutine. The words are saved in an array and then used with discrete abandon in a "canned" story. You could write your

*Program Listing 4. Checking account screen display program.*

```
100 '
110 '    - PROGRAM INITIALIZATION -
120 '
130 CLEAR 1000
140 CLS: J=0: K=0: QL=0: FM$="$$######.##": DIM A$(5,100)
150 '
160 '    - VIDEO HEADING -
170 '
180 QC$="PERSONAL ACCOUNT CHECK RECORD"
190 QP=18: GOSUB 65501
200 QC$=STRING$(64,"="): QP=64: GOSUB 65501:
    QP=192: GOSUB 65501: QP=896: GOSUB 65501
210 QC$="TYP     DATE     CHK-#     AMOUNT     DESCRIPTION":
    QP=128: GOSUB 65501
220 QC$="   ": PRINT @195,QC$;: PRINT @205,QC$;:
    PRINT @212,QC$;: PRINT @224,QC$;
230 L=192
240 '
250 '    - "TYPE" INPUT -
260 '
270 QC$="ENTER THE TYPE: <C>HECK, <D>EPOSIT, <W>ITHDR, <E>ND:"
280 QP=960: QL=1: GOSUB 65501: K=K+1: J=1: GOSUB 640: TY$=QR$
290 IF QR$="E" THEN END
300 P=1: L=L+64: IF L>832 THEN GOSUB 610: L=192: GOTO 300
310 GOSUB 580
320 '
330 '    - "DATE" INPUT -
340 '
350 QC$="ENTER THE DATE (MM/DD/YY):"
360 QP=960: QL=8: GOSUB 65501: J=2: GOSUB 640: P=5: GOSUB 580
370 IF TY$<>"C" THEN 460
380 '
390 '    - "CHECK NUMBER" INPUT -
400 '
410 QC$="ENTER THE CHECK NUMBER:"
420 QP=960: QL=4: GOSUB 65501: J=3: GOSUB 640: P=16: GOSUB 580
430 '
440 '    - "AMOUNT" INPUT -
450 '
460 QC$="ENTER THE AMOUNT: $"
470 QP=960: QL=10: GOSUB 65501: J=4: GOSUB 640: P=22: GOSUB 590
480 '
490 '    - "DESCRIPTION" INPUT -
500 '
510 QC$="DESCRIPTION ="
520 QP=960: QL=30: GOSUB 65501: J=5: GOSUB 640: P=34: GOSUB 580
530 GOTO 270
540 END
550 '-----------------------------------------
560 '          PROGRAM'S SUB-ROUTINES
570 '-----------------------------------------
580 QC$=QR$: QP=L+P: QL=0: GOSUB 65501: GOTO 600
590 PRINT @L+P, USING FM$; QR;
600 PRINT @960,STRING$(63," ");: RETURN
610 FOR I=256 TO 832 STEP 64
620     PRINT @I,STRING$(64," ");
630 NEXT I: RETURN
640 A$(J,K)=QR$: RETURN
```

*End*

own stories with key words left to be added. The results can sometimes be amazing.

## Customizing

You can use any variable names you like in the subroutine. Do not duplicate the ones used in your Basic program. If you don't like the dots used as the input field, you can change the period in line 65501 to the character you want.

You might want to change the block cursor. Line 65504 contains a CHR$ (143). You might like a (140) better.

To use this subroutine with both upper- and lowercase, change line 65507 to IF ASC(QI$)<32 OR (ASC(QI$)>90 AND ASC(QI$)<97) OR ASC(QI$) >122 THEN 65504.

Use the decimal codes on page C/2 of the *TRS-80 Level II Basic Reference Manual* for other characters as your cursor. Experiment to discover what you like best.

You should save this subroutine by itself so that you can use it with your Basic programs. If you want to use it in a program that you have already begun coding or to upgrade an already existing program, you must either key it into the program or merge it. If you don't have a disk system, you can still concatenate two Basic programs. (See Curtis F. Gerald's "Append It!," February 1980, p. 82, and "Simple Appending," 80 Input, June 1980, p. 11.)

First, load your Basic program.

Second, prepare your tape recorder

*Program Listing 5. The Storyteller.*

```
100 '-----------------------------------------
110 '            INITIALIZATION
120 '-----------------------------------------
130 CLEAR2000
140 CLS: DIMA$(20)
150 '-----------------------------------------
160 '          BEGIN THE ASKING OF QUESTIONS
170 '-----------------------------------------
180 QC$="WHAT KIND OF A DAY IS IT?":QP=0:QL=11:GOSUB65501:GOSUB3
20
190 QC$="NAME ONE OF THE SEASONS:":QP=64:GOSUB65501:GOSUB320
200 QC$="A BOY'S NAME:":QP=QP+64:GOSUB65501:GOSUB320
210 QC$="A GIRL'S NAME:":QP=QP+32:GOSUB65501:GOSUB320
220 QC$="ENTER IN ANY NUMBER YOU CAN THINK OF:":QP=QP+32:QL=15:G
OSUB65501:GOSUB320
230 QC$="AN ARTICLE OF MENS CLOTHING:":QP=QP+64:QL=14:GOSUB65501
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250 QC$="THE NAME OF A TYPE OF MATERIAL, CLOTH OR FABRIC:":QP=QP
+64:QL=10:GOSUB65501:GOSUB320
260 QC$="THE NAME OF ANY OBJECT!":QP=QP+64:QL=15:GOSUB65501:GOSU
B320
270 QC$="NAME A PHYSICAL ACTIVITY:":QP=QP+64:QL=20:GOSUB65501:GO
SUB320
280 QC$="A WOMEN'S ARTICLE OF CLOTHING:":QP=QP+64:QL=19:GOSUB655
01:GOSUB320
290 QC$="A SKIN CONDITION:":QP=QP+64:GOSUB65501:GOSUB320
300 QC$="A PHYSICAL AILMENT:":QP=QP+64:QL=17:GOSUB65501:GOSUB320

310 GOTO340
320 I=I+1:A$(I)=QR$:RETURN
330 E$=INKEY$:IFE$=""THEN330ELSERETURN
340 CLS
350 '-----------------------------------------
360 '            BEGIN THE STORY
370 '-----------------------------------------
380 PRINT"  ONE ";A$(1);" ";A$(2);" DAY, ";A$(3);" AND ";A$(4)
390 PRINT"WENT TO THE BEACH.  IN SPITE OF THE ";A$(1);" WEATHER,
"
400 PRINT"THERE WERE oNLY ABOUT ";A$(5);" PEOPLE ON THE BEACH."
410 PRINTA$(3);" HAD ON HIS FAVORITE ";A$(6);".  THE0ONE WITH"
420 PRINT"A PICTURE OF A ";A$(7);" ON THE REAR.  ";A$(4);" WORE"

430 PRINT"A CUTE TWO-PIECE ";A$(8);" BATHING SUIT WITH A ";A$(9)

440 PRINT"TIED RIGHT IN THE MIDDLE.  THE OCEAN WATER WAS COLD BU
T THAT"
450 PRINT"DIDN'T STOP EITHER ONE OF THEM FROM ";A$(10);"."
460 PRINTA$(3);" HAD A REAL PROBLEM WHEN HIS ";A$(6);" GOT WET."

470 PRINT"THE TIE STRING WOULD COME LOOSE, CAUSING HIS ";A$(6)
480 PRINT"TO DROOP.  ";A$(4);" TOOK OFF HER ";A$(11);" SHE HAD"
490 PRINT"BEEN WEARING IN ORDER TO GET BETTER ";A$(12);"."
500 PRINT"BOTH ";A$(3);" AND ";A$(4);" GOT ";A$(13);" IN SPITE"
510 PRINT"OF THE PROTECTIVE MEASURES THEY HAD TAKEN."
520 GOSUB330:CLS
530 END
```

*End*

to CLOAD the input subroutine you have saved on tape.

Third, in Basic command mode, key in the three program lines:

```
1 CLS:PRINTPEEK(16549);" ";
  PEEK(16548):E=17129
2 S=E:E=PEEK(S+1)*256+PEEK(S):
  IF E>0 GOTO 2
3 POKE16549, INT(S/256):POKE16548,
  S-INT(S/256)*256:END
```

Fourth, run that routine.

Fifth, write down the two numbers displayed on the screen. They should be 66 and 233.

Sixth, issue the CLOAD to bring in the input subroutine to be concatenated at the end of your Basic program.

When the tape stops, issue the following commands:

```
POKE 16549,66
POKE 16548,233
```

(They should be the same as from step 5 above.)

Seventh, issue a List to be sure everything loaded correctly.

Eighth, delete Basic lines 1, 2, and 3. Using a simple subroutine such as the one in this article can make your program more attractive and understandable to the user. ■

*Richard E. Glorvigen lives at 4925 Rio Verde Drive, San Jose, CA 95118.*



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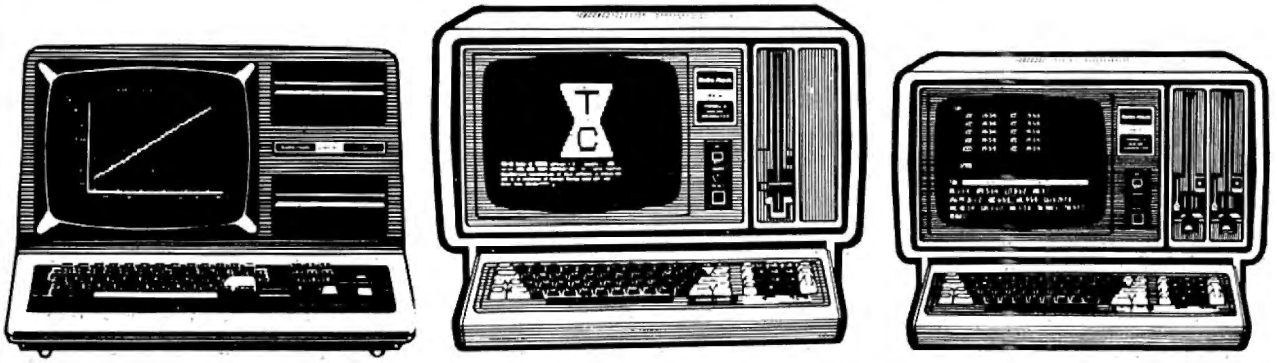

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232

by C. Warren Andreasen

# Uncommon Denominators

**You no longer have to convert fractions to their decimal equivalents in equations. This Basic program accepts fractions as input and displays them as output.**

A cabinetmaker friend of mine told me he wanted to use his computer in his work but had one problem—his computer doesn't process numbers in the units he requires, inches and fractions of inches. The only way he could use these units was to convert the fractions into their decimal equivalents. But the inconvenience involved makes it difficult to use his computer in his work. He asked me to help him out, and I wrote a program that accepts fractions as input, converts them to decimal values for computation, and generates fractions as output. We worked out two subroutines that let you add fractions to any program. The subroutines (Input and Output) are shown in the Program Listing.

One problem with converting decimals to fractions is that you cannot express some fractions (such as 1/3) as a decimal. This means that there is no direct decimal equivalent that converts back to the original fraction. Since my friend works with wood, rounding off to the nearest 1/16 is sufficient. The routine presented here tries to find the exact fraction but, if it gets to 1/32 and still has not found the exact fraction, the program rounds off to the nearest 16th. This program accepts input in the regular form with a decimal point included, or with a mixed decimal and fraction. It accepts just about any input short of spelling out the numbers.

## Input Routine

The first problem you'll encounter in trying to enter a fractional number is that as soon as you enter the slash in a fraction, the program displays an error message. Your computer cannot process anything but an integer.

The solution is to use strings to enter fractions. Strings accept any input. As

*Program Listing. Fraction generator. The Input subroutine is shown in lines 10000–10340; Output is in lines 11000–11330.*

```
10 CLS
20 PRINT"ENTER A NUMBER AND FRACTION"
30 GOSUB 10000:N1=N
40 PRINT"ENTER ANOTHER NUMBER":GOSUB 10000:N2=N
50 PRINT"THE 2ND NUMBER SUBTRACTED FROM THE 1ST NUMBER = ";
60 N=N1-N2:GOSUB 11000
70 IF N=0 THEN PRINT D$ ELSE PRINT N;D$
80 PRINT:GOTO 20
10000 '* * * * INPUT * * * *
10010 'INPUT SUBROUTINE - USES X, FL, AND N$. RETURNS WITH
10020 'STRING AS N$, FL=1 IF THERE IS A FRACTION AND FL=0
10030 'IF THERE IS NO FRACTION.
10040 '
10050 N$="":FL=0:INPUT N$
10060 FOR X=1 TO LEN(N$)
10070 IF MID$(N$,X,1)="/" THEN FL=1
10080 NEXT X
10090 '
10100 'FRACTION TO DECIMAL SUBROUTINE
10110 'USES LN, N, N$, X, X$, FR$, F1$, F1, F2$, F2, AND D
10120 'ENTER WITH NUMBER/FRACTION STRING N$ - RETURN WITH
10130 'N = NUMBER WITH DECIMAL POINT AND VALUE
10140 IF FL=0 THEN N=VAL(N$):RETURN 'NO FRACTION
10150 LN=LEN(N$):X=1
10160 X$=MID$(N$,X,1)
10170 IF X$=" "THEN GOTO 10200
10180 IF X=LN THEN NN$="0":N$="0 "+N$:LN=LN+2:X=2:GOTO 10200
10190 NN$=NN$+X$:X=X+1:GOTO10160
10200 N=VAL(NN$):NN$=""
10210 X=X+1
10220 FR$=MID$(N$,X,LN-X+1)
10230 X=1
10240 F1$=MID$(FR$,X,1)
10250 IF F1$="/" THEN GOTO 10270
10260 F$=F$+F1$:X=X+1:GOTO 10240
10270 F1=VAL(F$):F1$=""
10280 X=X+1
10290 F$=MID$(FR$,X,1)
10300 F2$=F2$+F$:IF X=LN THEN 10320
10310 GOTO 10280
```

*Listing continued*

### *The Key Box*

LOAD 80

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*Listing continued*

```
10320 F2=VAL(F2$):F2$=""
10330 D=F1/F2:F1=0:F2=0
10340 N=N+D:RETURN
11000 '* * * * OUTPUT * * * *
11010 'DECIMAL TO FRACTION SUBROUTINE
11020 'USES D, X, V, D$, DD, Y$, AND Z$
11030 'ENTER WITH N = NUMBER INCLUDING DECIMAL
11040 'RETURN WITH N = WHOLE NUMBER AND D$=FRACTION
11050 'IF FRACTION SMALLER THEN 1/16 THEN ANSWER IS ROUNDED TO
11060 'THE NEAREST 16TH
11070 D=N-INT(N):N=INT(N):X=2
11080 DD=D*X:IF DD=0 THEN D$="":RETURN
11090 IF DD=INT(DD) THEN GOTO 11300
11100 IF X>16 THEN PRINT"ABOUT ";:GOTO 11120
11110 X=X+1:GOTO 11080
11120 V=.0625:X=.03125
11130 IF D<X THEN D$="":RETURN
11140 X=X+V:IF D<X THEN D$="1/16":RETURN
11150 X=X+V:IF D<X THEN D$="1/8":RETURN
11160 X=X+V:IF D<X THEN D$="3/16":RETURN
11170 X=X+V:IF D<X THEN D$="1/4":RETURN
11180 X=X+V:IF D<X THEN D$="5/16":RETURN
11190 X=X+V:IF D<X THEN D$="3/8":RETURN
11200 X=X+V:IF D<X THEN D$="7/16":RETURN
11210 X=X+V:IF D<X THEN D$="1/2":RETURN
11220 X=X+V:IF D<X THEN D$="9/16":RETURN
11230 X=X+V:IF D<X THEN D$="5/8":RETURN
11240 X=X+V:IF D<X THEN D$="11/16":RETURN
11250 X=X+V:IF D<X THEN D$="3/4":RETURN
11260 X=X+V:IF D<X THEN D$="13/16":RETURN
11270 X=X+V:IF D<X THEN D$="7/8":RETURN
11280 IF D<X THEN D$="15/16":RETURN
11290 D$="":N=N+1:RETURN
11300 Y$=STR$(DD):L=LEN(Y$)-1:Y$=RIGHT$(Y$,L)
11310 Z$=STR$(X):L=LEN(Z$)-1:Z$=RIGHT$(Z$,L)
11320 D$=Y$+"/"+Z$
11330 Y$="":Z$="":RETURN
```

*End*

you enter the fraction (line 10000), the program skips comments until it gets to line 10050.

Line 10050 accomplishes three tasks. It clears a string labelled N$. The purpose of this is to let the program skip over the last value of string N$ in its next computation.

Next, the program sets a flag to zero. The flag is important later on in this routine as it identifies fractions for the program. If the program tries to convert a fraction that doesn't exist, it displays an error message.

Lastly, line 10050 inputs the string. Notice that the program prints no message with this input statement. Before calling this routine with a GOSUB statement, the program should generate an input message, allowing any message for each Input command.

Line 10060 sets up a string scan. The For...Next loop starts at the first character in the string and considers each character individually.

Line 10070 examines each character for the slash symbol. If the slash is found, the program sets the flag (FL) value to 1. If no slash is found, the flag value remains zero. Line 10080 closes the loop and, after the entire string is examined, the program drops to line 10140.

This line checks the flag. If it's zero, the program finds no fraction to convert and it converts the whole number portion from the ASCII string value to a numeric value and returns to the main body of the program with the number value stored in the variable N.

If a fraction is present, the program drops to line 10150 and sets up another string scan. This time the program looks for a space. If the string contains a whole number, a space precedes the fraction. The program examines each character in turn.

Line 10170 looks for the space. If it detects a space, the program jumps to line 10200 where it converts everything preceding the space from ASCII to numeric values. If the character examined is not a space, the program considers it part of the whole number and adds it to any preceding number string and checks the next character.

In line 10180, the program determines if it's reached the end of the string. If it has done so without finding a space, the program knows that there's only a fraction and no whole number in that string. In this case, the program generates an ASCII zero and places it at the front of the string. This avoids problems later. It also adjusts the line length to allow for the added character (zero) and the program jumps to line 10200.

If the character examined was not a

space or the last character in the string, then it must be a digit of the whole number. Line 10190 adds it to the end of the new string (NN$) being built to contain the ASCII equivalent of the whole number when the space is found. It adds one to the value of X and the program loops back to check for the next character.

When the program gets to line 10200 it converts the number (or zero) contained in string NN$ to its numeric value. If the zero is not generated earlier and added to the front of the string (when the value is zero), the program fails, since any attempt to convert a null to a numeric value causes an error. At this point N contains the value of the whole number.

Now that the whole number portion of the string is separated, the string scan continues stepping to the next character in line 10210 and takes the remaining portion of the string and assigns it to the new string of FR$. Line 10210 resets the X value to 1 so the program can start examining the first character of this new string.

Lines 10250 and 10260 examine the remaining characters until they encounter a slash. Everything up to the slash is the top portion of the fraction, which the program converts to the numeric value at line 10270. Again, line 10280 steps the value of X once to get past the slash. The value of the remaining portion of the string represents the bottom portion of the fraction.

One interesting note is that if a unit of measurement, such as inches, is typed and entered with the input string, the program ignores it and the numeric value is still correct.

Line 10330 divides the top portion of the fraction by the bottom of the fraction and D contains the decimal portion of the input number. This decimal portion adds to the whole number portion in line 10340 and the program returns to the main body of the program, with N containing the value entered as a string.

Since N contains a proper decimal number upon return from the subroutine, use it in any manner desired. This subroutine is called when the program needs an input, and upon return transfers the value of N to whatever variable you need for your problem. Don't forget to transfer the value of N to the variable of your choice, because the next time the program calls the Input subroutine, the variable takes on the value of the new input.

## Output Routine

Now that the input problem is solved



✓ See List of Advertisers on Page 227

and the program has generated an answer, it must be put in the same form as the input. To get the answer to proper output form we assign the answer to the variable N again and use the GOSUB command in line 11000.

This subroutine bases the principle of operation on the idea that if the top portion of the fraction divided by the bottom produces the decimal number, then multiplying the bottom portion by the decimal number gives you the top number. The only catch is that the bottom number is unknown.

You know that the top number is a whole number. The program starts with the number 2 and multiplies by the decimal. If the answer is a whole number, you have found the whole number. The top number is the result of the multiplier and the bottom value (X) is the number by which we multiplied the decimal.

This is a fine solution except for one thing—a fraction is really an unsolved problem and when solved does not always give an even answer. For example, the fraction 1/3 is .33333333.... The computer doesn't care how long it takes to find the answer so it keeps looking. To avoid this a limit is placed on the decimal-place accuracy.

For this example I pick 1/16 as the limit of my resolution. This resolution affects the output only and is not an input limit. The subroutine continues until it tests the fraction through 16ths and if it doesn't find the answer, the program prints the word *about* on the screen and the answer is rounded out to the nearest 16th. When the program exits this subroutine, it contains the whole number in the variable N and the ASCII string equivalent of the fraction in the string D$.

Line 11070 separates the whole number portion from the decimal portion.

Line 11080 multiplies. If the result is zero, then the number has no fraction and assigns D$ a null, displays nothing for the fraction, and there is only the whole number. It steps the value of X one if the result is not zero. This repeats until the fraction is found, or X (the bottom portion of the fraction) becomes greater than 16.

If it finds the fraction, then the program jumps to line 11300, and the first character of both the top and bottom numbers is removed. The first character is the plus sign which does not show but causes the addition of a space in front of each number in the fraction which does not look good.

Line 11320 generates the fraction string with first the top number, then the slash, then the bottom number. If it can't find the proper value of the fraction, the program drops into the section starting at line 11120.

This section through line 11280 is the rounding routine. It is very simple in that it adds .03125 (1/32) to the decimal number and tests it in steps of 1/16. If V (1/16) plus X (1/32) is greater than the decimal value, then the decimal value is less than 1/2 of 1/16th. Thus, the fraction rounds off to zero (null string).

If not, then it adds 1/16 and tries the test again. If the value is less, round off to 1/16. This test repeats until it passes 15/16 and if no match is found, the fraction rounds to 1. This returns a null string as in the case of zero, except it adds one to the whole number. ■

*You can contact C. Warren Andreasen at P.O. Box 8306, Van Nuys, CA 91409.*

# Tidbit #7

When I bought a Radio Shack DMP-400 printer because of its 130 cps speed, selectable pitch switch, and dot-addressable graphics, I was disappointed to read in the operator's manual that the DMP doesn't support the Radio Shack graphics character set. I wrote this simple screen dump routine in Basic that reproduces on paper what you see on the screen.

I based the module on the DMP's own block character set, which is about one-third the size of Radio Shack's. The DMP decimal codes I use are 224 (a blank), 233 (a left-side rectangle), 234 (a right-side rectangle), and 239 (a solid square). The program PEEKs each screen location on a line three times in order to determine which of the DMP codes to use.

Line 6020 switches the DMP into data mode and sets the line feed to half forward, so that the printer doesn't skip horizontal spaces. Lines 6030–6060 provide the loops that PEEK each screen location. From there, lines 6090–6200 analyze the character on the screen to determine which DMP character is appropriate for the upper third, the middle, and the bottom third of the printed line. Line 6210 sends the selected character to the DMP, gives the printer a form feed, and returns to the word processing mode in line 6260.

*Skip Murrow*
*Ft. Wood, MO*

```
6000 '   DHP400 SCREEN DUMP
6010 PRINT@964," - - - - -  WORKING - - - - -";
6020 LPRINTCHR$(19)CHR$(27)CHR$(28);
6030 FOR LN=15360TO16192 STEP64
6040 FOR DC=1TO3
6050 FOR PL=0TO63
6060 AS=PEEK(LN+PL):IFAS<32THENA=A+64
6070 IFAS=32THENAS=224:GOTO6210:' ALL ROWS BLANK
6080 IFDC=2THEN6130ELSEIFDC=3THEN6170
6090 IFINT(AS/4)=AS/4THENAS=224:GOTO6210:' 1ST ROW BLANK
6100 IFINT((AS-1)/4)=(AS-1)/4THENAS=233:GOTO6210:' 1ST ROW
     LEFT
6110 IFINT((AS-2)/4)=(AS-2)/4THENAS=234:GOTO6210:' 1ST ROW
     RIGHT
6120 AS=239:GOTO6210:' 1ST ROW BOTH
6130 IFINT(AS/16)=AS/16ORINT((AS-1)/16)=(AS-1)/16ORINT((AS
     -2)/16)=(AS-2)/16ORINT((AS-3)/16)=(AS-3)/16THENAS=
     224:GOTO6210:' 2D ROW BLANKS
6140 IFINT((AS-4)/16)=(AS-4)/16ORINT((AS-5)/16)=(AS-5)/16
     ORINT((AS-6)/16)=(AS-6)/16ORINT((AS-7)/16)=(AS-7)/16
     THENAS=233:GOTO6210:' 2D ROW LEFTS
6150 IFINT((AS-8)/16)=(AS-8)/16ORINT((AS-9)/16)=(AS-9)/16
     ORINT((AS-10)/16)=(AS-10)/16ORINT((AS-11)/16)=(AS-11)
     /16THENAS=234:GOTO6210:' 2D ROW RIGHTS
6160 AS=239:GOTO6210:' 2D ROW BOTH
6170 IF AS<144THENAS=224:GOTO6210:' 3D ROW BLANKS
6180 IFAS>143ANDAS<160THENAS=233:GOTO6210:' 3D ROW LEFTS
6190 IFAS>159ANDAS<176THENAS=234:GOTO6210:' 3D ROW RIGHTS
6200 AS=239:GOTO6210:' 3D ROW BOTH
6210 LPRINT CHR$(AS);
6220 NEXT PL
6230 LPRINT""
6240 NEXT DC
6250 NEXT LN
6260 LPRINT CHR$(12);CHR$(20);
6270 RETURN
6999 END
```



↩ See List of Advertisers on Page 227

*Listing 1 continued from p. 60*

```
05020           CALL    ROM05
05030           LD      (IY),A
05040           INC     IY
05050           LD      B,A             ; BYTES TO BYPASS
05060 NL2       CALL    ROM05           ; READ BYTES AND
05070           LD      (IY),A          ; STORE IN BUFFER
05080           INC     IY
05090           DJNZ    NL2
05100           JP      RDBT
05110 ; *****************************************************
05120 TRF       CALL    ROM05           ; READ 2ND '02' CODE
05130           LD      (IY),A
05140           INC     IY
05150           CALL    ROM05           ; READ LSB ENTRY ADDRESS
05160           LD      (IY),A
05170           INC     IY
05180           LD      (TRFAD),A       ; STORE TRANSFER ADDRESS
05190           CALL    ROM05           ; READ MSB ENTRY ADDRESS
05200           LD      (IY),A
05210           LD      (TRFAD+1),A
05220           LD      (BUFEND),IY     ; STORE TOP OF BUFFER
05230           CALL    DOS5            ; CLOSE FILE
05240           DEC     HL
05250           LD      (ENDAD),HL      ; STORE END ADDRESS
05260           LD      DE,(STADR)      ; ADJUST OPERATIONAL
05270           LD      (OEADR),HL      ; ADDRESSES
05280           LD      (OSADR),DE
05290           LD      HL,(TRFAD)
05300           LD      (OTADR),HL
05310           LD      A,(STADR)
05320           CALL    CONV            ; CONVERT ADDRESSES TO
05330           LD      (A2MSG+2),HL    ; ASCII FOR DISPLAY
05340           LD      A,(STADR+1)
05350           CALL    CONV
05360           LD      (A2MSG),HL
05370           LD      A,(ENDAD)
05380           CALL    CONV
05390           LD      (A4MSG+2),HL
05400           LD      A,(ENDAD+1)
05410           CALL    CONV
05420           LD      (A4MSG),HL
05430           LD      A,(TRFAD)
05440           CALL    CONV
05450           LD      (A6MSG+2),HL
05460           LD      A,(TRFAD+1)
05470           CALL    CONV
05480           LD      (A6MSG),HL
05490           LD      HL,A1MSG        ; DISPLAY LOAD ADDR
05500           CALL    DOS1
05510           CALL    OFTST           ; CHECK FOR OFFSET
05520           CALL    PBUF            ; DISPLAY OFFSET DATA
05530           LD      A,1             ; STORE OBJECT TYPE FLAG
05540           LD      (TYPEMK),A
05550           LD      HL,TYPEM1       ; DISPLAY FILE TYPE
05560           CALL    DOS1
05570           CALL    TRSPC           ; MOVE FILESPEC TO FCB
05580           JP      COMD
05590 ; *****************************************************
05600 ; *               EDTASM FORMAT                       *
05610 ; *****************************************************
05620 DEDTAS    LD      (IY),A          ; STORE D3 CODE
05630           INC     IY
05640           CALL    ROM05           ; READ BYTE UNTIL
05650           CP      0DH             ; CARRIAGE RETURN
05660           JR      NZ,DEDTAS
05670           LD      (IY),A          ; STORE 0DH CODE
05680           INC     IY
05690           CALL    ROM11           ; BLINK STAR
05700           CALL    ROM05           ; READ BYTE
05710           CP      1AH             ; CHECK FOR EOF BYTE
05720           JR      NZ,DEDTAS
05730           LD      (IY),A          ; STORE EOF BYTE
05740           LD      (BUFEND),IY     ; STORE BUFFER END ADR
05750           LD      A,02            ; STORE FILE TYPE ID
05760           LD      (TYPEMK),A
05770           LD      HL,TYPEM2       ; DISPLAY FILE TYPE
05780           CALL    DOS1
05790           CALL    DOS5            ; CLOSE FILE
05800           CALL    PBUF            ; DISPLAY FILE INFO
05810           CALL    TRSPC           ; TRANSFER TO FCB
05820           JP      COMD
05830 ; *****************************************************
05840 ; *               BASIC FORMAT                        *
05850 ; *****************************************************
05860 DBASIC    LD      (IY),A          ; STORE ID BYTE
05870           INC     IY
05880           CALL    ROM05           ; READ BYTE
05890           CP      00              ; LOOK FOR END OF LINE
05900           JR      NZ,DBASIC
05910           LD      (IY),A          ; SAVE BYTE
05920           INC     IY
05930           CALL    ROM11           ; BLINK STAR
05940           CALL    ROM05           ; READ BYTE
05950           CP      00              ; LOOK FOR EOF BYTES
05960           JR      NZ,DBASIC
05970           LD      (IY),A
05980           INC     IY
05990           CALL    ROM05           ; READ BYTE
06000           CP      00              ; THIRD NULL = EOF
06010           JR      NZ,DBASIC
06020           LD      (IY),A
06030           LD      (BUFEND),IY     ; STORE END ADDRESS
06040           LD      A,03            ; SET TYPE MARK
06050           LD      (TYPEMK),A
06060           LD      HL,TYPEM3       ; DISPLAY FILE TYPE
06070           CALL    DOS1
06080           LD      A,0DH
06090           CALL    PBUF            ; DISPLAY FILE INFO
06100           CALL    TRSPC           ; TRANFER TO FCB
06110           JP      COMD
06120 ; *****************************************************
06130 ; *               DATA FORMAT                         *
06140 ; *****************************************************
06150 DDATA     LD      (IY),A          ; SAVE BYTE IN BUFFER
06160           INC     IY
06170           CALL    ROM11           ; BLINK STAR
06180           CALL    ROM05           ; READ BYTE
06190           JP      NZ,DATCHK       ; CHECK EOF
06200           JR      DDATA           ; CONTINUE
06210 DATCHK    CP      1CH             ; EOF CODE
06220           JP      NZ,DOS6         ; DOS ERROR MESSAGE
06230           DEC     IY
06240           LD      (BUFEND),IY     ; STORE BUFFER END
06250           LD      A,(IY)
06260           CP      00
06270           JR      Z,DEND1
06280           LD      IY,TBUF
06290           LD      A,(IY)
06300           CP      20H
06310           JR      Z,DEND2
06320           CP      3AH
06330           JP      P,DEND2
06340           LD      A,6             ; BASIC ASCII FILE ID
06350           LD      (TYPEMK),A
06360           CALL    PBUF            ; DISPLAY FILE INFO
06370           LD      HL,TYPEM6
06380           CALL    DOS1
06390           JP      COMD
06400 ; *****************************************************
06410 DEND1     LD      A,7             ; ELECTRIC PENCIL FILE
06420           LD      (TYPEMK),A
06430           CALL    PBUF            ; DISPLAY FILE INFO
06440           LD      HL,TYPEM7
06450           CALL    DOS1
06460           JP      COMD
06470 ; *****************************************************
06480 DEND2     LD      A,4             ; DATA FILE TYPE
06490           LD      (TYPEMK),A
06500           CALL    PBUF            ; DISPLAY FILE INFO
06510           LD      HL,TYPEM4
06520           CALL    DOS1
06530           JP      COMD
06540 ;
```

*Program Listing 2. Source code for SuperCop II.*

```
06550 *LIST ON          ;
06560 ; *****************************************************
06570 ; *                                                   *
06580 ; *            PROBLEM TAPE LOAD ROUTINE              *
06590 ; *                                                   *
06600 ; *****************************************************
06610 ;
06620 PROBLD    CALL    ZBUF            ; ZERO DATA BUFFER
06630           LD      HL,TMSG         ; DISPLAY MESSAGE
06640           CALL    DOS1
06650           XOR     A               ; SET TO 500 BAUD
06660           LD      (4211H),A
06670           DI                      ; DISABLE INTERUPTS
06680 PBLD1     CALL    ROM01           ; GET ONE KEYSTROKE
06690           CP      0DH
06700           JR      NZ,PBLD1
06710           LD      A,(RECSL)       ; INITIALIZE RECORDER
06720           CALL    ROM09
06730           CALL    ROM12           ; FIND LEADER & SYNC BYTE
06740           LD      A,2AH           ; PUT STAR IN CORNER
06750           LD      (3C3EH),A
06760           CALL    STAR            ; BLINK STAR
06770           LD      A,5             ; SET FILE TYPE ID
06780           LD      (TYPEMK),A
06790           LD      A,0             ; SET TAPE FORMAT
06800           LD      (FORMAT),A
06810           LD      HL,TBUF         ; SET DATA BUFFER
06820 CHG4      CALL    RDBYT1
06830           JP      COMD
06840 ; *****************************************************
06850 ; MODEL I ROUTINE
06860 RDBYT1    LD      B,8             ; GET 8 BITS
06870           PUSH    HL
06880 RB20      PUSH    BC
06890           PUSH    AF
06900           LD      C,0H            ; SET TIMEOUT COUNTER
06910 RB30      LD      B,0H
06920 RB40      IN      A,(0FFH)        ; LOOK FOR BIT
06930           RLA                     ; ROTATE TO CARRY
06940           JR      C,RB50          ; IF NO BIT, CHECK TIME
06950           DJNZ    RB40
06960           DEC     C
06970           JR      Z,RB90
06980           JR      RB30
06990 RB50      LD      B,41H           ; DELAY
07000 RB60      DJNZ    RB60
07010           CALL    ROM13           ; RESET CASSETTE RELAY
07020           LD      B,50H           ; DELAY
07030 RB70      DJNZ    RB70
07040           LD      B,14H
07050 RB80      IN      A,(0FFH)        ; PREPARE TO READ
07060           DJNZ    RB80
07070           LD      B,A
07080           POP     AF              ; RESTORE A
07090           RL      B               ; MOVE TO CARRY
```

*Listing 2 continued*

See List of Advertisers on Page 227

*Listing 2 continued*

```
07100           RLA                     ; MOVE IN CARRY
07110           PUSH    AF
07120           CALL    ROM13           ; RESET CASSETTE RELAY
07130           POP     AF
07140           POP     BC
07150           DJNZ    RB20
07160           POP     HL
07170           LD      (HL),A          ; STORE BYTE IN BUFFER
07180           INC     HL              ; ADJUST BUFFER
07190           CALL    ROM11           ; BLINK STAR
07200           CALL    BREAK
07210           JR      RDBYT1
07220 RB90      POP     AF              ; RESTORE STACK
07230           POP     BC
07240           POP     HL
07250           DEC     HL
07260           LD      (BUFEND),HL
07270           CALL    BOT
07280           CALL    PBUF
07290           RET
07300 ; *****************************************************
07310 ; MODEL III ROUTINE
07320 RDBYT3    LD      B,8H            ; FOR 8 BITS
07330           LD      C,0H
07340 RB2       LD      DE,0000H        ; ZERO TIME OUT COUNTER
07350           PUSH    BC
07360 RB3       DEC     DE              ; DECREMENT COUNTER
07370           LD      A,D             ; CHECK FOR TIME OUT
07380           OR      E
07390           JR      Z,RB9
07400 RB4       IN      A,(0FFH)        ; LOOK FOR DATA
07410           RLA                     ; SHIFT INTO CARRY
07420           JR      NC,RB3          ; CHECK TIME OUT
07430           LD      B,6EH           ; DELAY
07440 RB5       DJNZ    RB5
07450           XOR     A
07460           OUT     (0FFH),A
07470           LD      B,98H           ; DELAY
07480 RB6       DJNZ    RB6
07490           IN      A,(0FFH)        ; LOOK FOR BIT
07500           POP     BC
07510           RLA
07520           RL      C               ; SHIFT INTO C
07530           XOR     A
07540           OUT     (0FFH),A
07550           DJNZ    RB2             ; GET 8 BITS
07560           LD      (HL),C
07570           INC     HL              ; PLACE IN BUFFER
07580           CALL    BREAK
07590           CALL    STAR
07600           JR      RDBYT3
07610 RB9       POP     BC              ; RESTORE STACK
07620           DEC     HL
07630           LD      (BUFEND),HL     ; SAVE END OF BUFFER
07640           CALL    BOT             ; CLEAR BOTTOM OF SCREEN
07650           CALL    PBUF            ; PRINT ADDRESSES
07660           RET
07670 ;
07680 ; *****************************************************
07690 ; *                                                   *
07700 ; *              TAPE WRITE ROUTINE                   *
07710 ; *                                                   *
07720 ; *****************************************************
07730 ;
07740 TAPWRT    CALL    BOT             ; CLEAR BOTTOM OF DISPLAY
07750           LD      HL,TWMSG        ; DISPLAY MESSAGE
07760           CALL    DOSL
07770 TPWRT1    CALL    ROM01           ; KEYBOARD SCAN
07780           CP      0DH             ; LOOK FOR <ENTER>
07790           JR      Z,TPWRT2
07800           JR      TPWRT1
07810 TPWRT2    LD      HL,(BUFEND)     ; CALCULATE FILE LENGTH
07820           LD      DE,TBUF
07830           OR      A
07840           SBC     HL,DE
07850           INC     HL
07860           EX      DE,HL
07870           LD      C,D
07880           LD      B,0             ; BLOCK BYTE COUNT
07890           LD      A,(FORMAT)      ; CHECK DISK FORMAT
07900           CP      01
07910           JP      Z,DTAPWT
07920           LD      A,(TYPEMK)      ; CHECK IF DATA TAPE
07930           CP      04
07940           JP      Z,TDATWT
07950 ; *****************************************************
07960 ; *     WRITE TAPE FROM NON-DATA TAPE FORMAT          *
07970 ; *****************************************************
07980 TWT1      CALL    SYNC            ; WRITE LEADER/SYNC BYTE
07990 TWT1A     LD      A,(HL)          ; GET BYTE FROM BUFFER
08000           CALL    ROM03           ; WRITE ONE BYTE TO TAPE
08010           INC     HL              ; ADJUST BUFFER POINTER
08020           DJNZ    TWT1A           ; WRITE ONE BLOCK
08030           CALL    STAR            ; BLINK STAR
08040           CALL    BREAK
08050           DEC     C               ; DECREMENT BLOCK COUNT
08060           JP      M,TWT1B         ; CHECK FOR LAST BLOCK
08070           LD      B,0
08080           JR      TWT1A           ; WRITE NEXT BLOCK
08090 TWT1B     LD      B,E             ; WRITE FINAL BLOCK
08100 TWT1C     LD      A,(HL)          ; GET BYTE FROM BUFFER
08110           CALL    ROM03           ; WRITE BYTE TO TAPE
08120           INC     HL              ; ADJUST BUFFER
08130           DJNZ    TWT1C           ; COMPLETE BLOCK
08140           JP      COMD
08150 ; *****************************************************
08160 ; *        WRITE TAPE FROM TAPE DATA FORMAT           *
08170 ; *****************************************************
08180 TDATWT    CALL    SYNC            ; WRITE LEADER/SYNC BYTE
08190 TDWT1     LD      A,(HL)          ; GET BYTE FROM BUFFER
08200           INC     HL              ; ADJUST BUFFER POINTER
08210           CALL    ROM03           ; WRITE BYTE TO TAPE
08220           CP      0DH             ; CHECK FOR CARRIAGE RTN
08230           DEC     DE              ; DECREMENT BYTE COUNT
08240           JR      NZ,TDWT1        ; REPEAT TO BLOCK END
08250           CALL    STAR            ; BLINK STAR
08260           CALL    BREAK
08270           LD      A,D             ; CHECK IF DONE
08280           OR      E
08290           JP      Z,COMD
08300           CALL    ROM10           ; WRITE LEADER/SYNC BYTE
08310           JR      TDWT1           ; REPEAT TO END
08320 ; *****************************************************
08330 ; *        WRITE TO TAPE FROM DISK FORMAT             *
08340 ; *****************************************************
08350 DTAPWT    LD      A,(TYPEMK)      ; CHECK FILE FORMAT
08360           CP      01              ; SYSTEM FILE
08370           JP      Z;WSYST
08380           CP      04H             ; DATA FILE
08390           JP      Z,TDATWT
08400           CP      03              ; BASIC FILE
08410           JP      Z,DBWT
08420           CP      07              ; ELECTRIC PENCIL FILE
08430           JP      Z,DPENWT
08440           JP      TWT1
08450 ; *****************************************************
08460 ; *        WRITE TAPE FROM DISK SYSTEM FORMAT         *
08470 ; *****************************************************
08480 WSYST     LD      HL,(ENDAD)      ; CHECK IF OFFSET
08490           LD      DE,8000H
08500           OR      A
08510           SBC     HL,DE
08520           JP      P,WSY1
08530           LD      HL,0000
08540           LD      (OFST),HL
08550           LD      HL,(TRFAD)      ; ADJUST ADDRESSES
08560           LD      (OTADR),HL
08570 WSY1      LD      DE,(OFST)
08580           PUSH    DE
08590           LD      DE,TFILE
08600           LD      HL,TBUF
08610           CALL    SYNC
08620           LD      A,55H
08630           CALL    ROM03
08640           LD      B,6
08650 WSY1A     LD      A,(DE)
08660           INC     DE
08670           CALL    ROM03
08680           DJNZ    WSY1A
08690           POP     DE
08700 WSY2      LD      A,(HL)          ; GET ONE BYTE
08710           CP      02              ; CHECK FOR TRANSFER CODE
08720           JP      Z,WSY4
08730           INC     HL
08740           CP      01H             ; CHECK FOR LOADER CODE
08750           JR      NZ,WSY2
08760           LD      A,3CH           ; WRITE BLOCK MARKER
08770           CALL    ROM03           ; WRITE TO TAPE
08780           LD      A,(HL)          ; GET BYTE COUNT
08790           DEC     A               ; ADJUST COUNT
08800           DEC     A
08810           CALL    ROM03           ; WRITE BYTE TO TAPE
08820           INC     HL              ; ADJUST BUFFER PTR
08830           LD      C,(HL)          ; GET LSB OF ADDRESS
08840           INC     HL
08850           LD      B,(HL)          ; GET MSB OF ADDRESS
08860           INC     HL
08870           PUSH    HL
08880           PUSH    BC
08890           POP     HL
08900           ADC     HL,DE           ; ADJUST FOR OFFSET
08910           LD      B,A             ; PUT BYTE COUNT IN B
08920           LD      A,L             ; WRITE LSB TO TAPE
08930           LD      C,A             ; SAVE FOR CHECKSUM
08940           CALL    ROM03
08950           LD      A,H             ; WRITE MSB TO TAPE
08960           CALL    ROM03
08970           ADD     A,C             ; UPDATE CHECKSUM
08980           LD      C,A
08990           POP     HL
09000 WSY3      LD      A,(HL)          ; GET DATA BYTE
09010           CALL    ROM03           ; WRITE TO TAPE
09020           ADD     A,C             ; UPDATE CHECKSUM
09030           LD      C,A
09040           INC     HL
09050           DJNZ    WSY3            ; COMPLETE BLOCK
09060           CALL    ROM03           ; WRITE CHECKSUM
09070           CALL    STAR            ; BLINK STAR
09080           CALL    BREAK
09090           JR      WSY2            ; REPEAT
09100 WSY4      LD      A,78H           ; TAPE TRANSFER CODE
09110           CALL    ROM03           ; WRITE TO TAPE
09120           LD      DE,(OTADR)
09130           LD      A,E             ; LSB TRANS ADDR
09140           CALL    ROM03           ; WRITE TO TAPE
09150           LD      A,D             ; MSB TRANS ADDR
09160           CALL    ROM03           ; WRITE TO TAPE
09170           JP      COMD
09180 ; *****************************************************
09190 ; *     WRITE TO TAPE FROM PENCIL TAPE FORMAT         *
09200 ; *****************************************************
09210 DPENWT    CALL    SYNC            ; WRITE LEADER/SYNC BYTE
09220 DPEN0     LD      A,0FFH          ; WRITE DISK ID
09230           LD      B,A             ; BLOCK BYTE COUNT
```

*Listing 2 continued*

*Listing 2 continued*

```
09240           CALL    ROM03           ; WRITE TO TAPE
09250           LD      C,0             ; SET FOR CHECKSUM
09260 DPEN1     LD      A,(HL)          ; GET BYTE FROM BUFFER
09270           CALL    ROM03           ; WRITE TO TAPE
09280           INC     HL              ; ADJUST BUFFER
09290           DEC     DE              ; DECREMENT COUNT
09300           ADD     A,C             ; SAVE FOR CHECKSUM
09310           LD      C,A
09320           DJNZ    DPEN1           ; WRITE BLOCK
09330           LD      A,C             ; WRITE CHECKSUM
09340           CALL    ROM03
09350           CALL    STAR            ; BLINK STAR
09360           CALL    BREAK
09370           LD      A,D             ; CHECK LAST BLOCK
09380           CP      0
09390           JP      NZ,DPEN0        ; CONTINUE
09400           LD      A,E             ; LOAD BLOCK BYTE COUNT
09410           CP      0
09420           JP      Z,DPEN3
09430           LD      A,E             ; WRITE FINAL BYTE COUNT
09440           CALL    ROM03
09450           LD      B,E             ; PUT IN B REGISTER
09460           LD      C,0             ; SET FOR CHECKSUM
09470 DPEN2     LD      A,(HL)          ; GET BYTE FROM BUFFER
09480           CALL    ROM03           ; WRITE TO TAPE
09490           ADD     A,C             ; ADD TO CHECKSUM
09500           LD      C,A
09510           INC     HL              ; ADJUST BUFFER
09520           DJNZ    DPEN2           ; REPEAT FOR BLOCK
09530           LD      A,C             ; WRITE CHECKSUM
09540           CALL    ROM03
09550 DPEN3     LD      A,0             ; SET EOF BYTE
09560           CALL    ROM03
09570           JP      COMD
09580 ; *****************************************************
09590 ; *          WRITE TAPE FROM BASIC TAPE FORMAT        *
09600 ; *****************************************************
09610 DBWT      CALL    SYNC            ; WRITE LEADER/SYNC BYTE
09620 DBWT1     INC     HL              ; ADJUST BUFFER
09630           DEC     B               ; DECREMENT BYTE COUNT
09640           LD      A,0D3H          ; BASIC ID MARKS (3)
09650           CALL    ROM03           ; WRITE TO TAPE
09660           CALL    ROM03
09670           CALL    ROM03
09680           LD      A,(TFILE)               ; FILENAME FOR ID
09690           CALL    ROM03           ; WRITE TO TAPE
09700           JP      TWT1A           ; JUMP FOR COMPLETION
09710 ;
09720 ; *****************************************************
09730 ; *                                                   *
09740 ; *                READ TAPE ROUTINE                  *
09750 ; *                                                   *
09760 ; *****************************************************
09770 ;
09780 TAPE      CALL    ZBUF            ; ZERO DATA BUFFER
09790           LD      A,0             ; SET FORMAT AS TAPE
09800           LD      (FORMAT),A
09810           LD      HL,TMSG         ; DISPLAY MESSAGE
09820           CALL    DOS1
09830           CALL    CLRSPC          ; CLEAR FCB
09840           DI                      ; DISABLE INTERUPTS
09850 TPLD1     CALL    ROM01           ; KEYBOARD SCAN
09860           CP      0DH             ; CHECK FOR <ENTER>
09870           JR      Z,TPLD2
09880           JR      TPLD1
09890 TPLD2     LD      A,(RECSL)       ; INITIALIZE CASSETTE PORT
09900           CALL    ROM09           ; TURN ON CASSETTE
09910           LD      HL,TBUF         ; SET BUFFER POINTER
09920           LD      DE,FILE         ; SET FCB
09930           CALL    ROM12           ; FIND LEADER & SYNC BYTE
09940           CALL    READ            ; READ BYTE
09950           CP      55H             ; SYSTEM TAPE
09960           JR      Z,SYST
09970           CP      0D3H            ; BASIC/EDTASM TAPE
09980           JP      Z,BASEDT
09990           JP      DATTAP          ; DATA/PENCIL TAPE
10000 ; *****************************************************
10010 ; *               READ SYSTEM TAPE FILE               *
10020 ; *****************************************************
10030 SYST      LD      (HL),A          ; SAVE SYSTEM ID
10040           INC     HL              ; ADJUST BUFFER
10050           LD      B,6H            ; READ FILE NAME
10060 NAME      CALL    READ
10070           LD      (DE),A          ; SAVE IN FCB
10080           LD      (HL),A          ; AND IN DATA BUFFER
10090           INC     DE
10100           INC     HL
10110           DJNZ    NAME            ; GET 6 CHARACTERS
10120           LD      A,03H
10130           LD      (DE),A          ; MARK FILESPEC END
10140 TLOOP     CALL    READ            ; READ UNTIL
10150           CP      3CH             ; BLOCK SYNC FOUND
10160           JR      NZ,TLOOP
10170           LD      (HL),A          ; STORE IN BUFFER
10180           INC     HL              ; ADJUST BUFFER
10190           CALL    READ            ; GET NEXT BYTE
10200           LD      (HL),A
10210           INC     HL
10220           LD      B,A             ; BYTE COUNT
10230           LD      IX,BYTE
10240           LD      (IX),A
10250           CALL    READ            ; READ LSB ADDRESS
10260           LD      (HL),A
10270           INC     HL
10280           LD      E,A
10290           CALL    READ            ; READ MSB ADDRESS
10300           LD      (HL),A
10310           INC     HL
10320           LD      D,A
10330           LD      (OSADR),DE      ; TAPE LOAD ADDRESS
10340           ADD     A,E             ; ADD D+E ADDRESS
10350           LD      C,A             ; AND SAVE FOR CHECKSUM
10360 NXT       CALL    READ            ; READY BYTE
10370           LD      (HL),A          ; STORE IN BUFFER
10380           INC     HL              ; ADJUST BUFFER
10390           ADD     A,C             ; ADD TO CHECKSUM
10400           LD      C,A
10410           DJNZ    NXT             ; COMPLETE BLOCK
10420           CALL    READ            ; GET NEXT BYTE
10430           LD      (HL),A          ; STORE IN BUFFER
10440           INC     HL              ; ADJUST BUFFER
10450           CP      C               ; COMPARE WITH CHECKSUM
10460           JR      Z,BLINK
10470           LD      A,43H           ; IF ERROR, PUT 'C' ON
10480           LD      (3C3EH),A       ;SCREEN IN PLACE OF STAR
10490 BLINK     CALL    ROM11           ; BLINK STAR
10500           CALL    BREAK
10510 TLOOP1    CALL    READ            ; READ NEXT BYTE
10520           CP      78H             ; CHECK EOF MARK
10530           JR      Z,FIN
10540           CP      3CH             ; CHECK BLOCK SYNC
10550           JR      NZ,TLOOP1
10560           LD      (HL),A          ; SAVE IN BUFFER
10570           INC     HL              ; ADJUST BUFFER
10580           CALL    READ            ; READ BYTE COUNT
10590           LD      (HL),A          ; SAVE IN BUFFER
10600           INC     HL              ; ADJUST BUFFER
10610           LD      B,A             ; BYTE COUNT
10620           LD      (IX),A
10630           CALL    READ            ; READ BYTE
10640           LD      (HL),A          ; STORE IN BUFFER
10650           INC     HL              ; ADJUST BUFFER
10660           LD      E,A             ; LSB LOAD ADDRESS
10670           LD      C,A             ; SAVE FOR CHECKSUM
10680           CALL    READ            ; READ BYTE
10690           LD      (HL),A          ; STORE IN BUFFER
10700           INC     HL              ; ADJUST BUFFER
10710           LD      D,A             ; MSB LOAD ADDRESS
10720           ADD     A,C             ; ADD FOR CHECKSUM
10730           LD      C,A
10740 TLOOP2    CALL    READ            ; READ DATA BYTE
10750           LD      (HL),A          ; STORE IN BUFFER
10760           INC     HL              ; ADJUST BUFFER
10770           ADD     A,C             ; ADD FOR CHECKSUM
10780           LD      C,A
10790           DJNZ    TLOOP2          ; COMPLETE BLOCK
10800           CALL    READ            ; READ CHECKSUM
10810           LD      (HL),A
10820           INC     HL
10830           CP      C               ; COMPARE CHECKSUM
10840           JR      Z,BLINK
10850           LD      A,43H           ; CHECKSUM ERROR
10860           LD      (3C3EH),A       ; REPLACE STAR WITH 'C'
10870           JR      BLINK           ; BLINK STAR & CONTINUE
10880 FIN       LD      (HL),A          ; LOAD ENTRY CODE
10890           INC     HL
10900           CALL    READ            ; READ LSB ENTRY ADDRESS
10910           LD      (HL),A
10920           INC     HL
10930           LD      (OTADR),A       ; LSB TRANSFER ADDR
10940           CALL    READ
10950           LD      (HL),A
10960           LD      (OTADR+1),A     ; MSB TRANSFER ADDR
10970           LD      (BUFEND),HL     ; LOAD END OF BUFFER ADR
10980           LD      C,(IX)          ; COMPUTE FILE ENDING
10990           LD      B,0             ; ADDRESS & STORE
11000           PUSH    DE
11010           POP     HL
11020           OR      A
11030           ADC     HL,BC
11040           LD      (OEADR),HL
11050           LD      HL,(OSADR)      ; ADJUST ADDRESSES
11060           LD      (STADR),HL
11070           LD      HL,(OTADR)
11080           LD      (TRFAD),HL
11090           LD      HL,(OEADR)
11100           LD      (ENDAD),HL
11110           LD      A,(OSADR)
11120           CALL    CONV            ; CONVERT TO ASCII FOR
11130           LD      (A2MSG+2),HL    ; DISPLAY
11140           LD      A,(OSADR+1)
11150           CALL    CONV
11160           LD      (A2MSG),HL
11170           LD      A,(OEADR)
11180           CALL    CONV
11190           LD      (A4MSG+2),HL
11200           LD      A,(OEADR+1)
11210           CALL    CONV
11220           LD      (A4MSG),HL
11230           LD      A,(OTADR)
11240           CALL    CONV
11250           LD      (A6MSG+2),HL
11260           LD      A,(OTADR+1)
11270           CALL    CONV
11280           LD      (A6MSG),HL
11290           CALL    BOT             ; CLEAR BOTTOM OF DISPLAY
11300           CALL    TRSPC
11310           LD      HL,TFILE        ; DISPLAY FILE TYPE
11320           CALL    DOS1
11330           LD      A,0DH
11340           CALL    ROM08           ; DISPLAY CARRIAGE RETURN
11350           LD      HL,A1MSG        ; DISPLAY ADDRESSSES
11360           CALL    DOS1
11370           CALL    PBUF            ; DISPLAY BUFFER ADR
```

*Listing 2 continued*

*Listing 2 continued*

```
11380           LD      A,01            ; STORE FILE TYPE ID
11390           LD      (TYPEMK),A
11400           LD      HL,TYPEM1       ; DISPLAY FILE TYPE MSG
11410           CALL    DOS1
11420           JP      COMD
11430 ; *****************************************************
11440 ; *           READ BASIC/EDTASM FILE TYPES            *
11450 ; *****************************************************
11460 BASEDT    LD      (HL),A          ; STORE BYTE IN BUFFER
11470           INC     HL              ; ADJUST BUFFER
11480           CALL    READ            ; READ NEXT BYTE
11490           CP      0D3H            ; CHECK BASIC ID
11500           JP      Z,BASTAP
11510           LD      B,6H            ; PREPARE TO READ EDTASM
11520           JR      EDTNM1
11530 EDTNAM    CALL    READ            ; READ ONE BYTE
11540 EDTNM1    LD      (HL),A          ; STORE IN BUFFER
11550           LD      (DE),A          ; & IN FCB
11560           INC     DE
11570           INC     HL
11580           DJNZ    EDTNAM          ; GET 6 CHARACTERS
11590           LD      A,03H           ; MARK FILESPEC END
11600           LD      (DE),A
11610 EDTNXT    CALL    READ            ; READ ONE BYTE
11620 EDTNX1    LD      (HL),A          ; SAVE IN BUFFER
11630           INC     HL              ; ADJUST BUFFER
11640           CP      0DH             ; LOOK FOR LINE END
11650           JP      NZ,EDTNXT
11660           CALL    ROM11           ; BLINK STAR
11670           CALL    BREAK
11680           CALL    READ            ; READ BYTE
11690           CP      1AH             ; CHECK EOF MARK
11700           JP      NZ,EDTNX1       ; CONTINUE
11710           LD      (HL),A          ; STORE EOF MARK
11720           LD      (BUFEND),HL     ; STORE BUFFER END ADR
11730           LD      A,2             ; STORE FILE TYPE
11740           LD      (TYPEMK),A
11750           CALL    BOT             ; CLEAR BOTTOM OF DISPLAY
11760           CALL    TRSPC
11770           LD      HL,TFILE        ; DISPLAY MESSAGE
11780           CALL    DOS1
11790           LD      A,0DH
11800           CALL    ROM08
11810           CALL    PBUF            ; DISPLAY FILE DATA
11820           LD      HL,TYPEM2
11830           CALL    DOS1
11840           JP      COMD
11850 ; *****************************************************
11860 ; *           READ BASIC TAPE FORMAT                  *
11870 ; *****************************************************
11880 DASTAP    LD      (HL),A          ; STORE BYTE IN BUFFER
11890           INC     HL              ; ADJUST BUFFER
11900           CALL    READ            ; READ NEXT BYTE
11910           LD      (HL),A          ; STORE IN BUFFER
11920           INC     HL              ; ADJUST BUFFER
11930           CALL    READ            ; READ NAME CHARACTER
11940           LD      (HL),A          ; STORE IN BUFFER
11950           INC     HL              ; ADJUST BUFFER
11960           LD      (DE),A          ; STORE IN FCB
11970           INC     DE
11980           LD      A,03H           ; MARK FILESPEC END
11990           LD      (DE),A
12000 BASNXT    CALL    READ            ; READ BYTE
12010 BASNX1    LD      (HL),A          ; STORE IN BUFFER
12020           INC     HL              ; ADJUST BUFFER
12030           CALL    READ            ; READ BYTE
12040           CP      00              ; CHECK END OF LINE
12050           JR      NZ,BASNX1       ; CONTINUE
12060           LD      (HL),A          ; STORE IN BUFFER
12070           INC     HL              ; ADJUST BUFFER
12080           CALL    ROM11           ; BLINK STAR
12090           CALL    BREAK
12100           CALL    READ            ; READ BYTE
12110           CP      00              ; CHECK FOR 2ND NULL CODE
12120           JR      NZ,BASNX1
12130           LD      (HL),A          ; STORE IN BUFFER
12140           INC     HL              ; ADJUST BUFFER
12150           CALL    READ            ; READ BYTE
12160           CP      00              ; EQUALS EOF
12170           JR      NZ,BASNX1
12180           LD      (HL),A          ; STORE IN BUFFER
12190           LD      (BUFEND),HL     ; STORE BUFFER END ADR
12200           LD      A,3             ; STORE FILE TYPE
12210           LD      (TYPEMK),A
12220           CALL    TRSPC
12230           CALL    BOT
12240           LD      HL,TFILE                ; DISPLAY FILENAME
12250           CALL    DOS1
12260           LD      A,0DH
12270           CALL    ROM08
12280           CALL    PBUF            ; DISPLAY BUFFER LOC
12290           LD      HL,TYPEM3       ; DISPLAY FILE TYPE
12300           CALL    DOS1
12310           JP      COMD
12320 ; *****************************************************
12330 ; *           READ DATA FORMAT TAPE                   *
12340 ; *****************************************************
12350 DATTAP    LD      (HL),A          ; STORE IN BUFFER
12360           INC     HL              ; ADJUST BUFFER
12370           CALL    READ            ; READ BYTE
```

*Listing 2 continued*

*Listing 2 continued*

```
12380           CP      0DH             ; CHECK END OF RECORD
12390           JR      NZ,DATTAP
12400           LD      (HL),A          ; STORE IN BUFFER
12410           INC     HL              ; ADJUST BUFFER
12420           CALL    READ            ; CHECK IF PENCIL FORMAT
12430           CP      0
12440           JP      NZ,PENTAP
12450 DATAP1    CALL    DTRD            ; BYPASS LEADER & SYNC
12460           CP      00H             ; CHECK LEADER/SYNC BYTE
12470           JR      Z,DATAP1
12480           CP      0A5H
12490           JR      Z,DATAP1
12500           LD      (HL),A          ; STORE IN BUFFER
12510           INC     HL              ; ADJUST BUFFER
12520           JR      DATAP1
12530 ; ***************************************************
12540 ; MODEL I ROUTINE
12550 DTRD1     PUSH    HL
12560           LD      B,8H            ; GET 8 BITS
12570 DT2       PUSH    BC
12580           PUSH    AF
12590           LD      C,0             ; SET TIMEOUT COUNTER
12600 DT3       LD      B,0H
12610 DT4       IN      A,(0FFH)        ; LOOK FOR DATA
12620           RLA                     ; SHIFT TO CARRY
12630           JR      C,DT5
12640           DEC     C
12650           JR      Z,DT9           ; CHECK FOR TIMEOUT
12660           JR      DT3
12670 DT5       LD      B,41H           ; DELAY
12680 DT6       DJNZ    DT6
12690           CALL    ROM13           ; RESET CASSETTE RELAY
12700           LD      B,50H           ; DELAY
12710 DT7       DJNZ    DT7
12720           LD      B,14H           ; PREPARE FOR BITS
12730 DT8       IN      A,(0FFH)
12740           DJNZ    DT8
12750           LD      B,A             ; SAVE IN B
12760           POP     AF
12770           RL      B
12780           RLA                     ; SHIFT TO A IN CARRY
12790           PUSH    AF
12800           CALL    ROM13           ; RESET CASSETTE RELAY
12810           POP     AF
12820           POP     BC
12830           DJNZ    DT2
12840           POP     HL
12850           PUSH    AF
12860           CALL    BREAK
12870           POP     AF
12880           RET
12890 DT9       POP     AF              ; RESTORE STACK
12900           POP     BC
12910           POP     HL
12920           POP     BC
12930           DEC     HL
12940           LD      (BUFEND),HL     ; SAVE END OF BUFFER
12950           CALL    BOT             ; CLEAR BOTTOM OF SCREEN
12960           CALL    PBUF            ; DISPLAY ADDRESSES
12970           LD      A,4H            ; STORE FILE TYPE
12980           LD      (TYPEMK),A
12990           LD      HL,TYPEM4       ; DISPLAY FILE TYPE
13000           CALL    DOS1
13010           JP      COMD
13020 ; ***************************************************
13030 ; MODEL III ROUTINE
13040 DTRD3     LD      B,8H            ; GET 8 BITS
13050           LD      C,0H            ; PREPARE TO PUT IN C
13060 DT20      LD      DE,0000H        ; ZERO TIMEOUT COUNTER
13070           PUSH    BC
13080 DT30      DEC     DE              ; DECREMENT COUNTER
13090           LD      A,D             ; CHECK TIME OUT
13100           OR      E
13110           JR      Z,DT90
13120 DT40      IN      A,(0FFH)        ; SEARCH FOR DATA
13130           RLA
13140           JR      NC,DT30
13150           LD      B,6EH           ; DELAY
13160 DT50      DJNZ    DT50
13170           XOR     A               ; RESET CASSETTE RELAY
13180           OUT     (0FFH),A
13190           LD      B,98H
13200 DT60      DJNZ    DT60            ; DELAY
13210           IN      A,(0FFH)        ; GET BIT
13220           POP     BC
13230           RLA                     ; ROTATE IN CARRY
13240           RL      C               ; ROTATE TO C
13250           XOR     A
13260           OUT     (0FFH),A
13270           DJNZ    DT20            ; GET 8 BITS
13280           LD      A,C             ; PUT IN A
13290           RET
13300 DT90      POP     BC              ; RESTORE STACK
13310           DEC     HL
13320           LD      (BUFEND),HL     ; STORE END OF BUFFER
13330           CALL    BOT             ; CLEAR BOTTOM OF SCREEN
13340           CALL    PBUF            ; DISPLAY ADDRESSES
13350           LD      A,4H            ; MARK FILETYPE
13360           LD      (TYPEMK),A
13370           LD      HL,TYPEM4       ; DISPLAY FILE TYPE
```

*Listing 2 continued*



See List of Advertisers on Page 227

*Listing 2 continued*

```
13380           CALL    DOS1
13390           JP      COMD
13400 ; *******************************************************
13410 ; *               READ PENCIL TAPE FORMAT                 *
13420 ; *******************************************************
13430 PENTAP    LD      (HL),A          ; STORE IN BUFFER
13440           INC     HL              ; ADJUST BUFFER
13450           CALL    READ            ; READ BYTE
13460           CP      00              ; CHECK FOR EOF
13470           JR      Z,PENTP1
13480           DJNZ    PENTAP          ; COMPLETE BLOCK
13490           LD      (HL),A          ; STORE IN BUFFER
13500           INC     HL              ; ADJUST BUFFER
13510           CALL    ROM11           ; BLINK STAR
13520           CALL    BREAK
13530           LD      B,0
13540           CALL    READ            ; READ NEXT BYTE
13550           JR      PENTAP          ; CONTINUE
13560 PENTP1    LD      (HL),A          ; STORE IN BUFFER
13570           INC     HL              ; ADJUST BUFFER
13580           CALL    READ            ; READ BYTE
13590           LD      (HL),A          ; STORE IN BUFFER
13600           INC     HL              ; ADJUST BUFFER
13610           CALL    READ            ; READ BYTE
13620           LD      (HL),A          ; STORE IN BUFFER
13630           LD      (BUFEND),HL     ; STORE BUFFER END ADR
13640           LD      A,7             ; STORE FILE TYPE
13650           LD      (TYPEMK),A
13660           CALL    BOT             ; CLEAR BOTTOM OF DISPLAY
13670           CALL    PBUF            ; DISPLAY BUFFER INFO
13680           LD      HL,TYPEM7       ; DISPLAY FILE TYPE
13690           CALL    DOS1
13700           JP      COMD
13710 ; *******************************************************
13720 ; *                                                     *
13730 ; *               BUFFER CHANGE ROUTINE                 *
13740 ; *                                                     *
13750 ; *******************************************************
13760 ;
13770 BUFCHG    LD      HL,BUFMSG       ; DISPLAY MESSAGE
13780           CALL    DOS1
13790 BC1       CALL    ROM01           ; KEYBOARD SCAN
13800           CP      00
13810           JR      Z,BC1
13820           CALL    ROM08           ; DISPLAY KEY
13830           LD      E,A             ; SAVE BYTE
13840 BC2       CALL    ROM01           ; KEYBOARD SCAN
13850           CP      00
13860           JR      Z,BC2
13870           CALL    ROM08           ; DISPLAY KEY
13880           SUB     30H             ; ADJUST FOR ASCII
13890           ADD     A,A             ; TIMES 10
13900           LD      C,A
13910           ADD     A,A
13920           ADD     A,A
13930           ADD     A,A
13940           LD      C,A             ; SAVE IN C
13950 BC3       CALL    ROM01           ; KEYBOARD SCAN
13960           CP      00
13970           JR      Z,BC3
13980           CALL    ROM08           ; DISPLAY KEY
13990           SUB     30H             ; ADJUST & STORE
14000           ADD     A,C
14010           LD      C,A
14020           LD      B,0
14030           LD      HL,(BUFEND)
14040           LD      A,E
14050           CP      2DH             ; CHECK +/-
14060           JP      Z,BUFCG2
14070           CP      2BH
14080           JP      NZ,BUFCHG
14090           ADC     HL,BC
14100           LD      (BUFEND),HL     ; ADJUST BUFFER END
14110           LD      A,0DH
14120           CALL    ROM08
14130           JP      COMD
14140 BUFCG2    SBC     HL,BC           ; ADJUST BUFFER END
14150           LD      (BUFEND),HL
14160           LD      A,0DH
14170           CALL    ROM08
14180           JP      COMD
14190 ;
14200 ; *******************************************************
14210 ; *                                                     *
14220 ; *               HARDCOPY ROUTINE                      *
14230 ; *                                                     *
14240 ; *******************************************************
14250 ;
14260 PBF       LD      HL,(BUFEND)     ; CALCULATE FILE SIZE
14270           LD      DE,TBUF
14280           OR      A
14290           SBC     HL,DE
14300           LD      DE,TBUF         ; SET DATA BUFFER
14310 PBF1      LD      IX,PRNTBF       ; SET PRINT BUFFER
14320           LD      IY,PRNTB1
14330           LD      B,16            ; READ 16 BYTES
14340 PBF2      LD      A,(DE)          ; GET ONE BYTE
14350           LD      C,A             ; PUT IN C
14360           PUSH    HL              ; SAVE REGISTERS
14370           PUSH    BC
14380           CALL    CONV            ; CONVERT TO ASCII
14390           LD      A,L             ; PUT ASCII CHARACTER
14400           LD      (IX),A          ; INTO PRINT BUFFER
14410           INC     IX              ; ADVANCE BUFFER PTR
14420           LD      A,H             ; PUT 2ND ASCII CHAR
14430           LD      (IX),A          ; INTO PRINT BUFFER
14440           INC     IX              ; ADVANCE BUFFER
14450           LD      A,20H           ; PUT SPACE INTO BUF
14460           LD      (IX),A
14470           INC     IX
14480           POP     BC              ; RESTORE REGISTERS
14490           POP     HL
14500           LD      A,C             ; CHECK FOR PRINTABLE
14510           CP      20H             ; HEX CODES
14520           JP      M,PBF4          ; IF NOT, USE PERIOD
14530           CP      7FH
14540           JP      P,PBF4
14550           JR      PBF5
14560 PBF3      INC     DE              ; ADVANCE BUFFER
14570           DEC     HL              ; DECREMENT COUNTER
14580           LD      A,H             ; CHECK END OF TEXT
14590           OR      L
14600           JR      Z,PBF3A
14610           DJNZ    PBF2            ; COMPLETE LINE
14620 PBF3A     PUSH    HL              ; SAVE REGISTERS
14630           PUSH    DE
14640           LD      HL,PRNTBF       ; SET PRINT BUFFER
14650           CALL    DOS8            ; AND PRINT IT
14660           POP     DE              ; RESTORE REGISTERS
14670           POP     HL
14680           CALL    BREAK
14690           LD      A,H             ; CHECK FOR EOF
14700           OR      L
14710           JP      Z,COMD
14720           JP      PBF1
14730 PBF4      LD      A,2EH           ; LOAD PERIOD INTO BUFFER
14740           LD      (IY),A
14750           INC     IY
14760           JP      PBF3
14770 PBF5      LD      (IY),A          ; LOAD ASCII CHARACTER
14780           INC     IY              ; INTO BUFFER
14790           JP      PBF3
14800 ;
14810 ; *******************************************************
14820 ; *               TAPE SUBROUTINES                      *
14830 ; *******************************************************
14840 READI     PUSH    BC              ; SAVE REGISTERS
14850           PUSH    HL
14860           LD      B,08H           ; FOR 8 BITS
14870 READ1     PUSH    BC
14880           PUSH    AF
14890 READ2     IN      A,(0FFH)        ; LOOK FOR BIT
14900           RLA                     ; SHIFT LEFT
14910           JR      NC,READ2
14920           LD      B,41H           ; DELAY LOOP
14930 READ3     DJNZ    READ3
14940           CALL    ROM13           ; PERFORMS OUT 0FFH
14950           LD      B,50H           ; DELAY LOOP
14960 READ4     DJNZ    READ4
14970           LD      B,14H           ; DELAY LOOP
14980 READ5     IN      A,(0FFH)
14990           DJNZ    READ5
15000           LD      B,A
15010           POP     AF
15020           RL      B
15030           RLA                     ; SHIFT LEFT
15040           PUSH    AF
15050           CALL    ROM13           ; PERFORMS OUT 0FFH
15060           POP     AF
15070           POP     BC
15080           DJNZ    READ1           ; REPEAT FOR 8 BITS
15090           POP     HL              ; RESTORE REGISTERS
15100           POP     BC
15110           RET
15120 ; *******************************************************
15130 STAR      LD      A,(3C3FH)       ; BLINK STAR
15140           XOR     0AH
15150           LD      (3C3FH),A
15160           RET
15170 ; *******************************************************
15180 SYNC      DI                      ; DISABLE INTERUPTS
15190           PUSH    BC
15200           LD      A,2AH           ; PUT STAR ON SCREEN
15210           LD      (3C3EH),A
15220           LD      A,(RECSL)       ; INITIALIZE RECORDER
15230           CALL    ROM09
15240           CALL    ROM10           ; WRITE LEADER/SYNC BYTE
15250           POP     BC
15260           RET
15270 ;
15280 RESET     DB      0C9H
15290           LD      A,4H    ; RESET MIII INTERRUPT
15300           OUT     (0E0H),A
15310           LD      A,40H   ; OUTPUT NEW MASK
15320           LD      (4210H),A
15330           OUT     (0ECH),A
15340           EI
15350           RET
15360 ;
15370 ; *******************************************************
15380 ; *               CONVERT TO ASCII                      *
15390 ; *******************************************************
15400 CONV      LD      C,A             ; SAVE IN C
15410           SRL     A               ; SHIFT HIGH NYBBLE TO A
15420           SRL     A
15430           SRL     A
15440           SRL     A
15450           CALL    CHECK
15460           LD      L,A             ; SAVE IN L
15470           LD      A,C             ; RESTORE BYTE IN A
15480           AND     0FH             ; MASK LOW NYBBLE
15490           CALL    CHECK
15500           LD      H,A             ; STORE IN H
15510           RET
```

*Listing 2 continued*

*Listing 2 continued*

```
15520 CHECK   ADD     A,30H           ; ADJUST FOR ASCII
15530         CP      3AH             ; IF OVER 39
15540         RET     M
15550         ADD     A,7             ; ADJUST A-F CODES
15560         RET
15570 ; ******************************************************
15580 ; *             DISK SUBROUTINES                       *
15590 ; ******************************************************
15600 ERCK    OR      80H             ; CHECK FOR DOS ERROR
15610         CALL    DOS6            ; DISPLAY ERROR MESSAGE
15620         JP      COMD
15630 ; ******************************************************
15640 UPRCAS  LD      DE,FILE         ; CONVERT FILESPEC TO
15650         LD      B,24            ; UPPERCASE CHARACTERS
15660 UC1     LD      A,(DE)
15670         CP      60H
15680         JR      C,UC2
15690         SUB     20H
15700 UC2     LD      (DE),A
15710         INC     DE
15720         DJNZ    UC1
15730         RET
15740 ; ******************************************************
15750 ; *           GENERAL SUBROUTINES                      *
15760 ; ******************************************************
15770 LINP    LD      HL,INST         ; INPUT ROUTINE
15780         LD      A,20H           ; PUT SPACES IN BUFFER
15790         LD      B,2CH
15800 CLR     LD      (HL),A
15810         INC     HL
15820         DJNZ    CLR
15830 LINP1   LD      HL,INST         ; SET BUFFER ADDRESS
15840         LD      B,2CH           ; MAXIMU NO. CHARACTERS
15850         CALL    ROM15           ; KEYBOARD INPUT ROUTINE
15860         JR      C,LINP1         ; CONTINUE
15870         DEC     B
15880         JP      M,LINP1
15890         LD      HL,INST
15900         DEC     HL
15910         LD      DE,FILE         ; TRANSFER TO FCB
15920 LIN     INC     HL
15930         LD      A,(HL)
15940         LD      (DE),A
15950         INC     DE
15960         CP      0DH
15970         JR      NZ,LIN
15980         RET
```

*End*

*Program Listing 3. Source code for SuperCop II.*

```
15990 *LIST ON        ;
16000 ; ******************************************************
16010 CLRSPC  LD      B,8             ; CLEAR FILESPEC
16020         LD      A,20H           ; WITH SPACES
16030         LD      HL,FILE
16040 CS2     LD      (HL),A
16050         INC     HL
16060         DJNZ    CS2
16070         LD      A,20H           ; CLEAR TAPE FILE NAME
16080         LD      B,6             ; WITH SPACES
16090         LD      IX,TFILE
16100 CTSPC   LD      (IX),A
16110         INC     IX
16120         DJNZ    CTSPC
16130         LD      A,03H           ; END MARK
16140         LD      (IX),A
16150         RET
16160 ; ******************************************************
16170 PBUF    LD      DE,TBUF         ; DISPLAY FILE LOCATION
16180         LD      A,E             ; IN BUFFER
16190         CALL    CONV            ; CONVERT TO ASCII
16200         LD      (B1MSG+2),HL    ; STORE IN MESSAGE
16210         LD      A,D
16220         CALL    CONV
16230         LD      (B1MSG),HL
16240         LD      A,(BUFEND)
16250         CALL    CONV
16260         LD      (B2MSG+2),HL
16270         LD      A,(BUFEND+1)
16280         CALL    CONV
16290         LD      (B2MSG),HL
16300         LD      HL,(BUFEND)     ; DETERMINE FILE LENGTH
16310         LD      DE,TBUF
16320         SBC     HL,DE
16330         LD      A,H
16340         INC     A
16350         LD      C,5             ; 5 SECTORS = 1 GRAN
16360         LD      B,0
16370 GRN     INC     B               ; CALCULATE GRANS REQD
16380         SUB     C
16390         JP      P,GRN
16400         LD      A,B
16410         LD      B,0
16420         LD      C,10
16430 GRN2    INC     B
16440         SUB     C
16450         JR      Z,GRN3
16460         JP      P,GRN2
16470         DEC     B
16480         ADD     A,C
16490 GRN3    ADD     A,30H           ; CONVERT TO ASCII
16500         LD      (GRAN+1),A      ; & STORE IN MESSAGE
16510         LD      A,B
16520         ADD     A,30H
16530         LD      (GRAN),A
16540         LD      HL,BMSG         ; DISPLAY MESSAGE
16550         CALL    DOS1
16560         RET
16570 ; ******************************************************
16580 TRSPC   LD      B,6             ; TRANSFER TAPE FILE
16590         LD      IX,FILE         ; NAME TO FCB
16600         LD      IY,TFILE
16610 TRSPC1  LD      A,(IX)
16620         CP      2FH             ; EXTENSION MARK
16630         RET     Z
16640         CP      03H             ; CHECK EOT MARK
16650         RET     Z
16660         CP      0DH             ; CARRIAGE RETURN
16670         RET     Z
16680         LD      (IY),A          ; MOVE CHARACTER
16690         INC     IX
16700         INC     IY
16710         DJNZ    TRSPC1
16720         RET
16730 ; ******************************************************
16740 OFTST   LD      HL,0000         ; CHECK IF FILE HAS
16750         LD      (OFST),HL       ; OFFSET
16760         LD      HL,(BUFEND)
16770         LD      BC,0012H        ; LOOK 12 BYTES BEFORE
16780         OR      A               ; BLOCK END
16790         SBC     HL,BC
16800         PUSH    HL
16810         POP     IX
16820         LD      A,(IX+10)       ; FOR BLOCK MOVE CODE
16830         CP      0EDH
16840         RET     NZ
16850         LD      A,(IX+11)
16860         CP      0B0H
16870         RET     NZ
16880         LD      L,(IX+5)        ; GET NORMAL START ADDR
16890         LD      H,(IX+6)
16900         LD      (OSADR),HL
16910         LD      C,(IX+8)        ; GET MOVE BYTE COUNT
16920         LD      B,(IX+9)
16930         LD      E,(IX+13)       ; GET NORMAL ENTRY ADR
16940         LD      D,(IX+14)
16950         LD      (OTADR),DE
16960         LD      E,(IX+2)        ; CALCULATE NORMAL
16970         LD      D,(IX+3)        ; END ADDRESS
16980         PUSH    HL
16990         OR      A
17000         SBC     HL,DE
17010         LD      (OFST),HL
17020         POP     HL
17030         OR      A
17040         ADC     HL,BC
17050         LD      (OEADR),HL      ; STORE END ADDRESS
17060         LD      A,(OSADR)       ; CONVERT ADDRESSES
17070         CALL    CONV            ; TO ASCII FOR DISPLAY
17080         LD      (O1MSG+2),HL    ; & STORE IN MESSAGE
17090         LD      A,(OSADR+1)
17100         CALL    CONV
17110         LD      (O1MSG),HL
17120         LD      A,(OEADR)
17130         CALL    CONV
17140         LD      (O3MSG+2),HL
17150         LD      A,(OEADR+1)
17160         CALL    CONV
17170         LD      (O3MSG),HL
17180         LD      A,(OTADR)
17190         CALL    CONV
17200         LD      (O5MSG+2),HL
17210         LD      A,(OTADR+1)
17220         CALL    CONV
17230         LD      (O5MSG),HL
17240         LD      HL,(OSADR)
17250         LD      DE,(STADR)
17260         OR      A
17270         SBC     HL,DE
17280         LD      (OFST),HL       ; CALCULATE OFFSET
17290         LD      HL,OMSG         ; DISPLAY MESSAGE
17300         CALL    DOS1
17310         RET
17320 ; ******************************************************
17330 BOT     CALL    RESET
17340         LD      HL,3E80H        ; CLEAR BOTTOM OF SCREEN
17350         LD      (4020H),HL      ; CURSOR ADDRESS
17360         LD      A,1FH           ; CLEAR FROM CURSOR TO
17370         CALL    ROM08           ; END OF SCREEN
17380         LD      HL,3E80H        ; SET CURSOR LOCATION
17390         LD      (4020H),HL
17400         RET
17410 ; ******************************************************
17420 INTRO   CALL    ROM04           ; CLEAR SCREEN
17430         LD      HL,3C07H        ; LOAD LOGO
17440         LD      IX,SUPDIS
17450         LD      B,48            ; TOP HALF
17460 INTLP   LD      A,(IX)
17470         LD      (HL),A
17480         INC     HL
17490         INC     IX
17500         DJNZ    INTLP
17510         LD      HL,3C47H
17520         LD      B,48            ; BOTTOM HALF
17530 INTLP2  LD      A,(IX)
17540         LD      (HL),A
17550         INC     HL
17560         INC     IX
17570         DJNZ    INTLP2
17580         LD      HL,3D00H        ; SET CURSOR LOCATION
17590         LD      (4020H),HL
```

*Listing 3 continued*

*Listing 3 continued*

```
17600           LD      HL,MSGCOM       ; DISPLAY COMMAND MENU
17610           CALL    DOS1
17620           LD      HL,MSGC1
17630           CALL    DOS1
17640           LD      HL,MSGC2
17650           CALL    DOS1
17660           LD      HL,MSGC3
17670           CALL    DOS1
17680           LD      HL,MSGC4
17690           CALL    DOS1
17700           LD      HL,3C80H
17710           LD      DE,0064
17720           LD      A,149           ; DRAW BAR
17730           CALL    BAR
17740           LD      A,170           ; DRAW BAR
17750           LD      HL,3CBFH
17760           CALL    BAR
17770           LD      HL,3C9FH        ; DRAW BAR
17780           CALL    BAR
17790           LD      HL,3C80H
17800           LD      B,40H
17810           LD      A,131
17820 ILLOOP    LD      (HL),A          ; DRAW LINE
17830           INC     HL
17840           DJNZ    ILLOOP
17850           LD      HL,3E40H
17860           LD      B,40H
17870           LD      A,131
17880 ILOOP     LD      (HL),A          ; DRAW LINE
17890           INC     HL
17900           DJNZ    ILOOP
17910           LD      A,151
17920           LD      HL,3C80H
17930           LD      (HL),A
17940           LD      A,171
17950           LD      HL,3CBFH
17960           LD      (HL),A
17970           LD      HL,3C9FH
17980           LD      (HL),A
17990           LD      HL,3E00H                ; SET CURSOR
18000           LD      (4020H),HL
18010           RET
18020 ; ********************************************************
18030 SUPDIS    DEFB    151     ; SUPERCOP II DISPLAY
18040           DEFB    163
18050           DEFB    179
18060           DEFB    179
18070           DEFB    179
18080           DEFB    187
18090           DEFB    151     ;U
18100           DEFB    171
18110           DEFB    191
18120           DEFB    191
18130           DEFB    151
18140           DEFB    171
18150           DEFB    151     ;P
18160           DEFB    163
18170           DEFB    179
18180           DEFB    179
18190           DEFB    147
18200           DEFB    171
18210           DEFB    151     ;E
18220           DEFB    163
18230           DEFB    179
18240           DEFB    179
18250           DEFB    179
18260           DEFB    187
18270           DEFB    151     ;R
18280           DEFB    163
18290           DEFB    179
18300           DEFB    179
18310           DEFB    147
18320           DEFB    171
18330           DEFB    151     ;C
18340           DEFB    163
18350           DEFB    179
18360           DEFB    179
18370           DEFB    179
18380           DEFB    191
18390           DEFB    151     ;O
18400           DEFB    163
18410           DEFB    179
18420           DEFB    179
18430           DEFB    131
18440           DEFB    191
18450           DEFB    151     ;P
18460           DEFB    163
18470           DEFB    179
18480           DEFB    179
18490           DEFB    147
18500           DEFB    171
18510           DEFB    157     ;LOWER ROW,S
18520           DEFB    140
18530           DEFB    140
18540           DEFB    140
18550           DEFB    132
18560           DEFB    170
18570           DEFB    149     ;U
18580           DEFB    138
18590           DEFB    143
18600           DEFB    143
18610           DEFB    133
18620           DEFB    170
18630           DEFB    149     ;P
18640           DEFB    168
18650           DEFB    188
```

*Listing 3 continued*

*Listing 3 continued*

```
18660           DEFB    188
18670           DEFB    188
18680           DEFB    190
18690           DEFB    149     ;E
18700           DEFB    136
18710           DEFB    142
18720           DEFB    143
18730           DEFB    143
18740           DEFB    175
18750           DEFB    149     ;R
18760           DEFB    168
18770           DEFB    188
18780           DEFB    188
18790           DEFB    144
18800           DEFB    174
18810           DEFB    149     ;C
18820           DEFB    138
18830           DEFB    143
18840           DEFB    143
18850           DEFB    143
18860           DEFB    191
18870           DEFB    149     ;O
18880           DEFB    138
18890           DEFB    143
18900           DEFB    143
18910           DEFB    128
18920           DEFB    191
18930           DEFB    149     ;P
18940           DEFB    168
18950           DEFB    188
18960           DEFB    188
18970           DEFB    188
18980           DEFB    190
18990 ; *****************************************************
19000 BAR       LD      B,7             ; DRAWS VERT. BAR
19010 BAR2      LD      (HL),A
19020           ADC     HL,DE
19030           DJNZ    BAR2
19040           RET
19050 ; *****************************************************
19060 BREAK     LD      A,(3840H)       ; CHECK FOR <BREAK> KEY
19070           CP      04H
19080           RET     NZ
19090           JP      COMD
19100 ; *****************************************************
19110 DISP      LD      A,(HL)          ; DISPLAY MESSAGE
19120           INC     HL
19130           CALL    033AH
19140           CP      03H
19150           RET     Z
19160           CP      0DH
19170           RET     Z
19180           JR      DISP
19190 ; *****************************************************
19200 ZBUF      LD      HL,(4049H)      ; GET HIMEM ADDRESS
19210           DEC     HL
19220           LD      DE,TBUF         ; GET DATA BUFFER ADDR
19230           OR      A
19240           SBC     HL,DE           ; CALCULATE BYTE COUNT
19250 ZBUF1     LD      A,0             ; ZERO BUFFER
19260           LD      (DE),A
19270           INC     DE
19280           DEC     HL
19290           LD      A,H
19300           OR      L
19310           JR      NZ,ZBUF1
19320           CALL    BOT             ; CLEAR BOTTOM OF DISPLAY
19330           RET
19340 ; *****************************************************
19350 PTRIII    LD      A,(HL)          ; MODEL III HARDCOPY
19360           INC     HL              ; ROUTINE
19370           CALL    ROM16           ; PRINT ONE BYTE
19380           CP      0DH
19390           RET     Z
19400           JR      PTRIII
19410 ; *****************************************************
19420 CHG3      CALL    BOT             ; CLEAR BOTTON OF SCREEN
19430           CALL    3042H           ; HIGH/LOW CASS SELECTION
19440           JP      COMD
19450 ; *****************************************************
19460 ; *                                                   *
19470 ; *               JUMP AND EQUATE AREA                *
19480 ; *                                                   *
19490 ; *****************************************************
19500 ;
19510 ROM01     EQU     035BH   ; KEYBOARD SCAN
19520 ROM02     EQU     001BH   ; WRITE ONE BYTE TO DISK
19530 ROM03     EQU     0264H   ; WRITE ONE BYTE TO CASSETTE
19540 ROM04     EQU     01C9H   ; CLEAR SCREEN
19550 ROM05     EQU     0013H   ; READ ONE BYTE FROM DISK
19560 ROM06     EQU     01F8H   ; TURN CASSETTE OFF
19570 ROM07     EQU     0033H   ; DISPLAY BYTE AT CURSOR
19580 ROM08     EQU     033AH   ; DISPLAY BYTE AT CURSOR
19590 ROM09     EQU     0212H   ; SELECT RECORDER 1 OR 2
19600 ROM10     EQU     0287H   ; WRITE LEADER AND SYNC BYTE
19610 ROM11     EQU     022CH   ; BLINK STAR ON DISPLAY
19620 ROM12     EQU     0296H   ; FIND SYNC BYTE
19630 ROM13     JP      021EH   ; CLEAR CASSETTE FLAG
19640 ROM14     EQU     0235H   ; READ BYTE FROM CASSETTE
19650 ROM15     EQU     05D9H   ; KEYBOARD INPUT ROUTINE
19660 ROM16     EQU     003BH   ; SEND ONE BYTE TO PRINTER
19670 ;
19680 DOS1      JP      DISP    ; DISPLAY MESSAGE ON VIDEO
19690 DOS2      JP      4419H   ; NEWDOS80 DOS CALL
19700 ;                           MODEL III USE 429CH
19710 DOS3      JP      4405H   ; RETURN TO DOS WITH COMMAND
```

*Listing 3 continued*

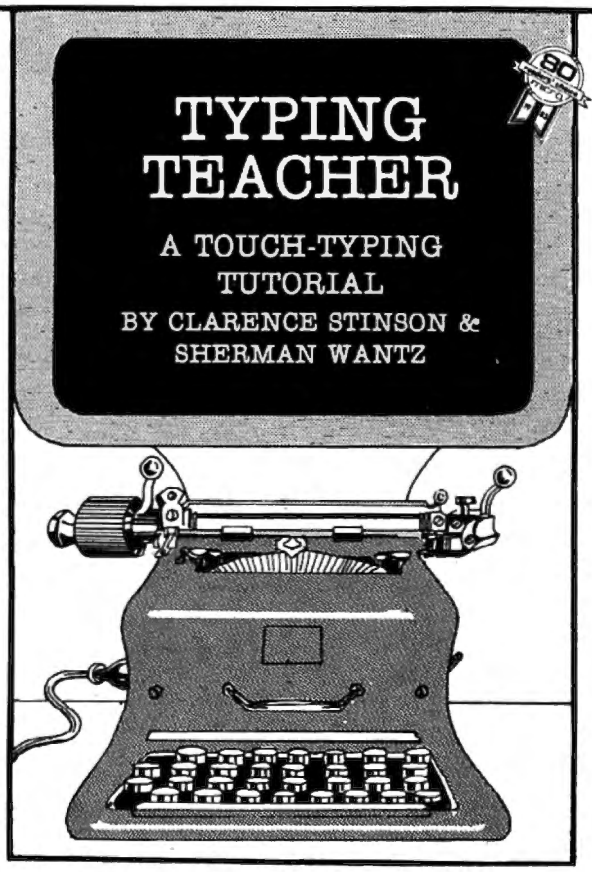
*Listing 3 continued*

```
19720 ;                              MODEL III USE 4299H
19730 DOS4     EQU     4424H   ; OPEN EXISTING FILE
19740 DOS5     EQU     4428H   ; CLOSE FILE
19750 DOS6     EQU     4409H   ; DISPLAY DOS ERROR MESSAGE
19760 DOS7     EQU     4420H   ; OPEN NEW FILE
19770 DOS8     JP      PTRIII  ; SEND LINE TO PRINTER
19780 DOS9     EQU     440DH   ; ENTER DEBUG
19790 READ     JP      READI  ; MODEL I TAPE READ
19800 RDBYT    JP      RDBYT1  ; MODEL I ROUTINE
19810 DTRD     JP      DTRD1   ; MODEL I ROUTINE
19820 ;
19830 ; ********************************************************
19840 ; *                                                      *
19850 ; *              DISPLAY MESSAGE AREA                    *
19860 ; *                                                      *
19870 ; ********************************************************
19880 ;
19890 AMSG     DEFM    'INPUT DISC FILESPEC'
19900          DEFB    0DH
19910 CASMSG   DEFM    'WHICH CASSETTE IS TO BE USED (1 OR 2)?'
19920          DEFB    0DH
19930 TWMSG    DEFM    'INSERT TAPE AND PRESS RECORD & PLAY.'
19940          DEFM    '  <ENTER>'
19950          DEFB    0DH
19960 MSGCOM   DEFM    '  D   LOAD DISK FILE                  T'
19970          DEFM    '   LOAD TAPE FILE'
19980          DEFB    0DH
19990 MSGC1    DEFM    '  W   WRITE TO DISK                   P'
20000          DEFM    '   WRITE TO TAPE'
20010          DEFB    0DH
20020 MSGC2    DEFM    '  B   ENTER DEBUG                     E'
20030          DEFM    '   EXIT TO DOS'
20040          DEFB    0DH
20050 MSGC3    DEFM    '  S   LOAD SPECIAL TAPE               R'
20060          DEFM    '   RECORDER SELECT'
20070          DEFB    0DH
20080 MSGC4    DEFM    '  H   HARD COPY                       A'
20090          DEFM    '   ADJUST BUFFER'
20100          DEFB    0DH
20110 OMSG     DEFM    'PROGROM IS OFFSET.          NORMAL LOAD '
20120 O1MSG    DEFM    'XXXX'
20130 O2MSG    DEFM    ' - '
20140 O3MSG    DEFM    'XXXX'
20150 O4MSG    DEFM    ', ENTRY = '
20160 O5MSG    DEFM    'XXXX'
20170          DEFB    03H
20180 TYPEM4   DEFM    'DATA FILE'
20190          DEFB    0DH
20200 TYPEM2   DEFM    'EDTASM SOURCE FILE '
20210          DEFB    0DH
20220 TYPEM3   DEFM    'BASIC FILE '
20230          DEFB    0DH
20240 TYPEM1   DEFM    'OBJECT FILE '
20250          DEFB    0DH
20260 TYPEM6   DEFM    'BASIC ASCII FILE'
20270          DEFB    0DH
20280 TYPEM7   DEFM    'ELECTRIC PENCIL FILE'
20290          DEFB    0DH
20300 TMSG     DEFM    'INSERT TAPE & PRESS PLAY.  <ENTER>'
20310          DEFB    0DH
20320 A1MSG    DEFM    'START ADDRESS = '
20330 A2MSG    DEFM    'XXXX'
20340 A3MSG    DEFM    '   END ADDRESS = '
20350 A4MSG    DEFM    'XXXX'
20360 A5MSG    DEFM    '   ENTRY ADDRESS = '
20370 A6MSG    DEFM    'XXXX'
20380          DEFB    03H
20390 BMSG     DEFM    'FILE IS IN BUFFER AT LOCATIONS '
20400 B1MSG    DEFM    'XXXX'
20410          DEFM    ' TO '
20420 B2MSG    DEFM    'XXXX.  '
20430 GRAN     DEFM    'XX GRANS.'
20440          DEFB    0DH
20450 BUFMSG   DEFM    'BYTES TO ADD/DELETE (+/-)?'
20460          DEFB    0DH
20470 PATCH    DEFS    50              ; 50 BYTE PATCH AREA
20480 TBUF     EQU     $               ; DATA BUFFER AREA
20490 ;
20500 ; ********************************************************
20510 ;
20520          END     START
```

*End*

```
00005 *LIST OFF
00010 *GET    SUP1/SRC
00015 *LIST OFF
00020 *GET    SUP2/SRC
00025 *LIST OFF
00030 *GET    SUP3/SRC
00040         END     START
```

*Program Listing 4. Assembling program for Listings 1-3.*

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# Form-matters

by John and Aileen Cornman

Text, the Model 100's word processing program, is handy for portable word processing, but it lacks many of the features necessary to prepare custom-formatted documents like letters.

If you have a Model III and Scripsit, you can use our Basic program, Forms, to design final documents by embedding Scripsit formatting codes in your Model 100 text files (see Program Listing 1).

Forms converts Model 100 Text file tapes to Model III Scripsit tapes. It also converts certain Model 100 characters to Scripsit text boundary markers and strips off the extra line feeds the Model 100 invokes after a carriage return.

## Installing the Program

In addition to the object code for Forms, Listing 1 contains a Model 100-to-Scripsit loader that installs Forms in your Model III. This Basic program automatically adjusts the machine-language instructions in Forms for the amount of memory in your machine.

As a result, Forms runs on 16K, 32K, and 48K machines without modification. The loader helps you find mistyped hexadecimal (hex) codes in the data statements and computes a checksum to ensure accuracy.

## Running the Loader

To load Forms, turn on your Model III and answer the memory size prompt with 31953 for a 16K machine, 48337 for a 32K machine, and 64721 for a 48K machine. Then run the program. If you made an error in specifying the memory size, the program displays acceptable responses and asks you to try again.

*Program Listing 1. Basic loader and object code for Forms.*

```
10 CLS:DEFINTA-Z
20 PRINTTAB(19)"Model 100 to SCRIPSIT Loader"
30 PRINTTAB(17)"by Structured Software Services":PRINT
40 PRINT:PRINT"Loading FORMS into memory, please wait..."
50 GOSUB 550   'CHECK MEMORY SIZE AND SET UP ADDRESSES
60 FORI=1TO814
70      READ HX$                        'GET A PAIR OF HEX DIGITS
80      D$ = LEFT$(HX$,1)               'LOOK AT THE LEFT DIGIT
90      IF D$ = "*" THEN 210            '* MEANS ADDRESS ADJUSTMENT
100     GOSUB 500                       'CONVERT HEX DIGIT TO DECIMAL
110     IF D = -1 THEN 400              '-1 IS FLAG FOR BAD HEX CHAR.
120     DC = D * 16                     'DC GETS VALUE OF LEFT DIGIT
130     D$ = RIGHT$(HX$,1)              'LOOK AT THE RIGHT DIGIT
140     GOSUB 500                       'CONVERT RIGHT DIGIT
150     IF D = -1 THEN 400
160     DC = DC + D                     'DC = THE DECIMAL CONVERSION
170     CS! = CS! + DC                  'ADD IT TO THE CHECKSUM
180     POKE PA,DC                      'LOAD IT INTO MEMORY
190     IF PA < 32767 THEN PA = PA + 1 'ADVANCE POKE ADDRESS
200     GOTO 300                        'READY FOR NEXT HEX PAIR
210     D$ = RIGHT$(HX$,1)              'D$ = RIGHT DIGIT OF *-PAIR
220     GOSUB 500
230     IF D = -1 THEN 400
240     CS! = CS! + D                   'ADD TO CHECKSUM
250     DC = BA + D                     'BASE ADDRESS + DISPLACEMENT
260     GOTO 180                        'GO POKE ADJUSTED ADDRESS
300 NEXT
310 IF CS! <> 75355 THEN 350    'VERIFY CHECKSUM TOTAL
320 PRINT:PRINT"FORMS has been successfully loaded."
330 PRINT:PRINT"Entry address for SYSTEM command is:";PA!
```

*Listing 1 continued*

*Listing 1 continued*

```
340 PRINT:PRINT"You may now convert Model 100 TEXT tapes to SCRIPS
IT format." : PRINT : END
350 PRINT:PRINT"Checksum error."
360 PRINT:PRINT"Please correct contents of DATA lines 800 - 890 an
d rerun." : PRINT : END
400 LN = INT((I-1) / 16)          'RELATIVE LINE # OF ERROR
410 CH = I - (LN * 16)            'BAD CHARACTER PAIR #
420 LN = 800 + LN * 2             'ACTUAL DATA LINE #
430 PRINT:PRINT"Invalid hex character: ";HX$
440 PRINT:PRINT"Please correct pair #";CH;"in line";LN;"and rerun.
"
450 PRINT : END
500 D = ASC(D$)
510 IF D > 47 AND D < 58 THEN D = D - 48 : RETURN '0-9 OK
520 IF D > 64 AND D < 71 THEN D = D - 55 : RETURN 'A-F OK
530 D = -1 : RETURN      'BAD HEX CHARACTER
550 BA = PEEK(16562)    'GET BASE ADDRESS
560 IF BA = 252 OR BA = 188 OR BA = 124 THEN 570 ELSE 620
570 IF PEEK(16561) <> 207 THEN 620
580 PA! = BA * 256 + 210          'PA! = START ADRESS FOR POKING
590 IF PA! > 32767 THEN PA = -1 * (65536 - PA!) ELSE PA = PA!
600 RETURN  'PA ADJUSTED IF PA! > 32767
620 PRINT@256,"Before running FORMS Loader, you must answer the Me
mory Size?"
630 PRINT"question according the the following table:" : PRINT
640 PRINT"Machine     Memory Size?"
650 PRINT"  16K           31953"
660 PRINT"  32K           48337"
670 PRINT"  48K           64721"
680 PRINT:PRINT"Please press the orange reset button and answer th
e"
690 PRINT"Memory Size? question again before rerunning this progra
m."
700 GOTO7C0
800 DATA CD,C9,01,21,15,3C,22,20,40,21,E9,*2,CD,1B,02,21,50,3C
802 DATA 22,20,40,21,FF,*2,CD,89,*2,3E,03,32,14,42,CD,91,*2,DA
804 DATA 00,00,3E,48,32,11,42,21,1E,*3,CD,1B,02,21,91,*3,CD,1B
806 DATA 02,CD,89,*2,CD,7F,*2,F3,21,00,00,CD,96,02,CD,35,02,FE
808 DATA 9C,20,F3,21,F8,*3,01,00,06,CD,77,*2,77,23,10,F9,06,0A
810 DATA CD,77,*2,10,FB,79,ED,44,4F,CD,35,02,B9,C2,59,*2,CD,F8
812 DATA 01,3A,F0,*3,FE,06,28,22,01,06,00,21,F1,*3,11,F8,*3,1A
814 DATA ED,A1,13,20,05,EA,4F,*1,18,0E,21,E7,*3,CD,1B,02,21,F8
816 DATA *3,CD,89,*2,18,A8,21,50,44,E5,21,00,00,CD,96,02,E1,CD
818 DATA 35,02,FE,8D,C2,59,*2,01,00,00,CD,77,*2,FE,0A,28,02,77
820 DATA 23,10,F5,79,ED,44,4F,CD,35,02,B9,C2,59,*2,2B,7E,23,FE
822 DATA 1A,20,D0,CD,F8,01,21,50,44,01,00,00,3E,1A,ED,B1,2B,36
824 DATA 00,23,11,50,44,37,3F,ED,52,44,4D,C5,EB,3E,5B,ED,B1,20
826 DATA 20,F5,2B,36,97,23,16,03,7E,F6,00,77,FE,BE,23,0B,28,03
828 DATA 15,20,F3,F1,E2,DD,*1,78,B7,FA,DD,*1,B1,20,DA,C1,C5,16
830 DATA 5D,1E,9B,CD,68,*2,C1,C5,16,0D,1E,8D,CD,68,*2,C1,C5,16
832 DATA AF,1E,8E,CD,68,*2,C1,C5,16,5C,1E,8C,CD,68,*2,C1,ED,43
834 DATA EE,*3,16,5E,1E,8B,CD,68,*2,CD,C9,01,21,91,*3,CD,1B,02
836 DATA 21,B7,*3,CD,89,*2,AF,32,11,42,CD,7F,*2,ED,5B,EE,*3,CD
838 DATA BB,*2,CD,F8,01,21,5A,*3,CD,89,*2,CD,49,00,FE,59,20,E6
840 DATA FE,79,28,E2,21,77,*3,CD,89,*2,CD,49,00,F5,CD,C9,01,F1
842 DATA FE,59,CA,F2,*0,FE,79,CA,F2,*0,C3,00,00,CD,F8,01,CD,C9
844 DATA 01,21,D7,*3,CD,89,*2,C3,F2,*0,21,50,44,7A,ED,B1,C0,F5
846 DATA 2B,73,23,F1,E0,18,F5,CD,35,02,F5,81,4F,F1,C9,21,36,*3
848 DATA CD,89,*2,CD,49,00,C9,CD,1B,02,2B,CD,1B,02,C9,21,1F,*3
850 DATA CD,1B,02,21,F1,*3,06,06,CD,40,00,D8,48,06,00,09,3E,06
852 DATA 91,32,F0,*3,C8,47,3E,20,77,23,10,FC,C9,F5,81,4F,F1,CD
854 DATA 64,02,C9,21,00,80,CD,87,02,21,50,44,01,00,00,03,1B,7A
856 DATA B3,28,05,78,FE,01,20,F5,41,0E,00,78,CD,64,02,7E,CD,B3
858 DATA *2,23,10,F9,79,CD,64,02,7A,B3,20,DC,C9,4D,6F,64,65,6C
860 DATA 20,31,30,30,20,74,6F,20,53,43,52,49,50,53,49,54,0D,62
862 DATA 79,20,53,74,72,75,63,74,75,72,65,64,20,53,6F,66,74,77
864 DATA 61,72,65,20,53,65,72,76,69,63,65,73,0D,45,6E,74,65,72
866 DATA 20,54,45,58,54,20,66,69,6C,65,20,6E,61,6D,65,3A,20,03
868 DATA 50,72,65,73,73,20,45,4E,54,45,52,20,77,68,65,6E,20,72
870 DATA 65,63,6F,72,64,65,72,20,69,73,20,72,65,61,64,79,2E,0D
872 DATA 57,72,69,74,65,20,61,6E,6F,74,68,65,72,20,63,6F,70,79
874 DATA 3F,20,28,59,20,6F,72,20,4E,29,0D,52,65,61,64,20,61,20
876 DATA 6E,65,77,20,74,61,70,65,3F,20,28,59,20,6F,72,20,4E,29
878 DATA 0D,50,72,65,70,61,72,65,20,74,6F,20,03,70,6C,61,79,20
880 DATA 4D,6F,64,65,6C,20,31,30,30,20,54,45,58,54,20,74,61,70
882 DATA 65,2E,0D,72,65,63,6F,72,64,20,4D,6F,64,65,6C,20,49,49
884 DATA 49,20,53,43,52,49,50,53,49,54,20,74,61,70,65,2E,0D,43
886 DATA 68,65,63,6B,73,75,6D,20,65,72,72,6F,72,2E,0D,53,6B,69
888 DATA 70,3A,20,03,00,00,00,00,00,00,00,00,00,00,00,00,00,00
890 DATA 00,00,0D,0D
```

*End*

## *The Key Box*

**The program in "Form-matters" requires 8K RAM to run on the Model 100; it also runs on a Model III with at least 16K RAM and Cassette Basic. The programs in "The Searcher" and "Getting Personal" each require 8K RAM; "Getting Personal" also calls for a printer.**

The loader then asks you to wait while it reads the hex codes in the data statements and loads them into memory. If the loader encounters an invalid hex character in the data statement, it displays the bad character pair, indicating the line number and pair number that need correction before you rerun the loader. Each data line contains 18 pairs of characters, except the last line where there are four.

Even if all the hex codes are acceptable, they can still be incorrect, so the loader tells you if the hex codes in the data statements add up to something other than the predetermined checksum total.

With an error of this type, the loader can provide no further information to help you find the incorrect code. You must recheck your data statements against Listing 1 to find the error before rerunning the loader.

If the loader finds no errors, it tells you the entry address to use with the System command when you run Forms. You're now ready to convert Model 100 Text tapes into the Model III Scripsit format.

### Using Forms

To use Forms, enter the System command, then enter the appropriate entry address at the asterisk prompt. Remember to type a slash in front of the number and press the enter key.

The Forms title screen appears and asks you to specify the name of the Text file in up to six characters. Type in the name you used when you created the Model 100 Text tape.

If you press the break key, the computer returns to the Cass? prompt. If you do not care what the name of the tape is, press the enter key and Forms reads the first Text file that it finds on the tape.

Then Forms prompts you to prepare to play your Model 100 Text tape and to press the enter key when the recorder is ready.

If the first name on the tape does not match what you request, Forms displays Skip: followed by the file name from the tape. It continues to search for the file with the name you entered.

When it finds the right file, it reads the tape into memory. If the program finds a checksum error, you must respecify the file name.

After reading the Model 100 Text tape, Forms prompts you to prepare to record a Model III Scripsit tape. Place a blank cassette into your recorder. Forms then prompts you to press the enter key when the recorder is ready.

After it writes to tape, Forms asks if you would like to create another copy. Press the Y key to record another copy or press the N key to go on.

Finally, Forms asks you if you would like to read another Model 100 Text tape for conversion. Press the Y key to read another tape. Pressing any other key ends the program and returns the computer to the Cass? prompt.

### Saving Forms

You can load a working copy of Forms at any time by running the loader program. However, if you use the program often, it saves time to have a machine-language system tape that loads directly into your Model III.

If you have a debug or monitor program that lets you write system tapes, you need the start, end, and entry point addresses for your machine. This information is in Table 1.

If you add more memory to your computer, you need to use the loader program to tailor Forms to the new high memory addresses.

| | START ADDRESS | | END ADDRESS | | ENTRY POINT | |
|---|---|---|---|---|---|---|
| MACHINE | Hex | Decimal | Hex | Decimal | Hex | Decimal |
| 16K | 7CD2 | 31954 | 7FFF | 32767 | 7CD2 | 31954 |
| 32K | BCD2 | 48338 | BFFF | 49151 | BCD2 | 48338 |
| 48K | FCD2 | 64722 | FFFF | 65535 | FCD2 | 64722 |

*Table 1. The start, end, and entry point addresses for saving Forms on 16K, 32K, and 48K Model IIIs.*

| Model III Scripsit symbol | Model 100 Text symbol | Meaning |
|---|---|---|
| ([) left bracket | ([) left bracket | block start |
| (]) right bracket | (]) right bracket | block end |
| (>) greater than | (>) greater than | block name end; format |
| (■) square block | ENTER key | forced end of line |
| (¶) paragraph | CODE/0 | begin new paragraph |
| (\) backslash | GRAPH/- | forced end of page |
| (^) caret | SHIFT/6 | copy marker |

*Table 2. Reference chart of Scripsit symbol equivalents and meanings.*

### Guidelines for Use

To take full advantage of Forms, take your Scripsit reference card and the following explanations of equivalents along with your Model 100. Table 2 contains a chart of the symbol conversion for easy reference.

Surround footers and other blocks of text with brackets on the Model III screen. To include these symbols in your text, use the Model 100's left- and right-bracket keys.

Be sure to include the one- or two-character block description code and include a greater-than symbol after the left bracket to terminate the block description or begin a format line.

Create end-of-line symbols on the Model 100 by using the enter key. The black triangle symbol on the Model 100 screen becomes a square block symbol in Scripsit.

You can include the paragraph symbol in your Model 100 text by pressing the code and zero keys together. The same symbol appears in the Scripsit version.

Scripsit uses the backslash character to indicate a forced end-of-page. Enter this symbol on your Model 100 in text by pressing the graph and hyphen keys together.

Copy markers appear as the caret symbol in Scripsit. Enter these symbols into your Model 100 text by typing the shift/6 keys simultaneously. ■

*John and Aileen Cornman are the owners of Structured Software Services. You can reach them at 9233 N.E. 269th St., Battle Ground, WA 98604.*

## The Searcher

**by Carl Oppedahl**

The Model 100's built-in Address and Schedule programs scan ADRS and Note files for strings of data you specify, but

they don't work on other .DO files. I wrote a program called Search that redirects the 100's ROM routine so you can search any .DO file using the Address program and display or print records containing a particular word or phrase (see Program Listing 2).

Although you can't modify the machine-language instructions in the ROM, you can modify the action of the routines. The method I use involves jumping to a point in the ROM routine other than the usual entry point and setting the register contents to point to a user-defined file.

### Creating Search

To develop the Search program, first locate the machine-language entry points for Address and Schedule. You can find the entry addresses for these programs in the system file directory at F962–FA74 hexadecimal (hex). To see this, enter and run this program:

```
5 OPEN "jmp" FOR OUTPUT AS 1
10 FOR A=63875 TO 63896:C=PEEK(A):PRINT1,A;C;
20 IF C<91 AND C>31 THEN PRINT 1 CHR$(C) ELSE PRINT
30 NEXT A
40 CLOSE
```

| Address | Contents |
|---|---|
| 63875 | 176 |
| 63876 | 104 |
| 63877 | 91 |
| 63878 | 65 A |
| 63879 | 68 D |
| 63880 | 68 D |
| 63881 | 82 R |
| 63882 | 83 S |
| 63883 | 83 S |
| 63884 | 32 |
| 63885 | 0 |
| 63886 | 176 |
| 63887 | 111 |
| 63888 | 91 |
| 63889 | 83 S |
| 63890 | 67 C |
| 63891 | 72 H |
| 63892 | 69 E |
| 63893 | 68 D |
| 63894 | 76 L |
| 63895 | 32 |
| 63896 | 0 |

*Table 3. File directory for the Address and Schedule programs.*

*Table 4. Description of file types.*

| Bit | Meaning |
|---|---|
| 128 | 1 if a valid file |
| 64 | 1 if a .DO file |
| 32 | 1 if a .CO file |
| 16 | 1 if located in ROM |
| 8 | 1 if invisible |

| Decimal | Hex | 8085 mnemonic | Z80 mnemonic |
|---|---|---|---|
| 209 | D1 | POP D | POP DE |
| 277 | E3 | XTHL | EX (SP),HL |
| 195 | C3 FF FF | JMP FFFF | JP FFFF |

*Table 5. Z80 to 8085 opcode conversion table.*

```
20 P$=CHR$(209)+CHR$(235)+CHR$(195)+CHR$
(116)+CHR$(91):PRINT"Input file:
";:LINEINPUTF$:F$=LEFT$(F$,6)+".DO"+CHR$
(0):FORI=1TOLEN(F$):C=ASC(MID$(F$,I,1))
:IFC>96 ANDC<123THENC=C-32
120 POKE64984+I,C:NEXT:A=VARPTR(P$)
:CALLPEEK(A+1)+256*PEEK(A+2),0,64985
```

*Program Listing 2. Search.BA finds specified strings in any .DO file.*

Table 3 contains a list of the information in the directory. The 3 bytes preceding the file name specify the file type and the load address. You can interpret file types using the information in Table 4.

Address and Schedule have file type 176, which comprises a valid .CO file located in ROM (128+32+16, see Table 4). The 2 bytes following the file type contain the entry addresses of the Address and Schedule programs. Combine the two numbers as follows to make up a 16-bit binary number.

Address: 104+256*91=23400 (decimal)
Schedule: 111+256*91=23407 (decimal)

In hex code, the entry addresses are 5B68 and 5B6F hex.

The code at 5B68–5B72 hex shows that each entry point leads to 5B74 hex, the scanning program that underlies the Address and Schedule programs. The code from ROM is:

```
5B68 LD DE,5CCE
5B6B SUB A,A
5B6C JP 5B74
5B6F LD DE,5D02
5B72 LD A,FF
5B74 start of program
```

Prior to reaching 5B74 hex, each entry point sets the DE register to point to the ASCII string of the file name you want the program to scan. The program sets the accumulator with a flag value to indicate whether the command prompt is Adrs (A=zero) or Schd (A is a nonzero number).

The code at 5CCE hex is ADRS.DO, and the code at 5D02 hex is Note.DO. In each case, a zero (null) follows the file name.

The scanning program starts at 5B74 hex and opens the file name that DE points to, usually ADRS.DO or Note.DO. However, if you put a different value in DE, the program opens that file instead.

You can't use the Basic Call command to call 5B74 because Call doesn't let you set the DE register. Furthermore, to keep the stack in order, you should jump, not call, to 5B74 hex.

To harness the Address and Schedule programs for your own use, set HL to point to the file name you want to scan and execute the following machine code:

```
D1       POP DE
EB       EX DE,HL
C3 74 5B JMP 5B74
```

The POP instruction eliminates the return address from the stack because the program never uses it. The EX DE,HL opcode makes the CPU exchange the contents of the DE and HL registers, and is an easy way to get the HL value into the DE register. The program then jumps to the ROM program, which scans the opened file for specified strings.

After writing the Assembly-language program, you can assemble it manually by using the opcode values in Table 5. The decimal values appear in the CHR$ functions in line 20 of the finished program, Search (see Program Listing 2).

Then the program gets your input, converts it to uppercase, and POKEs it into FDD9–FDE1 hex, the part of high memory that contains the file names when the program opens a file.

After setting up the file name, the program provides the location of the executable machine code for a Call command. In Basic, the Call command transfers program control to a

↙ See List of Advertisers on Page 227

machine-language routine at a specified starting address.

The CPU treats the values stored in memory beginning with the starting address as executable machine-language instructions, whether or not they are in fact executable.

Usually the LOADM, CLOADM, or POKE command puts the machine-code numerical values into RAM, but it doesn't matter to the CPU how the values get there. When using any of these methods, you should protect that portion of RAM by using the Clear command so that Basic doesn't overwrite it.

Search demonstrates another means of loading executable machine-language instructions into RAM, specifically the loading of CHR$ values into a string variable such as P$. You don't have to use the Clear command because Basic protects P$ as it protects any other variable. When using the Call command you must provide the starting address of the string.

The VARPTR function returns the numerical variable addresses, but the information that VARPTR gives for string variables is more complicated. Instead of returning the string address itself, VARPTR returns the address of the string control table. For example, if A = VARPTR(P$), the first table entry is PEEK(A), the second is PEEK(A + 1), and so on.

The second and third table entries make up the actual address of the string contents; the first entry in the table is the length of the string. To see this, run this Basic program:

```
10 INPUT F$: A = VARPTR(F$):PRINT PEEK(A),A
20 B = PEEK(A + 1) + 256*PEEK(A + 2)
30 FOR AD = B TO B + PEEK(A) - 1
40 PRINT CHR$(PEEK(AD)):NEXT:PRINT:END
```

Here, A is the address of the string table and B is the address of the first character in the string.

**Running the Program**

Program Listing 2 contains Search, the finished program. This program lets you use the searching capabilities of the Address program to find strings in your .DO files.

You can run the program from Basic or from the main menu. The program requests an input file. Respond by typing the file name without its extension (the program automatically supplies the .DO extension).

If the program doesn't find the file, it displays an error message similar to the one you see if you select the Address program without having created an ADRS.DO file.

When the program finds the file, it opens it and displays key labels and a prompt. The available function keys are the same as for Address and Schedule: Find (F1), Lfnd (F5), and Menu (F8).

Pressing the F8 key returns control to the main menu. If you press the F1 key and type in a search string, the program selects lines that contain the search string from the input file. Press the F1 and enter keys to display all lines of the input file.

When the screen isn't large enough to display all lines selected, press the F3 key to display the next screen or press the Quit key (F4) to return the computer to the Find Lfnd Menu prompt. The Lfnd key works like the Find key, except that output goes to the printer instead of the screen.

---

*This article is adapted from Carl Oppedahl's* Advanced Programming for the Model 100, *to be published soon by Wayne Green Books. You can reach Oppedahl at 99 Park Ave., New York, NY 10016.*

# Getting Personal

**by Richard Ramella**

Gone are the days when a computer-written letter with inserted "personal" information might have impressed you:

YES, YOU—***MS. MANDY BRANDY***—MAY ALREADY BE A WINNER OF PRIZES TO ENJOY AT 323 S. BIG SANDY...

Recognizing the cynicism inherent in some letters of this ilk, I offer HIPAL.BA (see Program Listing 3) with cautions and suggestions useful to both sender and receiver.

HIPAL is an 8K RAM Model 100 program that prints a standardized message to many addressees. It requires 11½-inch fanfold paper. I've stored the addresses in a text (.DO) file (see Fig. 1), and put the letter in several strings within the program.

When you run HIPAL, it takes the facts relevant to each addressee in turn and plugs them into the template letter, including the address and a proper salutation line. The program spaces to the succeeding page and repeats the process as long as it finds a new addressee.

## Simple Changes

I've thrown in a few mirror tricks to illustrate how to personalize a letter. If you need to send an identical message to all addressees, with individualized addresses and salutations, change line 890 to LPRINT SP and delete lines 800, 960–980, and 990. They are peculiar to the program as presented; I'll explain their function later.

Each address has eight fields whose numbers come into play in the program (see Table 6). Set up the address list in the .DO file just as I've done in Fig. 1: seven lines of information and a space.

The amounts in the sixth and seventh lines of each address (see Fig. 1) represent money pledged and the amount received to date, respectively. You can leave these lines blank in your applications (line feeds), or use them to designate something else—the amount of a bill and the money paid in the past month, for example.

My .DO file containing addresses (Fig. 1) ends with two line feeds and the word "End", though two line feeds suffice. The B(1) to B(15) string array running from lines 370–510 (see Program Listing 3) contains the elements of the letter sent to each addressee. Lines 450–510 have null values to remind you that your message can continue through B(15).

When you store HIPAL for later use, assign all the B(X) arrays a null value, as in 370 B(1)=" ". This makes them

*Figure 1. Addresses saved to .DO file.*

```
Mr.
Harlow
Barlow
1234 Marlowe Ct #3
Marlborough, SD 34567
125
10.72

Ms.
Mandy R.
Brandy
323 S. Big Sandy
The Andes, SA 23456
500
200

Dr.
Roy
Gunnoy III
876 S. Vannoy
Des Moines, WN 21345
1000
10

The Rev.
Chester F.
Lester
79 Veeblefester Ave.
Westchester, AL 45678
125
125

Ms.
Alice
Chalice
4890 Callous Way
Dallas, OH 21893
30
5

end
```

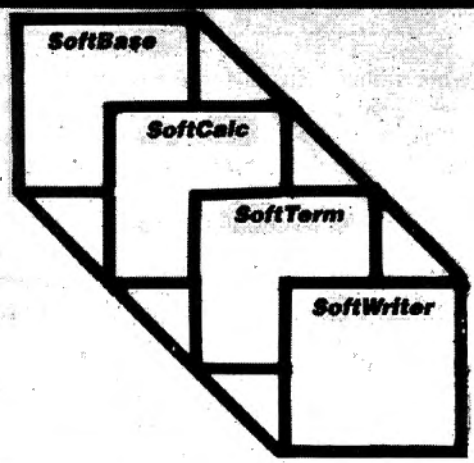
| Field | Description |
|---|---|
| 1 | Title |
| 2 | First name |
| 3 | Last name |
| 4 | Address |
| 5 | City-state-zip |
| 6 | Amount |
| 7 | Amount |
| 8 | Space created by line feed |

*Table 6. Address fields.*

*Program Listing 3. HIPAL.BA.*

```
100 REM * HI PAL: Personalized Mass Mail
*TRS-80 Model 100 8K/ Richard Ramella *
110 REM * REQUIRES PRINTER *
120 CLS
130 CLEAR 1000
140 PRINT @ 95,"HI PAL"
150 LINE(86,12)-(127,26),1,B
160 PRINT @ 165,"Personalized Mass
Mailing"
170 PRINT@ 245,"Tap enter to continue";
180 INPUT X
190 CLS
200 DEFSTR A-D,S
210 DIM B(15)
220 INPUT "Left margin";Q
230 INPUT "Right margin";R
240 SP=SPACE$(Q)
250 S=SPACE$(1)
260 PRINT "Type date and year separated
by comma"
270 PRINT
280 PRINT SPACE$(13);CHR$(153)
290 PRINT "as in April 1,1985 and press
enter."
300 PRINT SPACE$(6);STRING$(7,"-")
;SPACE$(1);STRING$(4,"-")
310 PRINT SPACE$(13);CHR$(152)
320 INPUT DT,DY
330 CLS
340 PRINT "Type file name for letter
list and press enter"
350 INPUT F$
360 OPEN F$ FOR INPUT AS 1
370 B(1)="The work of the Fraudulent
Foundation for Frivolous Grants to
Computer Article Writers progressed
significantly in the past year due in no
small measure to contributions such as
your own. Your particular pledge was a
special joy to us at 3F."
380 B(2)="Your pledge was deeply
appreciated. You are among our most
valued contributors."
390 B(3)="The need is now greater than
ever. Perhaps now is the time to send a
check for the remainder of your pledge.
"
400 B(4)="Your pledge to this worthy
cause was"
410 B(5)="and we have received"
420 B(6)="May prosperity and a
```

*Listing 3 continued*

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116

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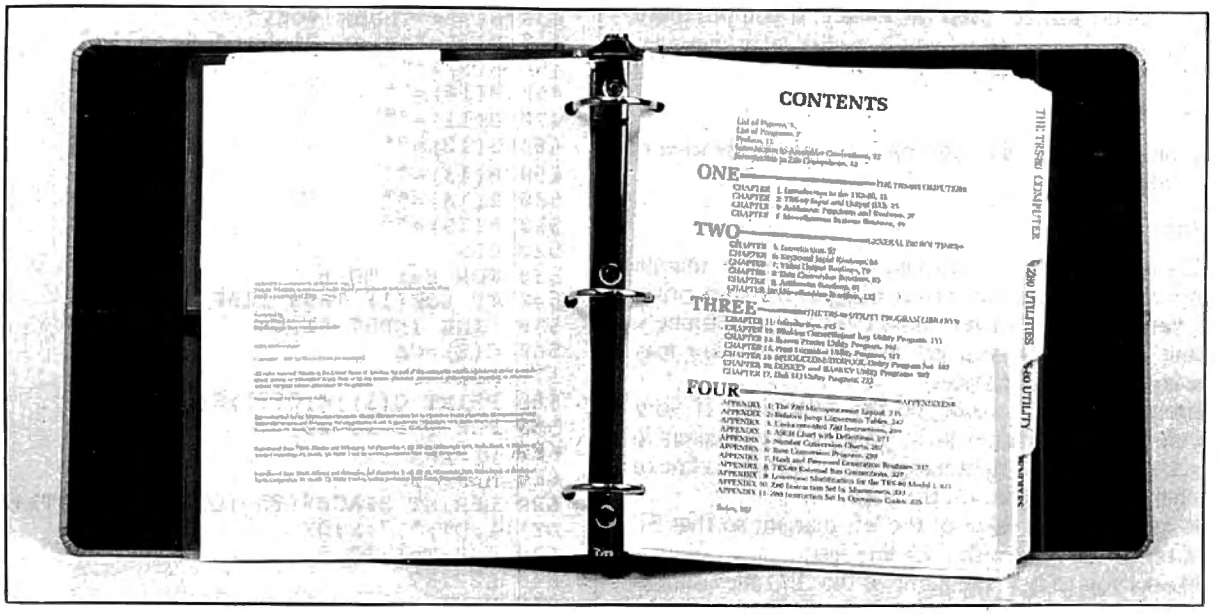
# Every Z80 assembly-language programmer needs this book.

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ready to accept your own material.

When you want to load a letter into the program, run HIPAL.BA, press the shift-break keys simultaneously, type in EDIT 370–510 and tap the enter key. In the edit mode, typing the letter as succeeding values of B(1) to B(15) is simple. When the values are loaded, press the F8 key. If you put more than 255 characters in any string, you'll see this error message:

```
Text ill-formed
Press space bar for TEXT
```

Tapping the space bar takes you back to edit mode to correct the mistake.

**Line by Line**

Lines 220 and 230 let you choose left and right margin widths. Experiment to get the correct margins for your printer. Later, you'll use the values chosen here to determine a line's default character. If you get strange results, you may have made strange margin choices.

An appropriate choice would be the following: If your printer offers 12 characters per inch, printing 85 characters in 8½ inches, choose left and right margins of 10 to yield a line of about 65 characters, centered on the page.

Line 240 assigns Q the value of the left margin, so that SP spaces that far to the right with each line feed.

Line 340 asks you to type the name of the .DO file containing the addressee. You'll get an FC error if you request a nonexistent file and strange results if you ask for a file that doesn't have addresses formatted as in Fig. 1.

Line 360 opens the address list .DO file, and lines 370–510 contain the elements of the letter.

Lines 530–570 input each of the address lines defined earlier and put them in the array C(1) to C(8). Line 580 displays the name of the current addressee.

**Printing the Letter**

After you turn on your printer, position the top perforation of the first page at the top of the print head. Printers vary, so experiment with positions if necessary. Lines 590–610 produce 12 line feeds, taking my print head down about two inches from the top of the page—enough room to clear most printed letterheads.

Line 620 prints the date you specified and positions its final character at the right margin. Lines 620–650 produce five line feeds to space down to the address area. Lines 660–680 print the current address. Strings C(1) to C(5) are, in turn: title, first name, last name, address, and city-state-zip code. Lines 690–710 space down five more lines.

Line 720 assigns NM$ the addressee's title, a space, and a last name, so line 730 can print the salutation "Dear Mr. Barlow" before spacing twice to begin the message (see Fig. 2).

Line 760 assigns PG a value of 29, the line the letter has reached on the page; the program counts the lines so it can space correctly to the next page when the current letter is complete.

Lines 770 and 780 assign numeric values to the sixth and seventh lines of the address. This particular application doesn't require these amounts, but I'll suggest ways you can manipulate them for your own purposes.

Lines 790–1040 make up a For...Next loop that travels through all the array strings holding the message being printed. Lines 800 and 960–990 are peculiar to my letter. In line 810 the program skips to the next value of B(G) if the current value is zero.

*Listing 3 continued*

```
charitable mien remain with you in the
months ahead -- months that well could
be difficult for many clients of the
Foundation."
430 B(7)="Thank you,"
440 B(8)="qsign Richard Ramella"
450 B(9)=""
460 B(10)=""
470 B(11)=""
480 B(12)=""
490 B(13)=""
500 B(14)=""
510 B(15)=""
520 CLS
530 FOR E=1 TO 8
540 IF EOF(1) THEN 1100
550 LINE INPUT #1,CA
560 C(E)=CA
570 NEXT E
580 PRINT C(1);S;C(2);S;C(3)
590 FOR T=1 TO 12
600 LPRINT
610 NEXT T
620 LPRINT SPACE$(85-(Q)-2-(LEN(DT)+LEN(
DY)));DT;",";S;DY
630 FOR T=1 TO 5
640 LPRINT
650 NEXT
660 LPRINT SP;C(1);S;C(2);S;C(3)
670 LPRINT SP;C(4)
680 LPRINT SP;C(5)
690 FOR T=1 TO 5
700 LPRINT
710 NEXT T
720 NM$=C(1)+S+C(3)
730 LPRINT SP;"Dear";S;NM$":"
740 LPRINT
750 LPRINT
760 PG=29
770 PD=VAL(C(6))
780 GI=VAL(C(7))
790 FOR G=1 TO 15
800 IF G=3 AND GI=>PD THEN G=6:PRINT S;
810 IF B(G)="" THEN 1040
820 IF INSTR(B(G),"qsign")=0 THEN 890
830 PG=PG+4
840 FOR T=1 TO 3
850 LPRINT
860 NEXT T
870 LPRINT SP;RIGHT$(B(G),LEN(B(G))-6)
880 GOTO 1050
890 IF G<>5 THEN LPRINT SP;
900 FOR H=1 TO LEN(B(G))
910 D=MID$(B(G),H,1)
920 LPRINT D;
930 LL=LL+1
940 IF LL>85-(Q+R) AND D=CHR$(32) THEN
SP=SPACE$(Q): LPRINT: LPRINT SP;: PG=PG+
1: LL=0
950 NEXT H
960 IF G=2 THEN LPRINT S;NM$".";
970 IF G=4 THEN LPRINT S"$"C(6);S;:
GOTO1040
980 IF G=5 THEN LPRINT S"$"C(7);".";
990 IFG=1 THEN LPRINT S;:SP="":GOTO1040
1000 LL=0
1010 LPRINT
1020 LPRINT
1030 PG=PG+2
```

*Listing 3 continued*

✓ See List of Advertisers on Page 227

Line 820 uses an instring test to see if the configuration qsign(cq) appears in the current string, and, if not, jumps to line 890. If lines 830–880 execute, the program has found qsign. I gave B(8) in line 440 the string value qsign Richard Ramella. The signature of each letter you write should comprise the following format: qsign, a space, and the writer's name. When it finds qsign, the program prints the name only and jumps to line 1050 for the sequence that spaces to the next page.

Lines 900–950 are a For...Next loop within the larger loop. Line 900 starts the loop, with H equal to the first to last character positions of the array string being printed. Line 910 assigns D string the single character encountered within the B(G) string; line 920 prints that character. Line 930 counts the number of characters per line and always adds one for the character just printed.

Line 940 determines if the letter needs a line feed and, if so, provides it. Its logic is: If current line length is over 85 characters long (the number of characters possible on the page) minus values of left plus right margin (Q+R), and the current value of the D string is a space, then restore the value of SP to SPACE$ (left margin), line feed once, print the left margin value, increment PG by one to keep the page number current, and set the line length value at zero. With this, the For...Next loop ends.

Once the program prints the current B(G) array string, lines 1000–1040 set the line length at zero, invoke two line feeds, increment PG twice to keep track of the number of lines on the current page, and end the loop.

Lines 1050–1070 space to the next page. On the printer I used to test this program, 66 lines fit on one 11½-inch page. Spacing forward 66, minus the number of lines on the current page, takes you to the top of the next page. This method ensures correct spacing forward, no matter what the length of your letter, so long as it fits on one page. The program also spaces correctly in situations where one run produces varying lengths of letters to different addressees. If either the 85 or 66 value does not work with your printer, see the end of the article for remedies.

Lines 1100–1140 produce a beep, denoting the end of the program.

### Personalizing Mail

The lines I've ignored so far produce personalization effects within the program. To get an idea of what can happen, scan the message of B(1) to B(5) in lines 370–510.

Line 800 changes the letter's format. It first tests if the third paragraph, B(3), is due to be printed. If so, and if GI (the amount given) equals or exceeds PD (the amount pledged), paragraphs B(3), B(4), and B(5) aren't needed in the letter (see Fig. 3). The program assigns G a value of 6, so it skips these paragraphs; the letter resumes without mentioning the balance of the pledge.

Consider another situation: The letter is a bill. The sixth and seventh lines in the .DO file address (see Fig. 1) represent the amount owed at the start of the month and the payment made at the end of the month, respectively. At the point in the letter where you want to print this information, give a B(X) array the value of QP; for example, B(3) = "We received your April payment of $"PD" and applied it to your balance of $"PG". Your new balance is $"PG−PD"."

Line 960 adds the addressee's title and name to the paragraph. If the program printed B(2), ending "...You are among our most valued contributors,...", it adds the personalized material "Mr. Barlow."

Some titles in Fig. 1 are inappropriate for salutations: otherwise chatty letters would refer to "Dr. Gunnoy III" and "The Rev. Lester" (see Fig. 3). Edit your address list so as not to reveal your clever letter as a computer trick. For example, rewrite "The Hon. James Mixworth" as "Judge Mixworth" and drop generational references such as "Jr." and "III" whenever possible.

Lines 970 and 980 work in tandem. They produce the sentence combining B(4), B(5), and address fields 6 and 7: "Your

*Listing 3 continued*

```
1040 NEXT G
1050 FOR J=1 TO 66-PG
1060 LPRINT
1070 NEXT J
1080 LL=0
1090 GOTO 530
1100 PRINT "Run complete."
1110 PRINT "Tap a key to end."
1120 BEEP
1130 IF INKEY$="" THEN 1120 ELSE END
1140 END
```

*End*

```
                                                    April 15, 1984


Mr. Harlow Barlow
1234 Marlowe Ct #3
Marlborough, SD 34567

Dear Mr. Barlow:

The work of the Fraudulent Foundation for Frivolous Grants to Computer
Article Writers progressed significantly in the past year due in no
small measure to contributions such as your own. Your particular pledge
was a special joy to us at 3F. Your pledge was deeply appreciated.
You are among our most valued contributors, Mr. Barlow.

The need is now greater than ever. Perhaps now is the time to send
a check for the remainder of your pledge.

Your pledge to this worthy cause was $125 and we have received $10.72.

May prosperity and a charitable mien remain with you in the months
ahead -- months that well could be difficult for many clients of the
Foundation.

Thank you.


Richard Ramella
```

*Figure 2. Sample letter as formatted by HIPAL.BA.*

```
                                                    April 15, 1984

The Rev. Chester F. Lester
79 Veeblefester Ave.
Westchester, AL 45678

Dear The Rev. Lester:

The work of the Fraudulent Foundation for Frivolous Grants to Computer
Article Writers progressed significantly in the past year due in no
small measure to contributions such as your own. Your particular pledge
was a special joy to us at 3F. Your pledge was deeply appreciated.
You are among our most valued contributors, The Rev. Lester.

May prosperity and a charitable mien remain with you in the months
ahead -- months that well could be difficult for many clients of the
Foundation.

Thank you.


Richard Ramella
```

*Figure 3. Modification in sample letter.*

pledge to this worthy cause was $100 and we have received $10."

Line 990 adds the material of one string array to that of the previous one within the same paragraph. Its logic goes: If G = 1, then the first string array has printed; to combine the second paragraph, print a space, then make the SP string null so no margin will be incorrectly printed, and go to line 1040 to continue that next array.

**Final Hints**

The paper spacing will be thrown if your letter is longer than one page.

If a two-inch top margin is insufficient, start the printing by positioning the print head below the top of the page.

If your printer won't print 12 characters per inch, giving you 85 characters across 8½ inches, run a test to find out how many characters it does yield. To assure correct margins, use that number in place of 85 in lines 620 and 940.

Follow the same procedure if the number of lines per page your printer can print differs from my line count; substitute that number for 66 in line 1050 to assure correct spacing to the next page. ■

---

*If you can't get HIPAL to run correctly, send a self-addressed, stamped envelope, a printed listing of the program as it exists in your system, and a run example to Richard Ramella, 1493 Mt. View Ave., Chico, CA 95926.*

---





See List of Advertisers on Page 227

## ReWrite

I have discovered two problems in line 15 of my program Writer.BA ("Write Now," February 1984, p. 191). First, my printer doesn't print the Model 100's down-arrow graphics character. To solve the problem, set the variable NPAGE$ equal to the down-arrow character (CHR$(153)) instead of the null string character.

Also, substitute 1 for the I in the variable L1ne$. Line is a Model 100 function, so using the normal spelling gives you a syntax error.

After you make these changes, line 15 should appear as follows:

```
15 NPAGE$=CHR$(153):CHAR$="":L1NE$=""
```

*Ronald F. Balonis*
*118 Rice St.*
*Trucksville, PA 18708*

In Ronald Balonis's "Write Now," Writer.BA loses part of a word when starting a new page. To correct the problem, change line 440 to:

```
IFEOF(1)THENCLOSE1ELSELCNT=0:PN=PN+1:GOTO210
```

I also added lines 301–304 to recognize an embedded command line and adjust the left margin while printing the Text file (see the Program Listing). Note that the printer expressed the caret character as a left bracket in line 305.

To make these changes, first terminate the present line by pressing the enter key, then add a command line by typing >nn and pressing the enter key.

The nn following the right arrow can be any one- or two-digit number from zero to RM-1. You can adjust the left margin as often as you like. The last setting holds until you change it.

*Jody Nelis*
*132 Autumn Drive*
*Trafford, PA 15085*

```
301 IFCHAR$<>">"THEN305
302 CHAR$=INPUT$(1,1):IFCHAR$=CR$THEN304
303 T2$=T2$+CHAR$:GOTO302
304 LM=VAL(T2$):LGTH=RM-LM:T2$="":GOTO300
305 IFCHAR$<>"["THEN310
306 IF LCNT<>TM THEN410
307 GOTO300
```

*Program Listing. Enhancement for Writer.BA.*

## Getting Through

I'd like to send Model 100 text files to my Model III disk to edit them with SuperScripsit. I can get the Model 100 to send the files, but I can't make the Model III receive them. Can anyone give me information on how to set this up?

*Jerel Peterson*
*Box 182*
*Cando, ND 58324*

*There's a skeleton terminal program on p. 63 of the Model III disk system manual—anyone with other ideas?—Eds.*

## COM/CMD Fix

My compliments to Ronald F. Balonis for his fine communications program for data transfer between the Model 100 and the Model I/III ("100 Disks," January 1984, p. 171).

However, in Model I's with the Radio Shack double-density board and TRSDOS 2.7DD, COM/CMD doesn't work. This is because TRSDOS 2.7DD places the command line in a buffer at 44DA hexadecimal (hex) rather than the standard 4318 hex. As a result, COM/CMD always prints the message: * COMMAND LINE ERROR *.

To fix the problem, change line 410 to read:

```
410  CMD  EQU  44DAH
```

If you've already assembled the program, patch it as follows:

```
PATCH COM/CMD (R=1,B=20,F=1E43,C=E044)
PATCH COM/CMD (R=1,B=28,F=1C43,C=DE44)
```

*Carl Oppedahl*
*99 Park Ave.*
*New York, NY 10016*

## Data Manager Debug

In my article, "Account for Yourself" (March 1984, p. 187), my Data Manager program contains a small error. Change line 2000 to read:

```
2000 IF FL$="" THEN 2200
```

*Mark Hickenbottom*
*28 Wrangler Court*
*Chico, CA 95926*

## Shooter Debug

Line 105 of my Shootr.BA program ("A New Pair of Shoes," March 1984, p. 194) contains a typographical error. Change 67.7% to 66.7%.

*Ronald F. Balonis*
*118 Rice St.*
*Trucksville, PA 18708*

# Scan the Bar Code Scene With Your Own Reader

If you pored over the bar code articles in the November issue of *80 Micro* as I did, you probably noticed that the only way mentioned to read bar codes into a TRS-80 is via the RS-232C port. A black box decodes the actual bar code and sends decoded ASCII characters to the computer.

While most bar code wand manufacturers make such decoder boxes, they're generally expensive. But you don't need to buy one because the computer can read in and decode information in bar code format. This month's project, a simple bar code interface and an integral TRS-80 bar code decoder, operates on a Model I, III, or 4 with at least 16K RAM.

The software in this project assumes that the computer is reading Code 39, one of the more popular bar codes. In a future issue, *80 Micro* will present software to decode Code 128 that uses the hardware presented here, supports the full ASCII character set, and allows program input.

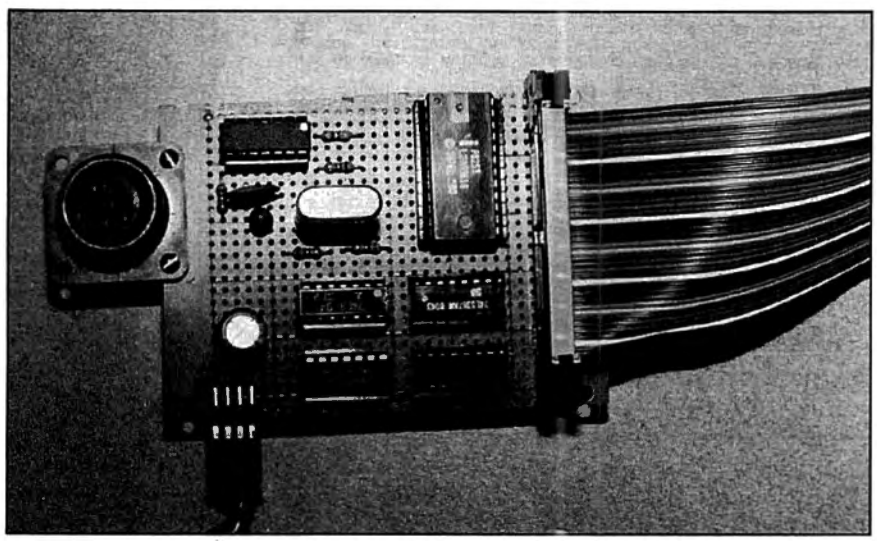

*Photo. Completed bar code reader board.*

### Code 39

For a discussion of the basics of Code 39 and the format for the entire Code 39 character set, see Davey S. Thornton's article "Bars and Stripes Forever" (*80 Micro*, November 1983, p. 104). I'll describe the technical details of Code 39 pertinent to my project.

Code 39 consists of 44 different characters, including the uppercase alphabet and the 10 digits. All Code 39 bar codes begin and end with an asterisk to verify the accuracy of the read and to determine read direction.

The three common densities of Code 39 bar codes are standard (9.4 characters per inch), medium (5.4 characters per inch), and low density (3 characters per inch). I've designed this month's project around the medium density code, though the bar code wand I use, Hewlett-Packard's HEDS-3250, reads up to standard density code.

In medium density bar code, the wide bars and spaces are about .0345 inches wide, the narrow bars and spaces about .0115 inches wide, as is the gap between characters. Because Code 39 has 3 wide and 6 narrow bits per character, it is, to a limited extent, a self-checking code.

### Interface Circuitry Design

I chose the HEDS-3250 bar code wand because of its low cost/performance ratio. Hewlett-Packard also makes a less expensive, lower-resolution wand (HEDS-3050) that should also work, but it requires a different connector and hasn't been tested with this circuitry and software.

The output of the HEDS-3250 is digital. Most bar code wands output an analog signal requiring external signal conditioning circuitry to work properly. The output of the HEDS-3250 is in the high (+5 volts) state when the wand is over a dark area or pointed into the air, and at a low (0 volts) state when the wand is over a light (reflective) area.

The computer must determine the length of each bar or space as the wand passes over it, the bit pattern of each character, and then the actual characters themselves. It determines the width of each bar and space through two kinds of time measurements. The less expensive and less accurate way is through software timing loops. The program looks at the wand's output (through an input port) at regular intervals, and increments a counter during each look. Once a transition occurs (dark area to white

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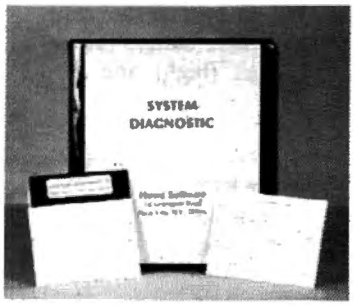


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area or vice versa), the program stores the counter value in memory, while establishing a new counter for the new bar or space.

The second method, and the one used in this month's project, is to have hardware do the timing, minimizing the software requirements and improving the accuracy of the time readings. The hardware consists of two timers and an input port to view the output of the bar code wand; I use an Intel 8253 triple-timer chip for my timers. The program must set up the timers as necessary, but the bar code wand itself turns the timers on and off. The program watches for a transition from the wand, then reads the timer value for the bar or space that's just been timed.

When you select timers and a count frequency, make sure to allow for the full range of bar code movement speeds. The typical range is three to 30 inches per second. Since the timers are 16-bit timers, the frequency I chose, 1.8432 MHz, works well; the maximum count is 21,197 (.0345 inches at 3 inches per second), and the minimum count is 707 (.0115 inches at 30 inches per second). In practice, I haven't gotten my decoder to operate at 30 inches per second; I use moderate speeds for best results. I'm sure that more experienced programmers of bar code software can correct the problem.

*The program sets up the timers, but the bar code wand turns them on and off.*

### Constructing the Project

The schematic for the bar code reader circuitry (see Fig. 1) shows the 74LS138 used for address decoding; the dotted lines indicate the address line configuration I used in my own board. The accompanying software assumes you're using these addresses. The two outputs on the 74LS138 consist of an eight-address range (see Table 1).

Two gates of a 74LS04 generate the clock for the 8253 timer chip. I used a 1.8432 MHz crystal, although a 2 MHz crystal also works. The computer buffers the bar code wand's input through a Schmitt trigger inverter (74LS14) to gate 1 of the 8253, and through a second inverter to gate zero. These gates determine when the respective timers start (high) and stop (low).

| E3 | E5 | Address Range |
|---|---|---|
| A5/ | A6/ | 54 hex–5B hex |
| A5/ | A6 | 14 hex–1B hex |
| A5 | A6/ | 74 hex–7B hex |
| A5 | A6 | 34 hex–3B hex |

*Table 1. Address ranges for the four jumper combinations on the bar code reader circuitry. The author used the second range.*

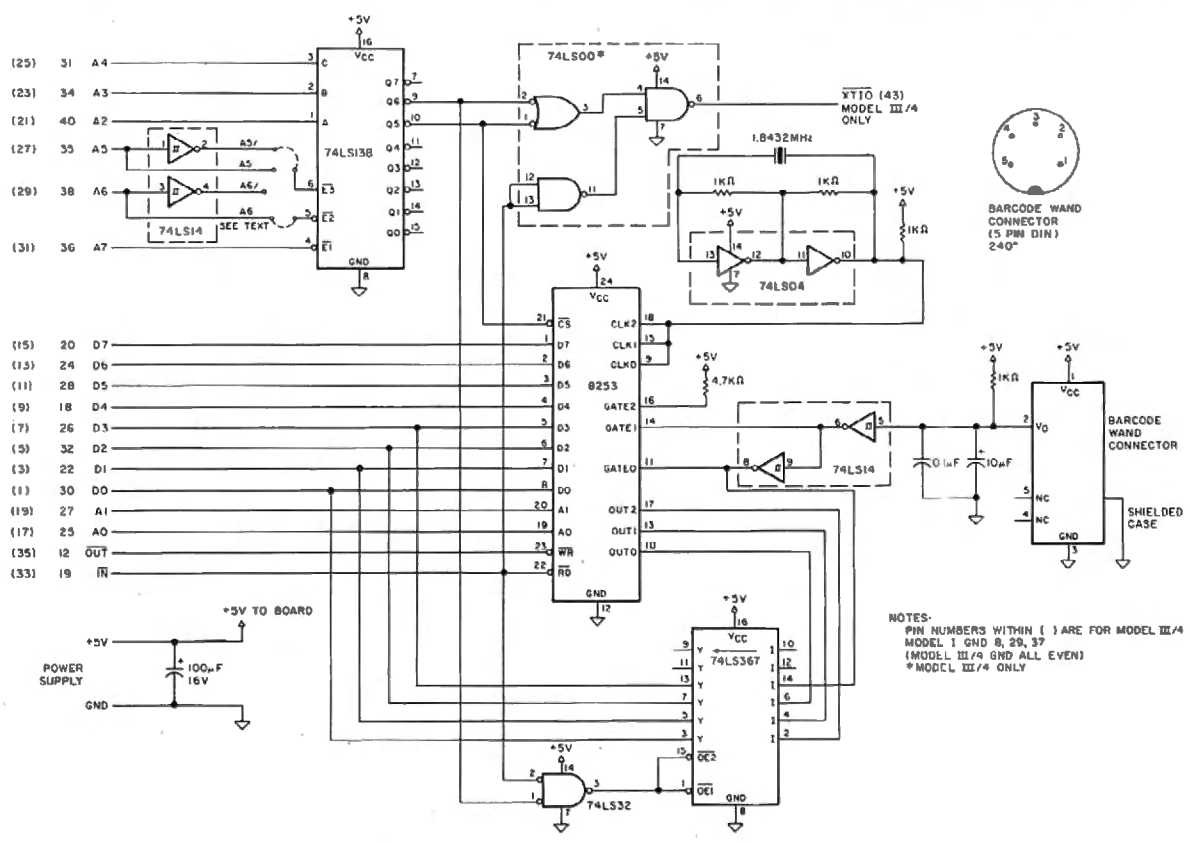


*Figure 1. Schematic for the bar code reader board.*

The output of the bar code wand (through the second inverter) is also routed to a 74LS367 so it may be read into the computer. The timer outputs, also routed to the 74LS367, indicate time-outs.

The HEDS-3250 bar code wand is shielded and has a shielded cable. You should connect this shield to ground (by grounding the connector case) to minimize interference on the line. I noticed a significant improvement in read rate once I grounded the shield.

The connector shown in the Photo isn't the one specified in the parts list (see Table 2). I used what I had on hand—the parts list specifies the proper connector for the job, a five-pin DIN connector, with the pins equally spaced on a 240-degree arc. (Note: Radio Shack's five-pin DIN connector does not work with the HEDS-3250 bar code wand.)

You need a single +5V (volts) power supply at 250 milliamperes (mA) for this project.

### Operation

The board is simple to operate. In fact, most of the project's difficulty lies in the software development. Once you've built the hardware, you should be able to plug everything in and be ready to go. The bar code wand emits a visible red light (many wands use infrared) you can see if you look into the tip.

I use only two of the three 16-bit timers on the 8253 timer chip. The 8253 supports six different timer modes, so you can use the timers in various applications. This application requires timer mode zero, which merely counts down the time value only when the input gate is active (high). Whenever the gate becomes inactive, counting stops automatically. Since the timer output goes active (high) during time-out, you can discern the beginning or end margins of a bar code, or detect read problems.

Hold the bar code wand itself at an angle of between zero and 30 degrees from vertical, as designed.

### Software

The software is the core of this project. Since the bar and space time input is the same for all bar codes, you need only change the software to support new bar codes.



See List of Advertisers on Page 227

| Quantity | Description | Distributor | Part Number | Price (each) |
|---|---|---|---|---|
| 1 | .1" matrix grid prototype board | RS | 276-158 | 1.95 |
| 1 | 8253 programmable interval timer IC | JDR | 8253 | 6.95 |
| 1 | HEDS-3250 Hewlett-Packard bar code wand | HA | HEDS-3250 | 125.00 |
| 1 | 74LS138 3-to-8 decoder IC | JDR | 74LS138 | 0.55 |
| 1 | 74LS14 hex inverter/Schmitt trigger (LS TTL) IC | JDR | 74LS14 | 0.59 |
| 1 | 74LS32 quad 2-input OR gate (LS TTL) IC | JDR | 74LS32 | 0.29 |
| 1 | 74LS04 hex inverter (LS TTL) IC | JDR | 74LS04 | 0.24 |
| 1 | 74LS00 quad two-input NAND gate (LS TTL) IC* | JDR | 74LS00 | 0.24 |
| 1 | 100 µF/35V electrolytic capacitor (PC mount) | RS | 272-1028 | 0.79 |
| 1 | 10 µF/35V electrolytic capacitor (PC mount) | RS | 272-1025 | 0.59 |
| 1 | .1 µF/50V disk capacitor | RS | 272-135 | 0.25 |
| 1 | 74LS367 hex tri-state buffer driver (LS TTL) IC | JDR | 74LS367 | 0.45 |
| 4 | 1k resistor (¼ watt) | RS | 271-1321 | 0.08 |
| 1 | 4.7k resistor (¼ watt) | RS | 271-1330 | 0.08 |
| 1 | 1.8432 MHz crystal | JDR | | 3.95 |
| 1 | 61GA5F 240-degree 5-pin DIN connector‡ | WDS | 61GA5F | 3.00 |
| 1 | 40-pos. cable header (W/W)† | DK | R241-ND | 5.58 |
| 1 | 40-pos. ribbon cable edge connector† | DK | R503-ND | 3.80 |
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*Model III/4
†Model I
‡No shipping charges. Michigan residents add 4 percent tax.

Addresses:

Radio Shack (RS), National Parts Division, 900 East Northside Drive, Fort Worth, TX 76102, 817-870-5662.

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Hamilton/Avnet Electronics (HA), 32487 Schoolcraft Road, Livonia, MI 48150.

Washtenaw Digital Systems (see end of article)

Digi-Key Corp. (DK), Highway 32 S., P.O. Box 677, Thief River Falls, MN 56701, 800-346-5144 or 218-681-6674.

*Table 2. Parts list and ordering information.*

*Program Listing 1. Decoder.*

```
00100 ;*********************************************************
00110 ;          CODE 39 BARCODE DECODER                       *
00120 ;                                                        *
00130 ;               by  Roger C. Alford                      *
00140 ;                                                        *
00150 ;     This software is for use with the barcode input    *
00160 ; board and Hewlett-Packard barcode wand to read in      *
00170 ; Code 39 barcode and convert it as required to ASCII    *
00180 ; strings.  The program performs error checking during   *
00190 ; input and decoding, and informs the user if an error   *
00200 ; is detected.                                           *
00210 ;     The program is designed to be called from Basic    *
00220 ; as a USR call. It expects the call variable to be the  *
00230 ; address of the descriptor block for the string where   *
00240 ; the decoded barcode characters are to be "stored."     *
00250 ; The address is usually received from the Basic         *
00260 ; VARPTR function.                                       *
```

*Listing 1 continued*

I wrote my Assembly-language program for a 48K system (see Program Listing 1), but you can assemble it at a lower address for other systems. You call the program from Basic with a USR function. The program first gets the passed parameter and temporarily stores it away. This parameter should be the pointer to a string descriptor block, where the result string (the bar code read-in) is to be "placed" (the string actually never moves).

The program then calls the subroutine BCDRD to read in the bar code times (see Fig. 2). This section of code remains the same even when reading different bar codes. Once the program has read the code in, the GETCOD routine (see Fig. 3) decodes the input data to an ASCII character string.

Upon returning from GETCOD, the carry flag indicates the success or failure of the read. If the carry flag is set, the read was unsuccessful. If the carry flag is clear, the decoded string address and size are placed into the descriptor block passed by the Basic program so the Basic program can read the string. Finally, a value is returned to the Basic program's USR result variable. The returned number can be one of three values (see Table 3).

As the values indicate, the program can read the bar code either forward or backward. Since Code 39 has both a beginning and a trailing asterisk, the software must merely check the bit pattern of the first character to determine the bar code read direction. Note that if the read was a backward read, the characters in the returned string will still be backward.

Program Listing 2 shows a Basic program using the bar code decoding software. Line 30 of the program calls the Assembly-language program. Notice that A$ receives the decoded bar code string, and the variable A gets the read status code. Incidentally, if you're going to read in more than one

| Value | Description |
|---|---|
| 0 | No errors; forward bar code read |
| 1 | No errors; backward bar code read |
| 2 | Bar code read error occurred |

*Table 3. Possible values returned to the USR routine.*

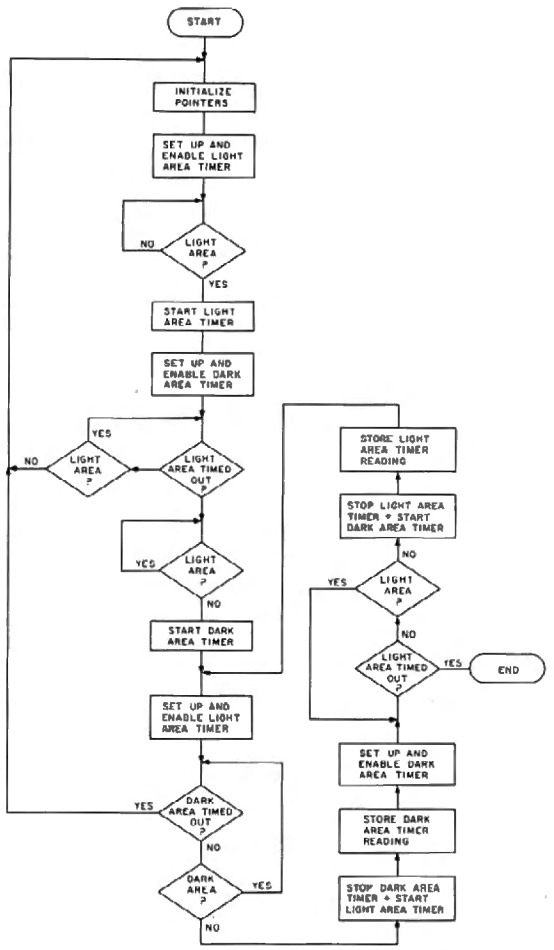


*Figure 2. Bar code timing flowchart.*

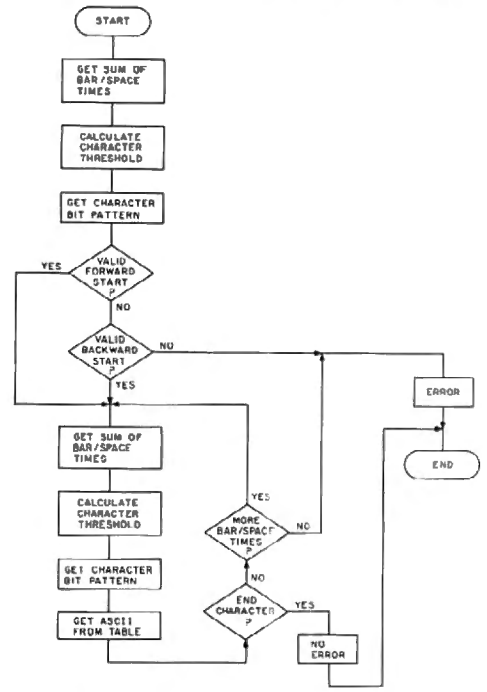


*Figure 3. Bar code decoding flowchart.*

bar code, the program should move the string to another variable since the next decoded bar code will write over the previous one (even if the second one has a different name).

The Basic program in Listing 2 prints the decoded string and the direction of the read if the read was good, or prints an error message if the read was bad. The program executes a short delay before the next read.

### Note to Readers

I'm always open to new project suggestions and ideas. Feel free to send me a note describing the project and why you think it would make a good one. ■

---

*To correspond with Roger C. Alford, send a self-addressed, stamped envelope c/o Washtenaw Digital Systems, P.O. Box 2014, Ann Arbor, MI 48106.*

*Listing 1 continued*

```
00270 ;     The program returns a status code to the Basic     *
00280 ; program. The possible code values and their            *
00290 ; respective meanings are described here:                 *
00300 ;        0 = No errors, forward barcode read.            *
00310 ;        1 = No errors, backward barcode read.           *
00320 ;        2 = Barcode read error occured.                 *
00330 ;                                                        *
00340 ;     Notice that the code can be read in either         *
00350 ; forward or backward, and the direction is given to     *
00360 ; the Basic program.                                     *
00370 ;     The lines marked for Model III/4 only are, of      *
00380 ; course, only required for those models.                *
00390 ;*****************************************************
00400 ;
F940          00410          ORG     0F940H
              00420 ;
0017          00430 TMRCMD   EQU     17H             ;TIMER COMMAND PORT
0014          00440 TIMER0   EQU     14H             ;TIMER0 TIME PORT
0015          00450 TIMER1   EQU     15H             ;TIMER 1 TIME PORT
0018          00460 BARCOD   EQU     18H             ;BARCODE STATUS PORT
0A7F          00470 GETPAR   EQU     0A7FH           ;GET PARAMETER ROUTINE
0A9A          00480 RETBAS   EQU     0A9AH           ;RETURN TO BASIC
FFFF          00490 TOM      EQU     0FFFFH          ;TOP OF MEMORY
              00500 ;
F940 CD7F0A   00510 BCSTRT   CALL    GETPAR          ;GET STRING PARAM
F943 22E7FB   00520          LD      (STRTMP),HL     ;SAVE IN TEMP. LOC
              00530 ;        LD      A,10H           ;**** MODEL III/4 ONLY
              00540 ;        OUT     (0ECH),A        ;**** MODEL III/4 ONLY
F946 CDD1FA   00550          CALL    BCDRD           ;READ IN BARCODE DATA
F949 CD73F9   00560          CALL    GETCOD          ;CONVERT TO ASCII
F94C 3006     00570          JR      NC,OKTOSV       ;IF NO ERROR, SAVE STR
F94E 210200   00580          LD      HL,0002H        ;ELSE, GET ERROR CODE
F951 C39A0A   00590          JP      RETBAS          ;RETURN TO BASIC
F954 EB       00600 OKTOSV   EX      DE,HL           ;PUT HL INTO DE
F955 2AE7FB   00610          LD      HL,(STRTMP)     ;GET STRING DES BLOCK
```

*Listing 1 continued*

*Program Listing 2. A sample program using Decoder.*

```
10 A$=""
20 DEFUSR0=&HF940
25 FOR I=1 TO 100:NEXT I:'   AFTER READ DELAY
30 A=USR0(VARPTR(A$))
40 IF A=0 PRINT A$:PRINT"FORWARD":GOTO 25
45 IF A=1 PRINT A$:PRINT"BACKWARD":GOTO 25
50 IF A=2 THEN PRINT "READ ERROR":GOTO 25
60 END
```

*End*

```
F97A 2F       00860          CPL                ;COMPLEMENT BYTE
F97B 5F       00870          LD      E,A        ;STORE IN E REG.
F97C 3E05     00880          LD      A,5        ;PUT DIVISOR INTO A REG.
F97E D5       00890          PUSH    DE         ;SAVE VALUE
F97F CDA7FA   00900          CALL    DIVIDE     ;GET 20% OF COUNT VALUE
F982 E1       00910          POP     HL         ;RESTORE VALUE INTO HL
F983 D8       00920          RET     C          ;RETURN ON ERROR
F984 ED52     00930          SBC     HL,DE      ;SUBTR 20% OF COUNT VALU
F986 7C       00940          LD      A,H        ;GET HI COUNT BYTE
F987 2F       00950          CPL                ;COMPLEMENT BYTE
F988 67       00960          LD      H,A        ;STORE BACK IN H REG
F989 7D       00970          LD      A,L        ;GET LOW COUNT BYTE
F98A 2F       00980          CPL                ;COMPLEMENT BYTE
F98B 6F       00990          LD      L,A        ;STORE BACK INTO L REG
F98C 22ECFB   01000          LD      (BUFFER),HL ;STORE CNT INTO BUFR
F98F 21ECFB   01010          LD      HL,BUFFER  ;POINT TO BUFFER
F992 22E3FB   01020          LD      (NEWPTR),HL ;INIT. ASCII CHAR PTR
F995 CDE5F9   01030          CALL    GETPAT     ;GET BIT PATTERN
F998 D8       01040          RET     C          ;RETURN ON ERROR
F999 7A       01050          LD      A,D        ;GET BAR BIT PATRN
F99A FE06     01060          CP      06H        ;CHECK FOR FWD '*' PTRN
F99C 2009     01070          JR      NZ,CHKBAK  ;IF NOT, CHECK FOR BKWRD
F99E 7B       01080          LD      A,E        ;GET SPACE BIT PATRN
F99F FE08     01090          CP      08H        ;CHECK FOR FWD '*' PATRN
F9A1 3E00     01100          LD      A,00H      ;LOAD A REG JUST IN CASE
F9A3 280B     01110          JR      Z,FWD      ;IF YES, FORWARD CODE
F9A5 37       01120 ERR      SCF                ;ELSE, ERROR - SET CARRY
F9A6 C9       01130          RET                ;RETURN ON ERROR
F9A7 FE0C     01140 CHKBAK   CP      0CH        ;CHECK FOR BKWD BAR PTRN
F9A9 20FA     01150          JR      NZ,ERR     ;IF NOT, ERROR
F9AB 7B       01160          LD      A,E        ;GET SPACE BIT PATRN
F9AC FE01     01170          CP      01H        ;CHECK FOR BKWD PATRN
F9AE 20F5     01180          JR      NZ,ERR     ;IF NOT, BAD CODE READ
F9B0 32E9FB   01190 FWD      LD      (DIRFLG),A ;SET DIRECTION FLAG APROP
F9B3 ED5BE1FB 01200 LOOP6    LD      DE,(PTR)   ;GET END OF BUFR POINTER
F9B7 E5       01210          PUSH    HL         ;SAVE BUFFER POINTER
F9B8 B7       01220          OR      A          ;CLEAR CARRY FLAG
F9B9 ED52     01230          SBC     HL,DE      ;CHECK FOR END OF BUFFER
F9BB E1       01240          POP     HL         ;RESTORE HL POINTER
F9BC 28E7     01250          JR      Z,ERR      ;IF END, BAD READ
F9BE 23       01260          INC     HL         ;POINT PAST DUMMY WORD
F9BF 23       01270          INC     HL
F9C0 CDD6F9   01280          CALL    DECODE     ;GET NEXT ASCII CHAR
F9C3 D8       01290          RET     C          ;RETURN ON ERROR
F9C4 FE2A     01300          CP      '*'        ;CHECK FOR END OF BUFR
F9C6 2805     01310          JR      Z,DUN      ;IF YES, DONE WITH DECOD
F9C8 CD9CFA   01320          CALL    SAVECH     ;ELSE, SAVE THE CHAR.
F9CB 18E6     01330          JR      LOOP6      ;LOOP FOR NEXT CHAR.
F9CD AF       01340 DUN      XOR     A          ;CLEAR ACC.
F9CE CD9CFA   01350          CALL    SAVECH     ;PUT 00 AT END OF ASCII
F9D1 21ECFB   01360          LD      HL,BUFFER  ;POINT TO BEG OF STRING
F9D4 B7       01370          OR      A          ;CLEAR CARRY (ERR FLAG)
F9D5 C9       01380          RET                ;RETURN - ALL OK
              01390 ;
F9D6 CDE5F9   01400 DECODE   CALL    GETPAT     ;GET CHAR BIT PATRN
F9D9 D8       01410          RET     C          ;RETURN ON ERROR
F9DA 3AE9FB   01420          LD      A,(DIRFLG) ;GET DIRECTION FLAG
F9DD B7       01430          OR      A          ;SET STATUS FLAGS
F9DE C45CFA   01440          CALL    NZ,REVPAT  ;IF SET, REVERSE BITS
F9E1 CD6FFA   01450          CALL    GETASC     ;GET ASCII CHAR
F9E4 C9       01460          RET                ;DONE - RETURN
              01470 ;
F9E5 110000   01480 GETPAT   LD      DE,0000H   ;CLEAR DE REG PAIR
F9E8 ED53EAFB 01490          LD      (SUM),DE   ;CLEAR SUM VARIABLE
F9EC 0609     01500          LD      B,9        ;SET UP BIT COUNTER
F9EE 22E5FB   01510          LD      (TEMP),HL  ;SAVE HL POINTER VALUE
F9F1 E5       01520 GETP2    PUSH    HL         ;SAVE BUFFER POINTER
F9F2 ED5BE1FB 01530          LD      DE,(PTR)   ;GET END OF BUFR PTR
F9F6 B7       01540          OR      A          ;CLEAR CARRY FLAG
F9F7 ED52     01550          SBC     HL,DE      ;COMPARE VALUES
F9F9 E1       01560          POP     HL         ;RESTORE HL POINTER
F9FA 2002     01570          JR      NZ,NOPROB  ;IF NOT END, ALL OK
F9FC 37       01580          SCF                ;ELSE ERROR, SET CARRY
F9FD C9       01590          RET                ;DONE - RETURN ON ERROR
F9FE 7E       01600 NOPROB   LD      A,(HL)     ;GET LOW COUNT BYTE
F9FF 2F       01610          CPL                ;COMPLEMENT BYTE
FA00 5F       01620          LD      E,A        ;STORE IN E REG
FA01 23       01630          INC     HL         ;POINT TO HI COUNT BYTE
FA02 7E       01640          LD      A,(HL)     ;GET HIGH COUNT BYTE
```

*Listing 1 continued*


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```
FA03 2F          01650          CPL             ;COMPLEMENT BYTE
FA04 57          01660          LD      D,A     ;STORE IN D REG
FA05 2B          01670          DEC     HL      ;POINT TO LOW BYTE AGAIN
FA06 CB3A        01680          SRL     D       ;DIVIDE COUNT BY 4
FA08 CB1B        01690          RR      E
FA0A CB3A        01700          SRL     D
FA0C CB1B        01710          RR      E
FA0E 73          01720          LD      (HL),E  ;STORE VALUE BACK IN BUFR
FA0F 23          01730          INC     HL      ;POINT TO HIGH BYTE LOC
FA10 72          01740          LD      (HL),D  ;STORE VALUE BACK IN BUFR
FA11 23          01750          INC     HL      ;POINT TO NEXT WORD
FA12 CD92FA      01760          CALL    ADDVAL  ;ADD VALUE TO SUM
FA15 D8          01770          RET     C       ;RETURN ON ERROR
FA16 10D9        01780          DJNZ    GETP2   ;LOOP FOR ALL 9 BITS
FA18 ED5BEAFB    01790          LD      DE,(SUM) ;GET ACCUMULATED SUM
FA1C 3E08        01800          LD      A,8     ;GET DIVISOR
FA1E CDA7FA      01810          CALL    DIVIDE  ;GET THRESHOLD BASE
FA21 D8          01820          RET     C       ;RETURN ON ERROR
FA22 2AE5FB      01830          LD      HL,(TEMP) ;POINT TO BEG OF CHAR AGN
FA25 010000      01840          LD      BC,0000H ;CLEAR BC REG PAIR
FA28 CD48FA      01850          CALL    GETBAR  ;GET BAR BIT
FA2B CD3BFA      01860          CALL    GETPR   ;GET SPACE AND BAR BITS
FA2E CD3BFA      01870          CALL    GETPR   ;GET SPACE AND BAR BITS
FA31 CD3BFA      01880          CALL    GETPR   ;GET SPACE AND BAR BITS
FA34 CD3BFA      01890          CALL    GETPR   ;GET SPACE AND BAR BITS
FA37 50          01900          LD      D,B     ;PUT BAR BITS INTO D REG
FA38 59          01910          LD      E,C     ;PUT SPC BITS INTO E REG
FA39 B7          01920          OR      A       ;CLEAR CARRY - ALL OK
FA3A C9          01930          RET             ;DONE - RETURN
                 01940 ;
FA3B CD42FA      01950 GETPR    CALL    GETSPC  ;GET SPACE BIT
FA3E CD48FA      01960          CALL    GETBAR  ;GET BAR BIT
FA41 C9          01970          RET             ;DONE - RETURN
                 01980 ;
FA42 CD4EFA      01990 GETSPC   CALL    CHKTHR  ;COMPARE BIT TO THRESHOLD
FA45 CB11        02000          RL      C       ;PUT BIT INTO C REG
FA47 C9          02010          RET             ;DONE - RETURN
                 02020 ;
FA48 CD4EFA      02030 GETBAR   CALL    CHKTHR  ;COMPARE BIT TO THRESHOLD
FA4B CB10        02040          RL      B       ;PUT BIT INTO B REG
FA4D C9          02050          RET             ;DONE - RETURN
                 02060 ;
FA4E C5          02070 CHKTHR   PUSH    BC      ;SAVE BIT PATTERNS
FA4F 4E          02080          LD      C,(HL)  ;GET LOW COUNT BYTE
FA50 23          02090          INC     HL      ;POINT TO HIGH BYTE
FA51 46          02100          LD      B,(HL)  ;GET HIGH COUNT BYTE
FA52 23          02110          INC     HL      ;POINT TO NEXT WORD
FA53 E5          02120          PUSH    HL      ;SAVE HL POINTER VALUE
FA54 6B          02130          LD      L,E     ;PUT THRESHOLD VALUE
FA55 62          02140          LD      H,D     ;  INTO HL REG PAIR
FA56 B7          02150          OR      A       ;CLEAR CARRY FLAG
FA57 ED42        02160          SBC     HL,BC   ;COMPARE THRESH TO COUNT
FA59 E1          02170          POP     HL      ;RESTORE HL POINTER
FA5A C1          02180          POP     BC      ;RESTORE BIT PATTERNS
FA5B C9          02190          RET             ;DONE - RETURN
                 02200 ;
FA5C AF          02210 REVPAT   XOR     A       ;CLEAR THE ACCUMULATOR
FA5D 0604        02220          LD      B,4     ;SET SPACE BIT CNTR
FA5F CB1B        02230 CHGE     RR      E       ;PUT LOW BIT INTO CARRY
FA61 17          02240          RLA             ;MOVE BIT INTO ACC.
FA62 10FB        02250          DJNZ    CHGE    ;MOVE ALL BITS
FA64 5F          02260          LD      E,A     ;STORE NEW PTRN IN E REG
FA65 0605        02270          LD      B,5     ;SET BAR BIT CNTR
FA67 AF          02280          XOR     A       ;CLEAR THE ACCUMULATOR
FA68 CB1A        02290 CHGD     RR      D       ;PUT LOW BIT INTO CARRY
FA6A 17          02300          RLA             ;MOVE BIT INTO ACC.
FA6B 10FB        02310          DJNZ    CHGD    ;MOVE ALL BITS
FA6D 57          02320          LD      D,A     ;STORE NEW PTRN IN D REG
FA6E C9          02330          RET             ;DONE - RETURN
                 02340 ;
FA6F E5          02350 GETASC   PUSH    HL      ;SAVE HL POINTER VALUE
FA70 062C        02360          LD      B,44    ;GET CODE COUNT
FA72 215DFB      02370          LD      HL,DATBL ;POINT TO DATA TABLE
FA75 7E          02380 CODLP    LD      A,(HL)  ;GET BAR CODE PATTERN
FA76 23          02390          INC     HL      ;POINT TO SPC PATTERN
FA77 BA          02400          CP      D       ;COMPARE TO BAR PTRN
FA78 2004        02410          JR      NZ,MIST1 ;IF NOT, CHECK NEXT
FA7A 7E          02420          LD      A,(HL)  ;GET SPC CODE PATTERN
FA7B BB          02430          CP      E       ;COMPARE TO SPC PTRN
FA7C 2006        02440          JR      Z,FNDCOD ;IF YES, FOUND CODE
FA7E 23          02450 MIST1    INC     HL      ;ELSE, POINT TO NXT PTRN
FA7F 10F4        02460          DJNZ    CODLP   ;LOOP UNTIL DONE
FA81 E1          02470          POP     HL      ;RESTORE HL POINTER
FA82 37          02480          SCF             ;INVALID CODE, ERROR
FA83 C9          02490          RET             ;DONE - RETURN ON ERROR
FA84 3E2C        02500 FNDCOD   LD      A,44    ;GET MAX. COUNT VALUE
FA86 90          02510          SUB     B       ;SUBTRACT B COUNT
FA87 4F          02520          LD      C,A     ;STORE INTO C REG AS OFST
FA88 0600        02530          LD      B,0     ;CLEAR B REG.
FA8A 21B5FB      02540          LD      HL,ASCTBL ;POINT TO ASCII TABLE
FA8D 09          02550          ADD     HL,BC   ;POINT TO ASCII CHARACTER
FA8E 7E          02560          LD      A,(HL)  ;GET CHARACTER
FA8F B7          02570          OR      A       ;CLEAR CARRY - ALL OK
FA90 E1          02580          POP     HL      ;RESTORE HL POINTER VALUE
FA91 C9          02590          RET             ;DONE - RETURN
                 02600 ;
FA92 E5          02610 ADDVAL   PUSH    HL      ;SAVE HL POINTER VALUE
FA93 2AEAFB      02620          LD      HL,(SUM) ;GET SUM VALUE
FA96 19          02630          ADD     HL,DE   ;ADD NEW COUNT VALUE
FA97 22EAFB      02640          LD      (SUM),HL ;STORE NEW SUM VALUE
FA9A E1          02650          POP     HL      ;RESTORE POINTER
FA9B C9          02660          RET             ;DONE - ERROR IF CARRY
                 02670 ;
FA9C E5          02680 SAVECH   PUSH    HL      ;SAVE HL POINTER
FA9D 2AE3FB      02690          LD      HL,(NEWPTR) ;POINT TO ASCII BUF LOC
FAA0 77          02700          LD      (HL),A  ;SAVE CHAR.
FAA1 23          02710          INC     HL      ;POINT TO NEXT LOC.
FAA2 22E3FB      02720          LD      (NEWPTR),HL ;SAVE ASCII BUF PTR
FAA5 E1          02730          POP     HL      ;RESTORE HL POINTER
FAA6 C9          02740          RET             ;DONE - RETURN
                 02750 ;
FAA7 C5          02760 DIVIDE   PUSH    BC      ;SAVE BC REGISTER PAIR
FAA8 B7          02770          OR      A       ;CHECK FOR 0 DIVISOR
FAA9 2003        02780          JR      NZ,OKTODV ;IF NOT ZERO, OK TO DVD
FAAB C1          02790          POP     BC      ;ELSE RESTORE BC
FAAC 37          02800          SCF             ;SET CARRY FLAG
FAAD C9          02810          RET             ;DONE - RETURN ON ERROR
FAAE 4F          02820 OKTODV   LD      C,A     ;STORE DIVISOR INTO C REG
FAAF 0610        02830          LD      B,16    ;SET LOOP COUNTER
FAB1 AF          02840          XOR     A       ;CLEAR ACCUMULATOR
FAB2 CB23        02850 DLOOP    SLA     E       ;SHIFT E REG LEFT 1 BIT
FAB4 CB12        02860          RL      D       ;ROTATE D LEFT ONE BIT
FAB6 17          02870          RLA             ;ROTATE ACC LEFT 1 BIT
FAB7 B9          02880          CP      C       ;COMPARE ACC. TO C REG
FAB8 3002        02890          JR      C,NOINC ;IF CARRY, NO INCREMENT
FABA 1C          02900          INC     E       ;ELSE INCREM E
FABB 91          02910          SUB     C       ;SUB DIVSR FROM ACC
FABC 10F4        02920 NOINC    DJNZ    DLOOP   ;LOOP FOR ALL BITS
FABE 47          02930          LD      B,A     ;SAVE ACC VALUE IN B
FABF 79          02940          LD      A,C     ;GET DIVISOR INTO ACC.
FAC0 CB3F        02950          SRL     A       ;SHIFT DVSR RIGHT
FAC2 CE00        02960          ADC     A,0     ;ADD CARRY BIT
FAC4 4F          02970          LD      C,A     ;STORE BACK INTO C REG
FAC5 78          02980          LD      A,B     ;PUT B BACK INTO ACC.
FAC6 91          02990          SUB     C       ;SUBTR C REG VALUE
FAC7 3005        03000          JR      C,NOINC2 ;IF CARRY, NO INCREMENT
FAC9 1C          03010          INC     E       ;INCR. RESULT BYTE
FACA 7A          03020          LD      A,D     ;PUT D REG INTO ACC.
FACB CE00        03030          ADC     A,0     ;ADD CARRY
FACD 57          03040          LD      D,A     ;PUT BACK INTO D REG
FACE C1          03050 NOINC2   POP     BC      ;RESTORE BC REGISTERS
FACF B7          03060          OR      A       ;CLEAR CARRY - ALL OK
FAD0 C9          03070          RET             ;DONE - RETURN
                 03080 ;
                 03090 ;
FAD1 21ECFB      03100 BCDRD    LD      HL,BUFFER ;POINT TO BUFFER AREA
FAD4 22E1FB      03110          LD      (PTR),HL ;STORE POINTER VALUE
FAD7 3E70        03120          LD      A,70H   ;GET TIMER 1 COMMAND BYTE
FAD9 D317        03130          OUT     (TMRCMD),A ;SET TIMER TO MODE 0
FADB 3E20        03140          LD      A,20H   ;GET LOW-ORDER TIMER BYTE
FADD D315        03150          OUT     (TIMER1),A ;SEND TO LIGHT AREA TIMER
FADF 3E4E        03160          LD      A,4EH   ;GET HI-ORDER TIMER BYTE
FAE1 D315        03170          OUT     (TIMER1),A ;SEND TO LIGHT AREA TIMER
FAE3 DB18        03180 LOOP1    IN      A,(BARCOD) ;READ BARCOD OUTPUT
FAE5 CB5F        03190          BIT     3,A     ;CHECK BARCODE BIT
FAE7 20FA        03200          JR      NZ,LOOP1 ;IF DARK AREA, WAIT
FAE9 3E30        03210          LD      A,30H   ;GET TIMER 0 COMMAND BYTE
FAEB D317        03220          OUT     (TMRCMD),A ;SET TIMER FOR MODE 0
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✓ See List of Advertisers on Page 227

*Listing 1 continued*

```
FAED 3EFF   03230          LD     A,0FFH       ;GET LOW-ORDER TIMER BYTE
FAEF D314   03240          OUT    (TIMER0),A   ;SEND TO DARK AREA TIMER
FAF1 D314   03250          OUT    (TIMER0),A   ;SEND HI-ORDER BYTE TOO
FAF3 DB18   03260 LOOP2    IN     A,(BARCOD)   ;GET BARCOD STATUS BYTE
FAF5 CB4F   03270          BIT    1,A          ;CHECK FOR LIGHT TIMEOUT
FAF7 2807   03280          JR     NZ,TMDOUT    ;IF SET, LIGHT TIMED OUT
FAF9 CB5F   03290          BIT    3,A          ;CHECK BARCODE BIT
FAFB 28F6   03300          JR     Z,LOOP2      ;IF LIGHT AREA, LOOP OVER
FAFD C3D1FA 03310          JP     BCDRD        ;ELSE OOPS, START OVER
FB00 DB18   03320 TMDOUT   IN     A,(BARCOD)   ;GET BARCOD STATUS BYTE
FB02 CB5F   03330          BIT    3,A          ;CHECK BARCODE BIT
FB04 28FA   03340          JR     Z,TMDOUT     ;IF STILL LIGHT, WAIT
FB06 3E70   03350 LOOP5    LD     A,70H        ;GET TIMER 1 COMMAND BYTE
FB08 D317   03360          OUT    (TMRCMD),A   ;SET LIGHT FOR MODE 0
FB0A 3EFF   03370          LD     A,0FFH       ;GET LOW-ORDER TIMER BYTE
FB0C D315   03380          OUT    (TIMER1),A   ;SEND TO LIGHT AREA TIMER
FB0E D315   03390          OUT    (TIMER1),A   ;SEND HI-ORDER BYTE TOO
FB10 DB18   03400 LOOP3    IN     A,(BARCOD)   ;GET BARCOD STATUS BYTE
FB12 CB57   03410          BIT    2,A          ;CHECK FOR DARK TIMEOUT
FB14 C2D1FA 03420          JP     NZ,BCDRD     ;IF YES, OOPS-START OVER
FB17 CB5F   03430          BIT    3,A          ;CHECK BARCODE BIT
FB19 28F5   03440          JR     NZ,LOOP3     ;IF STILL DARK, LOOP OVER
FB1B 0E14   03450          LD     C,TIMER0     ;POINT TO TIMER 0 PORT
FB1D ED58   03460          IN     E,(C)        ;GET LOW DARK COUNT BYTE
FB1F ED50   03470          IN     D,(C)        ;GET HI DARK COUNT BYTE
FB21 CD43FB 03480          CALL   SAVE         ;STORE VALUE IN BUFFER
FB24 3E30   03490          LD     A,30H        ;GET TIMER 0 COMMAND BYTE
FB26 D317   03500          OUT    (TMRCMD),A   ;SET DARK FOR MODE 0
FB28 3EFF   03510          LD     A,0FFH       ;GET LOW-ORDER COUNT BYTE
FB2A D314   03520          OUT    (TIMER0),A   ;SEND TO DARK AREA TIMER
FB2C D314   03530          OUT    (TIMER0),A   ;SEND HI-ORDER BYTE TOO
FB2E DB18   03540 LOOP4    IN     A,(BARCOD)   ;GET BARCOD STATUS BYTE
FB30 CB4F   03550          BIT    1,A          ;CHECK FOR LIGHT TIMEOUT
FB32 C0     03560          RET    NZ           ;IF YES, TIMING DONE!!!
FB33 CB5F   03570          BIT    3,A          ;ELSE, CHECK BARCODE BIT
FB35 28F7   03580          JR     Z,LOOP4      ;IF STILL LIGHT, LOOP
FB37 0E15   03590          LD     C,TIMER1     ;POINT TO LIGHT TIMER
FB39 ED58   03600          IN     E,(C)        ;GET LOW LIGHT COUNT BYTE
FB3B ED50   03610          IN     D,(C)        ;GET HI LIGHT COUNT BYTE
FB3D CD43FB 03620          CALL   SAVE         ;STORE VALUE IN BUFFER
FB40 C306FB 03630          JP     LOOP5        ;LOOP OVER UNTIL DONE
            03640 ;
FB43 2A21FB 03650 SAVE     LD     HL,(PTR)     ;GET CURRENT BUFFER PTR
FB46 01FDFF 03660          LD     BC,ENDBFR-2  ;PT TO BEG OF LAST ENTRY
FB49 B7     03670          OR     A            ;CLEAR CARRY FLAG
FB4A ED42   03680          SBC    HL,BC        ;CHECK FOR END OF BUFFER
FB4C 3804   03690          JR     C,SAVOK      ;IF NOT END, OK TO SAVE
FB4E E1     03700          POP    HL           ;ELSE OOPS, POP RTRN ADDR
FB4F C3D1FA 03710          JP     BCDRD        ;START ALL OVER
FB52 2A21FB 03720 SAVOK    LD     HL,(PTR)     ;GET POINT VALUE AGAIN
FB55 73     03730          LD     (HL),E       ;SAVE LOW-ORDER COUNT BYT
FB56 23     03740          INC    HL           ;POINT TO NEXT BUFFER LOC
FB57 72     03750          LD     (HL),D       ;SAVE HI-ORDER COUNT BYTE
FB58 23     03760          INC    HL           ;POINT TO NEXT BUFFER LOC
FB59 22E1FB 03770          LD     (PTR),HL     ;SAVE NEW POINTER VALUE
FB5C C9     03780          RET                 ;DONE - RETURN
            03790 ;
FB5D 11     03800 DATBL    DEFB   11H          ;BARCODE DATA TABLE
FB5E 04     03810          DEFB   04H
FB5F 09     03820          DEFB   09H
FB60 04     03830          DEFB   04H
FB61 18     03840          DEFB   18H
FB62 04     03850          DEFB   04H
FB63 05     03860          DEFB   05H
FB64 04     03870          DEFB   04H
FB65 14     03880          DEFB   14H
FB66 04     03890          DEFB   04H
FB67 0C     03900          DEFB   0CH
FB68 04     03910          DEFB   04H
FB69 03     03920          DEFB   03H
FB6A 04     03930          DEFB   04H
FB6B 12     03940          DEFB   12H
FB6C 04     03950          DEFB   04H
FB6D 0A     03960          DEFB   0AH
FB6E 04     03970          DEFB   04H
FB6F 06     03980          DEFB   06H
FB70 04     03990          DEFB   04H
FB71 11     04000          DEFB   11H
FB72 02     04010          DEFB   02H
FB73 09     04020          DEFB   09H
FB74 02     04030          DEFB   02H
FB75 18     04040          DEFB   18H
FB76 02     04050          DEFB   02H
FB77 05     04060          DEFB   05H
FB78 02     04070          DEFB   02H
FB79 14     04080          DEFB   14H
FB7A 02     04090          DEFB   02H
FB7B 0C     04100          DEFB   0CH
FB7C 02     04110          DEFB   02H
FB7D 03     04120          DEFB   03H
FB7E 02     04130          DEFB   02H
FB7F 12     04140          DEFB   12H
FB80 02     04150          DEFB   02H
FB81 0A     04160          DEFB   0AH
FB82 02     04170          DEFB   02H
FB83 06     04180          DEFB   06H
FB84 02     04190          DEFB   02H
FB85 11     04200          DEFB   11H
FB86 01     04210          DEFB   01H
FB87 09     04220          DEFB   09H
FB88 01     04230          DEFB   01H
FB89 18     04240          DEFB   18H
FB8A 01     04250          DEFB   01H
FB8B 05     04260          DEFB   05H
FB8C 01     04270          DEFB   01H
FB8D 14     04280          DEFB   14H
FB8E 01     04290          DEFB   01H
FB8F 0C     04300          DEFB   0CH
FB90 01     04310          DEFB   01H
FB91 03     04320          DEFB   03H
FB92 01     04330          DEFB   01H
FB93 12     04340          DEFB   12H
FB94 01     04350          DEFB   01H
FB95 0A     04360          DEFB   0AH
FB96 01     04370          DEFB   01H
FB97 06     04380          DEFB   06H
FB98 01     04390          DEFB   01H
FB99 11     04400          DEFB   11H
FB9A 08     04410          DEFB   08H
FB9B 09     04420          DEFB   09H
FB9C 08     04430          DEFB   08H
FB9D 18     04440          DEFB   18H
FB9E 08     04450          DEFB   08H
FB9F 05     04460          DEFB   05H
FBA0 08     04470          DEFB   08H
FBA1 14     04480          DEFB   14H
FBA2 08     04490          DEFB   08H
FBA3 0C     04500          DEFB   0CH
FBA4 08     04510          DEFB   08H
FBA5 03     04520          DEFB   03H
FBA6 08     04530          DEFB   08H
FBA7 12     04540          DEFB   12H
FBA8 08     04550          DEFB   08H
FBA9 0A     04560          DEFB   0AH
FBAA 08     04570          DEFB   08H
FBAB 06     04580          DEFB   06H
FBAC 08     04590          DEFB   08H
FBAD 00     04600          DEFB   00H
FBAE 0E     04610          DEFB   0EH
FBAF 00     04620          DEFB   00H
FBB0 0D     04630          DEFB   0DH
FBB1 00     04640          DEFB   00H
FBB2 0B     04650          DEFB   0BH
FBB3 00     04660          DEFB   00H
FBB4 07     04670          DEFB   07H
FBB5 31     04680 ASCTBL   DEFM   '1234'          ;ASCII CHARACTER TABLE
FBB9 35     04690          DEFM   '567890'
FBBF 41     04700          DEFM   'ABCDEFGHIJKLMNOPQRSTUVWXYZ'
FBD9 2D     04710          DEFM   '-. *$/+%'
0002        04720 PTR      DEFS   2             ;BUFFER POINTER STORAGE
0002        04730 NEWPTR   DEFS   2             ;ASCII STRING POINTER
0002        04740 TEMP     DEFS   2             ;TEMPORARY PTR HOLDER
0002        04750 STRTMP   DEFS   2             ;STORAGE FOR STRNG PARAM
0001        04760 DIRFLG   DEFS   1             ;CODE DIRECTION FLAG
0002        04770 SUM      DEFS   2             ;SUM STORAGE
0000        04780 BUFFER   DEFS   0             ;DATA STORAGE BUFFER
FFFF        04790 ENDBFR   EQU    TOM           ;END OF BUFFER LOCATION
F940        04800          END    BCSTRT
00000 Total errors
```

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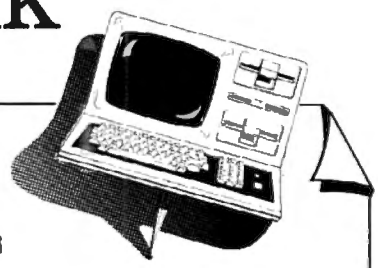

An electronic bulletin board works like the bulletin board at your local supermarket, but sending messages on a small computer is a lot more complicated than tacking them up at the corner grocery.

Last month we introduced you to electronic bulletin boards and described how computers communicate with one another over telephone lines (see "BBS Express," May 1984, p. 42). But there's more involved in bulletin boards than teaching your TRS-80 to talk on the telephone. Over the course of this series we'll take a look at telecommunication theory, disk file formats, Z80 Assembly language, and Basic programming tricks. You'll learn to write a complex program and modify an existing operating system. You don't have to be an Assembly-language programmer to follow the discussion, but it would help if you're familiar with editor/assemblers.

Each month we'll present another module of the BBS and explain how each module fits into the finished bulletin board and justify our programming decisions. The code for each module is available on Load 80, and as we mentioned last month, you can download the code from our BBS (606-739-6088) after 6 p.m. Eastern Standard Time.

Impatient readers can order a working version of the BBS from us (see ordering information at the end of this article).

### Switching Messages

An electronic bulletin board is essentially a telecommunicating message-switching program. It works like the bulletin board at your local supermarket, but sending messages on a small computer is a lot more complicated than tacking them up at the corner grocery.

A visitor to your BBS wants to send and receive information, and you must guide him through the system. Simply linking your TRS-80 to the telephone line with a modem isn't enough. A good BBS should prompt the user, provide a method for sending and receiving information and a directory of available information, and be absolutely crash-proof.

A BBS is an operating environment for your computer that limits the user's choices, provides input/output facilities, monitors the telephone connection, and handles files.

Bulletin board systems are most popular at night, when long-distance telephone rates are lowest. Since you're probably not going to be there if someone uses the BBS at 3 a.m., your BBS software should be helpful enough to offset its lack of documentation.

### Environmental Conditions

Before writing the BBS, you must decide on a system and an environment, list the system's functions, and make Basic talk.

Choosing an environment for the BBS Express involves some arbitrary decisions. We chose a Model III with 48K RAM, two 40-track disk drives, a Daisy Wheel II printer, and a Hayes Smartmodem. (The system does not require the printer.) For operating systems, we chose TRSDOS 1.3 and LDOS 5.1.3.

We can already hear Models I and 4 owners grumbling. Let us explain our decisions. The BBS is not a small program—it requires about 28K to run. Although you could run it (with alterations) as a series of modules on a machine with less memory, the BBS would run so poorly that it wouldn't be worth the effort. To work properly, the BBS Express needs a 48K machine.

Model 4's pose a different problem. Running in Model 4 mode, the computer switches out its ROMs. Since our BBS uses ROM calls, we can only support Model 4's operating in Model III mode.

Our DOS choices will probably create a lot of flak, too. We want to examine different operating systems in the BBS Express, and investigate the problems inherent to designing a system that runs in different environments. We chose TRSDOS 1.3 because Model IIIs came with a copy of it, and LDOS 5.1.3 because it approaches the same problems in a radically different way. This doesn't mean the BBS won't run on your operating system.

Since the machine-code portions of the program don't interact with the DOS, and the remainder of the program is in standard Basic, the BBS Express might run very well with your DOS. We hope so. Try it and let us know how it goes.

### Parameter Choices

We also had to decide on communications parameters, often inaccurately

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referred to as communications protocols. Last month we discussed baud rate (the speed of information transfer), word length (the number of bits in a word), stop bits (the number of bits signifying the end of a character), and parity (a method for error-checking).

To set these parameters, you must configure your universal asynchronous receiver/transmitter (UART). Your baud rate depends on the rates your modem supports. You can't set your UART for a 1,200 baud rate if the modem only supports 300 baud, the most popular rate for small computers. Our Hayes Smartmodem is a 300 baud unit.

Word length, you will recall from last month, can be 5, 6, 7, or 8 bits. Many BBSes use 8-bit words, but you can send the entire ASCII set using only 7 bits. CompuServe Information Service uses 7-bit words, and our BBS also uses 7-bit words. In fact, we designed the BBS Express to work as much like CompuServe as possible. We followed CompuServe protocol the rest of the way, using even parity and 1 stop bit.

### Specifications

So far, we've picked a machine, two operating systems, and communications parameters. We have no code or any idea of what's going to happen when somebody calls in, but at least we're approaching the project in a systematic manner.

We need to decide on the operational specifications for the program. After a little scratching with a pencil and paper, we came up with a program Wish List (see the Figure). It's not a formal design specification, nor does it cover all the areas we must address in the BBS Express. In later installments, we'll expand our list.

Our Wish List contains some pretty exotic terms. Don't worry if they look strange; demystifying them is what the BBS Express is all about.

The specifications in the list should give you an idea of why we chose the Model III for the BBS. One hundred 20-line messages take up 128,000 bytes, and a Model I has only 89,000 bytes available on a data disk.

### Talking Basic

To create a BBS, you must teach Basic to talk, and to do that, you must learn how to communicate with the UART.

Model IIIs and 4's have port-mapped serial input/output (I/O). You communicate with the UART through its ports, rather than by PEEKing and POKEing in memory. But working with ports is similar to working with memory—easier, in fact.

The Z80 chip that's the brain of your TRS-80 can communicate with 255 different ports. The computer performs operations to the port you specify. Basic has two commands that can access the ports, INP and OUT port,value. INP reads from a port and OUT writes to a port. In Z80 Assembly language, the two commands are IN A,(port) and OUT(port),A.

1. Send and receive information from the telephone lines.
   A. Information must be readily available to Basic.
   B. Must detect broken connection and bring the program to normal termination in that case.
2. Maintain a message board of at least 100 20-line messages.
   A. Message board must be readable forward, backwards, individually, selectively, or by marked messages.
   B. Message board must take care of file clean-up, removing files that have been deleted, or that have scrolled off, and must be indexed for quick operation.
   C. Must support printer so that SYSOP can have hard copy of messages.
   D. Users must have a way of editing messages before storing them.
   E. Must provide a method for marking messages directed to a user, and informing him that he has messages waiting.
   F. The message board should be partitioned into sections, and SYSOP must have control over who has access to what sections.
   G. Private messages must be allowed.
3. Allow for a large database.
   A. Must include a directory or catalog of files available, preferably alphabetic.
   B. Must include provision for downloading program material without formatting to user's screen width.
   C. Password protection desirable for SYSOP's private use.
   D. Must react quickly enough to support burst-transmissions from another computer, and support XON/XOFF handshaking.
4. Maintain a membership log.
   A. Provision for production of mailing labels would be handy.
   B. Must have fast, easy location of individual member's record.
   C. Should produce alphabetic listing, and support printer.
   D. Must allow the user or the SYSOP to alter user's record conveniently.
5. Maintain a chronological user log.
6. Dynamically format the screen displays to the user's screen.

*Figure. Preliminary program outline.*

| Port | Read Function | Write Function |
|---|---|---|
| E8 hex | Modem status | Master Reset |
| E9 hex | Sense switches | Select baud rate |
| EA hex | UART status | UART control |
| EB hex | Receive data | Transmit data |

*Table 1. UART port functions.*

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The UART communicates with the TRS-80 through four of these ports, E8–EB hexadecimal (hex); see Table 1. To make the UART work, you must read from or write to the port assigned a specific instruction or command. An individual port may have one function for reads and another for writes; the direction of data flow determines port operation.

You must read from and write to these ports to set the communications parameters. For successful communications, you have to specify baud rate, parity, word length, and the number of stop bits; set both computers to the same values. Port E9 hex is supposed to set baud rate, so let's start there.

You might try writing the actual baud rate out to the port to set it. Unfortunately, that won't work. The largest number you can write to or read from a port is 255, and your baud rate is 300. Instead, you must write a coded value to this port, and set it to transmit and receive. Though perhaps not practical, you can receive and transmit at different baud rates.

The baud rate port works in a strange way. You must send the code for receiving and the code for transmitting in 1 byte. The code for 300 baud is five. Since you want to send and receive at 300 baud, write a 55 hex byte to the port. The Basic command for this parameter is OUT&HE9,&H55. The Z80 Assembly language command is LD A,55H OUT (0E9H),A.

| Hex values for code | Decimal values for baud rate |
|---|---|
| 2 | 110 |
| 4 | 150 |
| 5 | 300 |
| 6 | 600 |
| 7 | 1,200 |
| A | 2,400 |
| C | 4,800 |
| E | 9,600 |

*Table 2. Baud rate codes.*

Before you can send either command, you must use Reset to get the UART into a known status by writing any value to port E8 hex.

**Building Bytes**

You can now set the rest of the parameters with the UART control port, EA hex. This port might seem confusing if you're unfamiliar with the concept it uses. Port EA hex is bit-mapped: each of its 8 available bits has a different meaning (see Table 3).

You're going to build a byte from the information in Table 3. The UART uses this byte as a map of the functions it performs. If you want a feature, you can set or reset the appropriate bit. To set a bit, make it a 1, and to reset it, make it a zero. Let's start with a clean slate, the binary number 00000000.

Table 3 indicates that position zero is data terminal ready. Many auto-answer modems require data terminal ready to be set, and Table 3 indicates that you'll need a zero bit in position zero, so your byte remains 00000000.

Bit 1 is request to send, a signal used in half-duplex transmissions and not needed here. You should set request to

| Bit Position | Function | Commands |
|---|---|---|
| 0 | Data terminal ready | 1 = reset, 0 = set DTR |
| 1 | Request to send | 1 = reset, 0 = set RTS |
| 2 | Break | 1 = normal, 0 = true |
| 3 | Parity enable | 1 = disable, 1 = enable |
| 4 | Stop bit select | 1 = 2 bits, 0 = 1 bit |
| 5 | Word length | 1 = add 2 bits |
| 6 | Word length | 1 = add 1 bit |
| 7 | Parity | 1 = even, 0 = odd |

*Table 3. Bit map of port EA hex.*

*Don't worry if some of the terms look strange; demystifying them is what the BBS Express is all about.*

send, keeping your byte 00000000.

According to Table 3, bit 2 sets modem break. You can use modem break to get a BBS user's attention or to break a program in some installations. You want normal operation, so you should use a 1 in bit 2. Your byte is now 00000100.

Bits 3 and 7 work together to determine parity. Bit 3 determines whether or not you enable parity, and bit 7 signifies even or odd parity. You should set a zero in position 3 to enable it, and a one in position 7 for even parity. Your byte is now 10000100.

Bits 5 and 6 determine word length. If you set both bits to zero, the word length defaults to 5. Setting bit 5 adds 2 bits to word length, for 7-bit words. Setting bit 6 adds 1 bit to word length, for 6-bit words. Setting both 5 and 6 adds three, for 8-bit words. You want 7-bit words, so set bit 5, making your byte 10100100.

That's what you send out to port EA hex. Since it's awkward dealing with all those zeros and ones, you can express it as decimal 164, or A4 hex. Writing this value to port EA hex sets your communications parameters to 7-bit words, even parity, and no stop bits. The Basic command for this is OUT &HEA,164 and the Assembly-language command is LD A,0A4H followed by OUT (0EAH),A.

Let's summarize. First, you reset the UART by writing any value to port E8 hex. Then you set the baud rate by writing 55 hex to port E9 hex. Finally, you set 7-bit words, 1 stop bit, and even parity, by writing 164 to port EA hex.

Two examples might clarify this operation. Listing 1 contains the Z80 Assembly code, and Listing 2 contains the equivalent Basic commands.

Here's the end of the second BBS Express installment, and we still haven't written any code. But we decided on a system and an operating environment, and examined some program features. Next month the programming starts. ■

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*Program Listing 1. Assembly-language instructions to program UART.*

```
00100       OUT   (0E8H),A       ;MASTER RESET
00110       LD    A,55H          ;300 BAUD
00120       OUT   (0E9H),A
00130       LD    A,0A4H         ;7/E/1
00140       OUT   (0EAH),A
00150       END
```

*End*

*Program Listing 2. Basic instructions to program UART.*

```
100 OUT &HE8,0    :REM   MASTER RESET
200 OUT &HE9,&H55:REM    300 BAUD
300 OUT &HEA,164 :REM    7/E/1
```

*End*



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# Writing and Compiling Your First Pascal Program


Last month you learned a little about the structure of Pascal programs and how to use Pascal's Write and WRITELN statements. This month I'll introduce you to the predefined (elementary) Pascal data types, the Assignment statement, the Read and READLN statements, and describe how to compile programs.

**Defining Variable Types**

As mentioned last month, the elementary Pascal data types are Boolean, character (CHAR), integer, real, and string. Boolean is a special data type that has one of two possible values—true or false. The CHAR data type consists of any single ASCII or special character. Pascal's integer data type is identical to Basic's integer data type. It can represent any whole number between −32,768 and 32,768 inclusive, but can't take on fractional values.

Pascal's real data type is identical to Basic's single-precision real data type, which is the default for untyped variables and constants in Basic. It can represent any fractional or whole number between about 1E−38 and 1E+38. Pascal's string data type is almost identical to Basic's string type; the differences don't concern us right now.

You can declare a variable as any one of these data types in the VAR section of a Pascal program. The VAR, or variable declaration section, precedes executable program statements. You must declare all variables in the VAR section, or Pascal gives you an Error 104 (undeclared identifier).

An identifier is a name for a program, procedure, function, variable, or constant in Pascal. Identifiers may be as long as you like, but only the first eight characters determine uniqueness. Thus, Pascal reads EXAMPLE11 and EXAMPLE12 as equivalent identifiers.

You must begin an identifier with an alphabetic character (letter), but can use alphanumeric or special characters for the rest of the identifier. For example, Name-Of-Client$ is a valid Pascal identifier. You can name a variable with any valid identifier.

The VAR section of a program declares all the variables used by the program to the compiler. The compiler is a single-pass compiler (standard with Pascal compilers), so the compiler must know the variables and their types *before* it can operate. The compiler needs the information to know what kind of code to generate. The program segment below exemplifies the VAR section.

```
VAR
  Customer Name : STRING;
  age,weight : INTEGER;
  bodyFatPercentage : REAL;
  overWeight : BOOLEAN;
```

This section declares the variable Customer Name as a string-type variable. This means that it can take on the value of an arbitrary length string of characters. Age and weight are integer types, and bodyFatPercentage is a real number. The variable overWeight is a Boolean variable, and can only take on values of true or false. This declaration section is similar to what you might find in a customer management program for a weight loss clinic.

The program body, you will recall, starts with a Begin keyword. This tells the compiler that the declaration section is done and the executable program statements follow. In the program body, one of the most common statements is an Assignment statement. The assignment operator in Pascal is := (not just = as in Basic).

For example,

```
age := 32;
```

assigns the value 32 to the variable age. One of the most common errors made by Pascal beginners is forgetting to use := for assignment statements. Program Listing 1 is a short program that assigns values to the variables for a typical customer in our weight loss clinic.

You must use the BLDSTR function, a predeclared Pascal function in TRS-80 Pascal, when assigning a string constant to a string variable. In Listing 1, I assign the values of 32 for age, 196 for weight, and 27.4 for bodyFatPercentage to customer Joe Cool. Since

See List of Advertisers on Page 227

he is overweight, the Boolean variable overWeight has a value of true.

### The Read and READLN Statements

No programming language would be very useful if you couldn't assign values to variables from the user via the keyboard. With Basic, you use the Input statement; with Pascal, you use the Read and READLN statements.

Remember from last month that the Write and WRITELN statements differ only in that output begins on the next line after a WRITELN statement. Read and READLN differ in much the same way. After a Read statement, the next Read or READLN statement continues reading variables from the same line, whereas a READLN statement moves to the next line after it reads (inputs) data. This becomes important when you read from files—a topic I'll discuss in a future column.

The Read and READLN statements can read the elementary data types Boolean, CHAR, integer, real, and string (and variables that are arrays of CHAR). When reading a Boolean data type, simply type TRUE (or FALSE).

Pascal reads the other data types similar to Basic's Input statement. When Pascal prompts you for input, type it in. The backspace key erases characters, and the enter key puts the value into the program. Be sure that the value you enter matches the data type that Pascal expects. If you enter a letter when it expects a number, Pascal flags an error and terminates execution.

Program Listing 2 is an example that prompts customers for data through use of the Write and READLN statements. The Figure is what the screen looks like after the customer responds.

### Pascal Expressions: Operator Precedence

A Pascal expression is a collection of values, variables, and functions that you can simplify to a single value. For example, 13 is a simple expression, and it has the numeric value 13. But 3 + 4 * 5 is a more complicated expression that can produce different values depending on whether you perform addition or multiplication first. If you perform addition first (3 + 4 = 7) and then multiply that by 5, the result is 35. However, if you perform multiplication first (4 * 5 = 20) and then add 3, the result is 23.

The + and * signs, which indicate addition and multiplication, respec-

```
PROGRAM weightLossClinic;
VAR
  Customer_Name : STRING;
  age,weight    : INTEGER;
  bodyFatPercentage : REAL;
  overWeight : BOOLEAN;
BEGIN
  Customer_Name := BLDSTR('Joe Cool');
  age := 32; weight := 196;
  bodyFatPercentage := 27.4;
  overWeight := TRUE;
END
```

*Program Listing 1. Assigning values to variables.*

```
PROGRAM highByteLowByte;
VAR
  low,high,value : integer;
BEGIN
  WRITE('Enter the integer: ');
  READLN(value);
  high := value DIV 256;
  low := value MOD 256;
  WRITELN('High byte = ',high);
  WRITELN('Low byte = ',low);
END
```

*Program Listing 4. Finding an integer's high and low bytes.*

| Operator | Precedence | Description |
|---|---|---|
| – | 1 (highest) | unary negation |
| * | 2 | multiplication |
| / | 2 | division |
| DIV | 2 | integer division |
| MOD | 2 | remainder from integer division |
| + | 3 | addition |
| – | 3 (lowest) | subtraction |

*Table. Pascal operator precedence.*

```
PROGRAM weightLossClinic;
VAR
  Customer_Name : STRING;
  age,weight    : INTEGER;
  bodyFatPercentage : REAL;
  overWeight : BOOLEAN;
BEGIN
  WRITE('Enter customer name: ');
  READLN(Customer_Name);
  WRITE('Enter age: ');
  READLN(age);
  WRITE('Enter weight: ');
  READLN(weight);
  WRITE ('Enter body fat percentage: ');
  READLN(bodyFatPercentage);
  WRITE('Is ',customer_Name,' overweight (TRUE/FALSE)? ');
  READLN(overWeight);
END
```

*Program Listing 2. Prompting for keyboard input.*

```
PROGRAM CtoF;
VAR
  centigrade, Fahrenheit : integer;
BEGIN
  WRITE('Enter the temperature in centigrade: ');
  READLN(centigrade);
  Fahrenheit := 9 / 5 * centigrade + 32;
  WRITELN('That equals ',Fahrenheit:1,' degrees.');
END
```

*Program Listing 3. Centigrade to Fahrenheit.*

```
Enter customer name: Joe Cool <ENTER>
Enter age: 32 <ENTER>
Enter weight: 196 <ENTER>
Enter body fat percentage: 27.4 <ENTER>
Is Joe Cool overweight (TRUE/FALSE)? TRUE <ENTER>
```

*Figure. Listing 2's screen output with user responses (underlined).*

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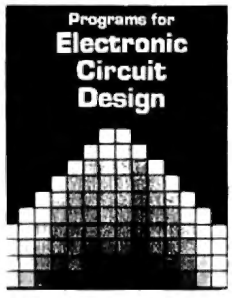


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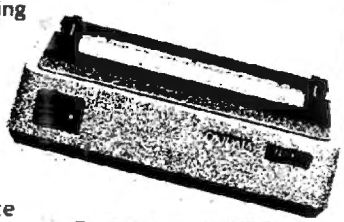

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tively, are operators. The order in which you evaluate operators is called operator precedence. The Table shows the operator precedence for the arithmetic operators in Pascal.

Unary negation (as in the number −3) negates the value of the integer (3 here). Using the Pascal operator precedence in the Table, you would evaluate the expression −3 * −5 −6, by first negating 3, and then negating 5. Multiply the two together (−3 * −5 = 15) and finally subtract 6 to yield the final result of 9. If two operators are of equal precedence (such as division and multiplication) then TRS-80 Pascal performs them from left to right.

This pecking order of operators makes the evaluation of any Pascal arithmetic expression unambiguous (at least to the compiler, if not the programmer). You can change this ingrained order of evaluation by using parentheses. Parentheses force immediate evaluation of the subexpression within the parentheses. The expression 5 * (4 + 3) would normally be evaluated multiplication first. But the parentheses cause the subexpression within the parentheses (4 + 3) to be evaluated first. This yields a value of 7, which multiplied by 5 gives a final result of 35.

The DIV and MOD operators aren't available in Basic. DIV returns the integer division of two integer arguments, and throws away the remainder. 4 DIV 3 gives 1, since 4 divided by 3 is more than 1 but less than 2. MOD throws away the result of the division and returns the remainder. 7 MOD 5 gives 2, since 7 divided by 5 equals 1 2/5. 20 MOD 4 returns zero since 4 goes into 20 evenly. These operators make life a little easier when working with integers.

### Compiling Your First Program

Let's write a simple program, using variables, operators, and the Pascal statements WRITELN and READLN, to convert a temperature from degrees centigrade to degrees Fahrenheit. Type Program Listing 3 on a word processor (such as the Blaise text editor included with TRS-80 Pascal) just as it appears. Save it to disk with the name CTOF/PCL (although it can be any legal TRSDOS file name with a /PCL extension).

To compile the program, type PASCAL CTOF from the DOS Ready prompt. If you typed the program correctly, the compiler reports "No Errors." If it finds an error, the screen shows where it discovered the error (not necessarily where the error is).

The compiler writes a special file, CTOF/OBJ, for the object code. To execute this program, type RUN CTOF from the DOS Ready prompt. This assumes that the files Pascal/CMD and Run/CMD are both on the disk to compile and run the program, respectively.

Run the program. It should prompt you to enter the number of degrees like this:

```
Enter the temperature in centigrade:_
```

The underscore shows where the cursor is. Type in a reasonable temperature, such as 42. The program calculates the degrees in Fahrenheit and prints the result.

Advanced programmers often need to know the high and low bytes of an integer. Integers are stored in 2 bytes of memory. The value of the number is given by the equation, value := low * 256 + high.

Given the value, you can easily compute the low and high bytes of the number using the DIV and MOD operators. Value DIV 256 gives the high byte. Value MOD 256 gives the remainder after the division, or the low byte. Program Listing 4 calculates the low and high bytes.

I've covered a lot of territory this month, such as Pascal variables, assignment statements, arithmetic expressions, and compiling programs. Certainly I haven't gone into great detail, but you can now try writing and compiling some of your own simple programs. For an exercise, write a Pascal program similar to the CTOF program, that converts inches to centimeters (hint: 1 inch equals 2.54 centimeters so use real variables). ■

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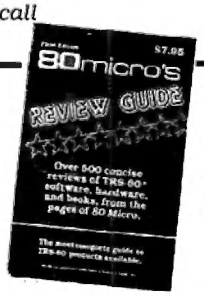


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# Tossing Around Assembly Tips

I'm using this month's column to clean up some odds and ends and answer some readers' questions. I'll start with a follow-up to last month's column about binary coded decimal (BCD) math and the decimal arithmetic adjust (DAA) instruction.

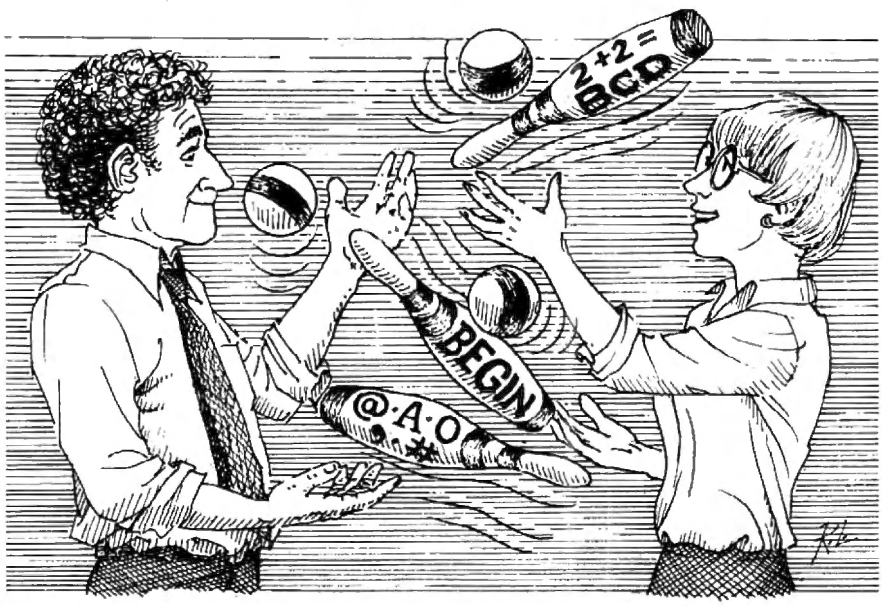
Since writing the May column, I've discovered a major problem with the DAA instruction; it doesn't affect last month's routine, but you should be aware of it anyway.

BCD math and the DAA instruction won't work properly with INC A or DEC A, at least not without special precautions. The problem is caused by the way the various 8-bit arithmetic instructions and DAA handle the status flags.

The DAA instruction checks three status flags during its operation: C (carry), H (half-carry), and N (the negative or add/subtract flag). The N flag is set during subtract operations (including SUB, SBC, DEC, and CPL); it is reset during additions (ADD, ADC, INC, and others). The N flag tells the DAA what type of instruction has just occurred.

The DAA also needs to know if the program has performed a carry out of either BCD digit. The program sets the H flag for a carry out of the lower nibble of the A register into the upper nibble (from the low-order BCD digit into the upper-order digit). It also sets the carry flag for a carry out of the upper digit of the A register.

The DAA instruction uses the N, H, and C flags to determine how to alter the value in the A register to create the necessary BCD format. The ADD, ADC, SUB, and SBC operations set all three flags correctly for DAA to give a proper result. But (and it's a big but), INC and DEC don't change the status of the carry flag. If the flag is set, the results of either of these two instructions:




1) INC A
DAA

2) DEC A
DAA

could be correct or incorrect. If the program resets the carry flag, the instructions operate correctly. If you need to use INC or DEC in a BCD routine, make sure you first reset the carry flag by using a simple OR A instruction immediately before the INC A or DEC A.

Now if someone can just explain why the Z80 designers decided to leave the carry flag unchanged during increments and decrements....

### Strange Parentheses

One problem in programming is learning to cope with seeming inconsistencies in syntax, whatever the language. The use of parentheses in Z80 Assembly language presents a case in point.

The Z80 instruction LD A,(HL) tells the computer to take the value in HL, use it as an address, and load the byte found at that address into the A register. This is an example of "Register Indirect Addressing." The program uses the register pair in parentheses, in this case HL, as a pointer to the address actually desired. The same instruction works in reverse: LD (HL),A copies the value in the A register into the byte whose address is held in the HL register pair.

The instruction LD A,(IX+1AH) exemplifies a similar, but subtly different, type of addressing. This instruction adds the value 1A hexadecimal (hex) (26 decimal) to the address in the IX register; the program uses the result as a pointer to the value it copies into the A register. The value inside the parentheses can range from −128 decimal to +127 decimal. The program uses IX to provide an index from which to calculate other addresses; this is called "Indexed Addressing."

Now for the part that tends to be confusing, especially to neophyte programmers or those used to working with Assembly languages for other machines. If you place an address (or a label) inside the parentheses, the rules seem to change. The instruction LD A,(8000H) tells the computer to take the byte stored at 8000 hex and copy it into the A register. It does not tell the computer to take the value at

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### 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 1, LEVEL II | **: 7 MIN. 34 SEC.** |
| ZBASIC Execution speed MOD 1, 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 subroutine package.) Program shown exactly as compiled and run in BASIC and ZBASIC.

```
10 '========== ZBASIC 2.2 EXAMPLE PROGRAM AND TIME TEST==========
20 CLS:CLEAR100: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=1TO127STEP2 :FOR J=47TO1STEP-3:XX=POINT(I,J):SET(I,J)
50 XX=(I-J)/CC*(7+I+J) :XX=ABS(INT(RND(I*J)-AA)+7) :RESET(I,J)
60 XX=PEEK(I+J) :POKE15360+I+J,J :OUT255,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$,"9"):XX=SQR(I*J)
90 BA$=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 IFPOS(0)>62 THEN TRON:TROFF:PRINT ELSE XX=NOT(RND(99))+100
120 A$=INKEY$:IF A$="Y" OR A$="y" AND I>120 THEN PRINT"TRUE.."
130 RESTORE :READA,C,Z(J),D:GOSUB170:GOSUB170:GOSUB170:GOTO210
140 NEXT :PRINT"*";:NEXTI: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 GOTO140
```

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```
                00100 ;Jim Kyle's fix for the bug
                00110 ;in TRSDOS 1.3's DO routine.
                00120 ;
                00130 ;This can be added to any Model I or III
                00140 ;program that protects itself in high
                00150 ;memory or that links itself into the
                00160 ;keyboard DCB.
                00170 ;
                00180 ;
                00190 ;Call TCHEK1 when HL contains the new value
                00200 ;  for HIMEM.
                00210 ;
0000 CD1000     00220 TCHEK1  CALL    TCHEK           ;CHECK FOR TRSDOS 1.3
0003 C0         00230         RET     NZ              ;RETURN IF TEST FAILS
0004 221544     00240         LD      (4415H),HL      ;ELSE SAVE HL IN SAVE-HI
0007 C9         00250         RET                     ;AND RETURN
                00260 ;
                00270 ;Call TCHEK2 when HL contains the new value
                00280 ;  for the keyboard DCB at 4016H/4017H
                00290 ;
0008 CD1000     00300 TCHEK2  CALL    TCHEK           ;CHECK FOR TRSDOS 1.3
000B C0         00310         RET     NZ              ;RETURN IF TEST FAILS
000C 22B142     00320         LD      (42B1H),HL      ;ELSE SAVE HL IN SAVE-KB
000F C9         00330         RET                     ;AND RETURN
                00340 ;
                00350 ;The following checks for Model III TRSDOS
                00360 ;
0010 3A2501     00370 TCHEK   LD      A,(0125H)       ;GET BYTE TO TEST
0013 FE49       00380         CP      'I'             ;TEST FOR MODEL III
0015 C0         00390         RET     NZ              ;RETURN IF MODEL I
0016 3A8044     00400         LD      A,(4480H)       ;GET BYTE TO TEST
0019 FEF5       00410         CP      0F5H            ;TEST FOR TRSDOS
001B C9         00420         RET                     ;RETURN TO CALLER
                00430 ;
0000            00440         END
00000 Total errors
```

*Program Listing. Jim Kyle fixes the bug in TRSDOS 1.3's Do routine.*

8000 hex as a pointer to another address.

Even more confusing to some is the type of addressing exemplified by LD (8000H),DE or LD (HIMEM),DE. In these cases, the program copies the value in E into either 8000 hex, or whatever address HIMEM represents, and copies the value in D into the next higher memory location.

In the first two cases, the confusion is caused by programmers' thinking of the value in parentheses as a pointer to an address. If you mentally classify the instruction that way, you'll expect the program to use the parenthetical value in the last examples as a pointer. It's much easier to think of parenthetical values as addresses, no matter how those addresses are represented. In all the Z80 addressing modes, addresses are placed in parentheses but absolute values are not.

In many programs, the label HIMEM, MEMTOP, or HIGH$ is often equated to 4411 hex (on the Model III) at the beginning of the program, because DOS stores its high-memory address in locations 4411 hex and 4412 hex. Later in the program, it's easy to fall into the trap of thinking that HIMEM is the value stored at that location instead of the address of the value. If your program later includes the instruction LD HL,(HIMEM), then the computer loads HL with the address of the highest byte in memory unprotected by DOS. In other words, HL points to the highest free memory location.

If you use LD HL,HIMEM instead, the program loads a pointer to the pointer to the highest free memory location into HL. Instead of holding the value you probably want, HL will contain 4411 hex, the HIMEM pointer's address. The HIMEM label (or any of the other choices) might cause part of the confusion. Here's a clearer label, though it's longer than most people feel like typing: ADDRESS__OF__THE__HIMEM__POINTER.

If the situation of pointers and pointers to pointers isn't confusing enough, consider what happens when your program calls a ROM routine such as 2337 hex, which evaluates the numeric or string expression at (HL). That is, HL points to the expression.

If the expression evaluates as a string, the program places the address of the string's vector (sometimes called the VARPTR) in Basic's accumulator at 4121 hex/4122 hex. The variable-type flag at 40AF hex will contain a 03 hex byte to indicate a string. Then instruction LD IX,(4121 hex) loads IX with the address of the string vector. You can use the instructions

```
LD B,(IX+0)
LD L,(IX+1)
LD H,(IX+2)
```

to load HL with the address of the string and B with the string's length. Note that HL now becomes a pointer to the string. If you want the first character of the string in the A register, use LD A,(HL). The original value at 4121 hex was a pointer to a pointer. Sometimes, the only way to keep the levels of pointers straight is to draw a diagram on paper while you're programming.

**Machine Recognition**

If you're writing a program for distribution to others, or if you own more than one TRS-80, you often have to deal with the differences between the Models I, III, and 4. For example, all major Model I DOSes use 4049 hex to store the HIMEM value, but Model III DOSes use 4411 hex, and Basic (Disk or Cassette) uses 40B1 hex. How can your program tell in what environment it is running?

The easiest way for you to distinguish between a tape and disk program is to load it and check memory location 400F hex. This is the first byte of the RST 30 hex entry point to RAM. In tape systems, RST 30 hex is unused, and 400F hex contains a 0C9 hex value, which is a RETurn instruction.

DOS uses RST 30 hex as the entry point to Debug, and therefore this location will probably contain a 0C3 hex value (a jump instruction). In any case, it doesn't usually contain 0C9 hex. This test is problematical, however, because you have no guarantee that any RAM location will contain an expected value.

If you know your customer will either load the program from SYSTEM on a tape system or run it from DOS READY on a disk system (instead of from the Basic Ready prompt), you can check the top value of the stack. In a DOS system that value will always be 402D hex, the reentry point to all operating systems.

The test to distinguish between a Model I and Model III is more definite, because it depends on the differences between the ROMs. It's easiest to test the byte at 0054 hex. On a Model I, that byte is 01 hex. The code for the test, suggested by Jack Decker, would look something like this:

```
LD    A,(54H)
DEC   A
JP    Z,Model I routine
```

The test of the byte at 0054 hex distinguishes between all known Model I and Model III/4 ROMs (the Model 4 in Model III mode will appear as a Model III to your program). An alternative, recommended by Radio Shack, is to test location 0125 hex, which will always contain an ASCII 'I' (49 hex) on a Model III.

Sometimes a program may need to determine whether it is operating on a Model III or on a Model 4 in Model III mode. Jack Decker also suggested the following ROM test for this problem. If the byte at 3029 hex is a 37 hex, your program is running on a Model III; if it is 00 hex, you are on a Model 4 in ROM mode. That memory location is part of the Model III's I/O rerouter routine which Tandy eliminated in the Model 4 ROMs.

Finally, if your program needs to know whether it is running on a Model 4 in Model 4 mode, it need simply test to see if any ROM exists at all. Save the value at some ROM location (for example, 0000 hex), then try to change that value at that address by loading something else. If the change takes, 0000 hex is RAM and your program is definitely running in Model 4 mode.

You should be aware of one problem here. Several programs are available that let a Model 4 run in Model III mode but with an 80 by 24 screen. They usually operate by bank switching RAM over the ROMs and copying the ROM code into that RAM with the necessary changes. Decker's test fails if such a program is running.

I don't know of any simple method to tell, within a program, what DOS is being used. If anyone has a test that distinguishes between the major DOSes—TRSDOS, LDOS, NEWDOS, DOSPLUS, and MULTIDOS in all their current incarnations—I'd like to hear from you.

### Name and Address

Several months ago I mentioned a superb book, Jack Decker's *TRS-80 ROM Routines Documented*, published by The Alternate Source. I didn't include ordering information in that column, and several readers have asked me how to order the book. Jack has since updated the book, and it includes a cross-reference to each of the specific routines. The book is invaluable for anyone wishing to call ROM routines from a machine-language program. You can order it from The Alternate Source, 704 N. Pennsylvania Ave., Lansing, MI 48906, 517-482-8270. The cost is $19.95 plus $3 shipping and handling.

### Watch Out for DO

Warning! Keyboard filters and other high-memory modules won't work properly with TRSDOS 1.3 without special care. This word comes from Jim Kyle of The Software Factory (12101 N. Western View, Oklahoma City, OK 73132—he has some excellent Model I/III disk utilities available in his catalog).

Before getting to the bugs, I'll give a little background. As I mentioned above, all "TRSDOS-compatible" Model III operating systems (NEW-



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DOS, LDOS, DOSPLUS, MULTI-DOS, and so on) store the address of the highest-available byte of memory in 4411 hex, or HIMEM. Also, the Models I and III store the address of the keyboard driver or first filter in the keyboard driver chain at 4016 hex/4017 hex in the keyboard DCB.

TRSDOS 1.3 (and probably 1.2 also) stores both addresses in other locations as well. It copies HIMEM to 4415 hex/4416 hex, and copies the keyboard driver's address to 42B1 hex/42B2 hex. The DOS copies these addresses at boot-up, and, according to Jim, they never change.

Normally, when a program loads itself into high memory, it resets the 4411 hex HIMEM pointer to protect itself from being overwritten by the DOS or other programs. And, normally, the installation phase of a keyboard filter puts the address of the filter program into 4016 hex so that, whenever any program goes to check the keyboard, the computer automatically directs it to the filter.

Like most automatic keying routines, the TRSDOS DO routine unhooks the normal keyboard driver chain and puts its own address in the keyboard DCB so it can feed characters from the /BLD file. Also, DO moves HIMEM down in memory in order to leave room for LPC/CMD.

So far, there's no problem. But, when DO is finished the fun begins. As the DO routine disconnects itself from the keyboard filter and removes its copy of LPC/CMD from high memory, it does not reset 4411 hex and 4016 hex as they were before. Instead, it copies the values from 4415 hex and 42B1 hex. The result is that keyboard filters and other programs saved in high memory are liable to be overwritten by anything (including Basic's stack or string space) after a DO command. Also, if a disk error occurs while DO is active, the error routine will also copy the old, erroneous values into 4016 hex and 4411 hex.

*TRSDOS 1.3's DO can bomb any program in high memory and cause a system crash if you use a keyboard filter.*

If all that seems unnecessarily complex to you, just realize that TRSDOS 1.3's DO can bomb any program in high memory and cause a system crash if you use a keyboard filter. The solution, once you understand the problem, is relatively easy—reset the extra storage areas at 4415 hex and 42B1 hex. The only difficulty with this solution is that all other Model III operating systems use those two locations for other things—your program can only save values there if it can be sure it is operating under TRSDOS 1.3.

Jim's solution to the entire problem is the routine in the Program Listing. You can include it in any program that resets HIMEM or the keyboard DCB on a Model I, III, or 4 (in Model III mode). Call TCHEK1 when the HL register pair holds the new address for HIMEM, and TCHEK2 when HL contains the address that you wish to put into the keyboard DCB. This routine does not reset HIMEM or the DCB value, so you'll have to do that the normal way. It does, however, check to be sure it is running on TRSDOS 1.3 and, if so, sets the correct values into 4415 hex and 42B1 hex.

If you've had trouble running a high-memory program or keyboard filter under TRSDOS, this bug might be causing the problem. If you don't want to rewrite the program, just load it first and then, using Debug, copy the values at 4411 hex/4412 hex into 4415 hex/4416 hex and the values from 4016 hex/4017 hex into 42B1 hex/42B2 hex. As far as I know, the entire problem only occurs if you use DO. If you avoid DO entirely, everything should be okay. ■

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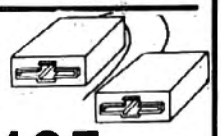

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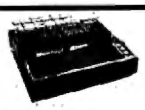

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*Continued from p. 16*

vious versions. Go to the closest Radio Shack Computer Center and ask for the patches that correct those errors (better call first to make sure they have them on hand).

Here's a patch that makes TRSDOS display complete error messages.

PATCH *4(ADD=4E28,FIND=20,
CHG=18))

**Q** In the July 1983 issue, J.H.M. of San Clemente, CA, inquired about interfacing a Model I with an Adler SE1010 electronic typewriter.

I wrote/modified two program listings, one in Assembly language (see Program Listing 1) and the other in Basic (see Program Listing 2), for my 48K Model I and Adler SE1010. I hope these are of use to him. *(John Clarke, West Warwick, RI)*

**A** Thanks for the assistance. Your letter helps prove how knowledgeable and helpful *80 Micro* readers are.

**Q** The Scripsit patch for Mr. Goldstein and his TP-1 is Scriplus from Powersoft. The specific problem with the TP-1 is that it needs to have carriage returns defined as a carriage return *and* line feed. In Scriplus you do this by typing Y in response to the sign-on prompt concerning line feeds. *(Timothy Bowman, Spokane, WA)*

I think I can answer Mr. Goldstein's query about a patch to Model I Scripsit for the TP-1 printer. I have the same combination of hardware and software, except that I also use the SuperScript patch program from Acorn Software, which patches it to do underlining, boldface, super- and subscripting, read disk directories while editing, and other things (if your printer has such capacity) including adding a line feed with the carriage return.

The SuperScript patch comes with 12 different printer drivers; you choose the one best suited to your needs, and add the option to include the extra line feeds. There isn't a specific driver labeled for the TP-1, but I've been using the one for the Radio Shack Daisy Wheel II printer and it works fine.

*Program Listing 1. Assembly-language program for interfacing a Model I with an Adler SE1010.*

```
                00100 ;RS232DVR/SRC PROGRAM TO DRIVE PRINTER FROM BASIC USING
                00110 ;THE SERIAL PORT. THE SPEED OF THE OUTPUT DATA IS
                00120 ;CONTROLED BY ADJUSTING THE NUMBER OF COUNT ITERATIONS
                00130 ;IN THE BC REGISTER JUST BEFORE THE CALL TO 0060H.
                00140 ;VERSION DATED 01/10/83
                00150 ;
                00160 ;
                00170 ;
00E8            00180 RESURT  EQU 0E8H        ;AN OUT TO THIS LOCATION RESETS THE
UART, AN IN READS THE RS232 CONTROL BITS
00E9            00190 SWITCH  EQU 0E9H        ;AN OUT TO THIS LOCATION LOADS THEBA
UD RATE GENERATOR, AN IN READS THE SENSE SWITCHES
00EA            00200 CNTREG  EQU 0EAH        ;AN OUT TO THIS LOCATION LOADS THEUA
RT CONTROL REGISTER, AN IN READS THE UART STATUS REG.
00EB            00210 DTAREG  EQU 0EBH        ;AN OUT TO THIS LOCATION LOADS THEUA
RT XMIT HOLDING REGISTER, AN IN READS THE RECEIVED DATA
FF00            00220         ORG 0FF00H      ;65280D ORG FOR DRIVER
                00230 ; RS232C OUTPUT DRIVER TO BE USED WITH THE LPRINT COMMAND IN
 LEVEL II BASIC.
                00240 ; THE DRIVER IS POKED INTO HIGH MEMORY (48K MACHINE)AND THE
DEVICE CONTROL BLOCK
                00250 ; CHANGED TO VECTOR THE LPRINT COMMAND TO THE RS232C DRIVER
WITH A SHORT BASIC PROGRAM
FF00 E5         00260 INIT    PUSH HL         ;SAVE REGISTER USED
FF01 C5         00270         PUSH BC
FF02 F5         00280         PUSH AF
FF03 210200     00290         LD HL,02H       ;LOAD REG WITH VECTOR FOR DCB
FF06 222540     00300         LD (4025H),HL   ;LOAD DCB WITH HIMEM VECTOR
FF09 210000     00310         LD HL,0H        ;LOAD REG WITH LSB VECTOR

FF0C 222640     00320         LD (4026H),HL   ;VECTORED TO HIMEM LSB
FF0F 21FF00     00330         LD HL,0FFH      ;LOAD REG WITH MSB VECTOR
FF12 222740     00340         LD (4027H),HL   ;HIMEM MSB
FF15 210000     00350         LD HL,0H        ;ZERO HL REGISTER
                00360 ; THIS SECTION OF CODE IS USED TO INITALIZE THE RS232C INTER
FACE TO CORRESPOND TO
                00370 ; THE OPTIONS SPECIFIED BY THE SENSE SWITCHES IN THE INTERFA
CE (BAUD RATE, STOP BITS, BITS/CHAR. ETC.)
FF18 3A6DFF     00380         LD A,(FLAG)     ;CHECK FLAG TO SEE IF UART AND BRG H
AVE BEEN INIT.
FF1B FE01       00390         CP 01H
FF1D 2820       00400         JR Z,RESTOR     ;RESTORE REG. AND OUTPUT CHAR IF SO
FF1F 3E01       00410         LD A,01H
FF21 326DFF     00420         LD (FLAG),A     ;SET FLAG TO INDICATE INIT.
FF24 D3E8       00430         OUT (RESURT),A  ;READ 37DCH TO RESET UART

FF26 DBE9       00440         IN A,(SWITCH)   ;READ SENSE SWITCHES
FF28 E6F8       00450         AND 0F8H        ;LOP OFF LOWER 3 BITS
FF2A F604       00460         OR 04H          ;RESETS RTS,RESETS DTR,SETS BRK IN H
ANDSHAKE LATCH
FF2C 326CFF     00470         LD (SWTIMG),A   ;LOAD SWTIMG W/IMAGE OF LATCH BITS
FF2F D3EA       00480         OUT (CNTREG),A  ;LOAD UART W/SWITCH IMAGE
FF31 DBE9       00490 BAUDST  IN A,(SWITCH)   ;SET BAUD RATE ACCORDING TO SWITCH S
ELECTION
FF33 E607       00500         AND 07H         ;LOP UPPER 5 BITS
FF35 2164FF     00510         LD HL,BDTABL    ;POINT TO FIRST LOC IN BAUD TBL
FF38 0600       00520         LD B,00H        ;ZERO B REGISTER
FF3A 4F         00530         LD C,A          ;PUT OFFSET IN C
FF3B 09         00540         ADD HL,BC       ;ADD OFFSET TO HL
FF3C 7E         00550         LD A,(HL)       ;LOAD POINTED VALUE

FF3D D3E9       00560         OUT (SWITCH),A  ;LOAD BRG W/TABLE VALUE
FF3F F1         00570 RESTOR  POP AF
FF40 C1         00580         POP BC
FF41 E1         00590         POP HL          ;RESTORE REG.
                00600 ;THIS SECTION OF CODE DOES THE ACTUAL OUTPUT OF THE CHAR. TO
 THE UART FOR SERIAL XMIT.
                00610 ;IT FIRST CHECKS THE UART TO SEE IF IT'S HOLDING REGISTER IS
 EMPTY,LOOPS UNTIL IT IS
                00620 ;AND LOADS THE CHARACTER TO BE TRANSMITTED TO THE HOLDING RE
GISTER.
FF42 DBEA       00630 STATIN  IN A,(CNTREG)   ;LOAD UART STATUS
FF44 CB77       00640         BIT 6,A         ;TEST THRE FOR HIGH
FF46 28FA       00650         JR Z,STATIN     ;LOOP IF NOT
FF48 79         00660         LD A,C          ;LOAD A W/CHAR TO BE OUTPUT
FF49 D3EB       00670         OUT (DTAREG),A  ;LOAD HOLDING REG W/CHAR
FF4B F5         00680         PUSH AF         ;CLEAR FOR TIMING LOOP
FF4C C5         00690         PUSH BC         ;CLEAR FOR TIMING LOOP
FF4D 01001C     00700         LD BC,1C00H     ;TIMING ADJUSTED HERE
FF50 CD6000     00710         CALL 0060H      ;ROM CALL TIMING ROUTINE
FF53 C1         00720         POP BC          ;RESTORE REGISTER
FF54 F1         00730         POP AF          ;RESTORE REGISTER
FF55 FE0D       00740         CP 0DH          ;IS IT A CARRIAGE RET?
FF57 200A       00750         JR NZ,RETRN     ;RETURN IF NOT
FF59 0E00       00760         LD C,00H        ;IF SO ZERO C REGISTER
FF5B 18E5       00770         JR STATIN       ;OUTPUT TO UART
FF5D DBEA       00780         IN A,(CNTREG)   ;LOAD UART STATUS
FF5F CB77       00790         BIT 6,A         ;TEST THERE FOR HIGH
FF61 28DF       00800         JR Z,STATIN     ;LOOP IF NOT
FF63 C9         00810 RETRN   RET             ;RETURN TO CALLING CODE
                00820 ;THE FOLLOWING TABLE DEFINES THE BAUD RATE SELECTED BY THE S
ENSE SWITCHES IN THE INTERFACE
FF64 22         00830 BDTABL  DEFB 22H        ;110 BAUD
FF65 44         00840         DEFB 44H        ;150 BAUD
FF66 55         00850         DEFB 55H        ;300 BAUD
FF67 66         00860         DEFB 66H        ;600 BAUD
FF68 77         00870         DEFB 77H        ;1200 BAUD
FF69 AA         00880         DEFB 0AAH       ;2400 BAUD
FF6A CC         00890         DEFB 0CCH       ;4800 BAUD
FF6B EE         00900         DEFB 0EEH       ;9600 BAUD
FF6C 00         00910 SWTIMG  DEFB 00H        ;IMAGE OF HANDSHAKE LATCH
FF6D 00         00920 FLAG    DEFB 0
FF00            00930         END     INIT
00000 Total errors
```

My only complaint with SuperScript is that the documentation is a little weak. The program requires a lowercase driver, unless you zap the first portion of the program, but this isn't mentioned. And there isn't room on the distribution disk to store the patched version of Scripsit, which requires 10 grans, so the patching process aborts unless you first remove a printer driver or two to give you the extra room.

This doesn't help when you want to print out a Basic program, but I usually just save the program in ASCII format and use my patched Scripsit to print out the file. *(Gary Shanafelt, Abilene, TX)*

**A:** Powersoft's address is: 11500 Stemmons Freeway, Suite 125, Dallas, TX 75229, 214-484-2979. Acorn Software is located at 7655 Leesburg Pike, Falls Church, VA 22043. SuperScript retails for $50.

Thanks to both of you for bringing these two products to our attention.

```
10 REM ** RS232 DRIVER PROGRAM TO DRIVE A PRINTER FROM **
20 REM ** BASIC USING THE SERIAL PORT. MEMORY SHOULD BE **
30 REM ** PROTECTED AT 65280 IN A 48 K MACHINE. THE PROGRAM **
40 REM ** CAN BE CALLED FROM A BASIC PROGRAM BY A USR(X) CALL **
50 REM ** POKE NEW DCB TYPE AND ADDRESS IN RAM <4025H> **
60 REM ** TO VECTOR PRINT COMMANDS TO HIMEM **
70 POKE 16421,2:POKE16422,0:POKE16423,255
80 REM ** POKE RS-232-C I/O DRIVER INTO HIGH MEM <0FF00H> **
90 FORX=-256TO-192
100 READ Y
110 POKE X,Y
120 NEXT X
130 END
140 DATA 229,197,245,58,64,255,254,1,40
150 DATA 32,62,1,50,64,255,211,232,219,233
160 DATA 230,248,246,4,50,63,255,211,234
170 DATA 219,233,230,7,33,55,255,6,0,79,9
180 DATA 126,211,233,241,193,225,219,234
190 DATA 203,119,40,250,121,211,235,201
200 DATA 34,68,85,102,119
210 DATA 170,204,238,0,0                End
```

*Program Listing 2. Basic program for interfacing a Model I with an Adler SE1010.*

```
00010          ORG     0BF00H
00020 PATCH    LD      DE,DCB          ;LOAD SCRIPSIT PROGRAM
00030          CALL    LOAD            ;
00040          CALL    CLOSE           ;
00050          LD      DE,5202H        ;PUT PATCH IN COPYRIGHT AREA
00060          LD      HL,PATCH1       ;
00070          LD      BC,END1-PATCH1  ;
00080          LDIR                    ;
00090          LD      DE,7A97H        ;DO TWO OTHER PATCHES
00100          LD      HL,PATCH2
00110          LD      BC,3
00120          LDIR
00130          LD      DE,7A9EH
00140          LD      HL,PATCH2
00150          LD      BC,3
00160          LDIR
00170          JP      5200H   ;GO TO SCRIPSIT
00180 ;
00190 PATCH1   CP      0DH     ;TEST FOR CARRIAGE RETURN
00200          JR      Z,CR    ;JUMP IF YES
00210          CP      '+'     ;TEST FOR PLUS SIGN
00220          JR      NZ,TEST2;JUMP IF NO
00230          LD      A,19H   ;PUT IN EM--AUTO UNDERSCORE
00240 TEST2    CP      40H     ;TEST FOR @--AT SIGN
00250          JR      NZ,PRNT.;JUMP IF NO
00260          LD      A,11H   ;PUT IN SET-LEFT-MARGIN CODE
00270 PRNT     LD      (37E8H),A;OUTPUT CHARACTER
00280          RET
00290 ;
00300 CR       LD      (37E8H),A;OUTPUT CARRIAGE-RETURN
00310 CHKBIT   LD      A,(37E8H);LOAD STATUS
00320          BIT     7,A     ;TEST IF BUSY
00330          LD      A,0AH   ;LOAD AN EXTRA LINE-FEED
00340          JR      Z,PRNT  ;BRAND IF NOT BUSY
00350          JR      CHKBIT  ;ELSE, TEST AGAIN
00360 END1     EQU     $
00370 ;
00380 PATCH2   CALL    5202H
00390 ;
00400 ; NOTE: I RENAMED MY SCRIPSIT PROGRAM TO S/CMD
00410 DCB      DEFM    'S/CMD' ;PROGRAM TO LOAD
00420          DEFB    3       ;MARKS END OF NAME
00430 LOAD     EQU     4436H   ;DOCUMENTED ONLY IN SCRIPSIT BOOK
00440 CLOSE    EQU     4428H
00450 ;
00460          END     PATCH
```

*Program Listing 3. Patch for Scripsit and the TP-1 printer.*

**Q:** I had the same difficulty with the TP-1 as Mr. Goldstein, and solved it using the method suggested in earlier issues of your magazine. My Scripsit is tape-based, so the actual addresses won't work on disk, but the method should:

- Load Scripsit into RAM.
- Use a machine-language monitor to find the position of all 0AH bytes in the program (mine had four).
- Use the disassembler in your monitor to examine the instructions containing 0AH. In mine, two were loads to put the 0AH in the A register before outputting them to the printer, while the others were for something else.
- In the Load instructions, change the 0AH to 0DH. The TP-1 interprets the 0AH as only a line feed, but interprets the 0DH as a carriage return and a line feed.
- Save your modified program.

This worked for me and should work for Mr. Goldstein. *(Matthew Cammen, Painted Post, NY)*

I've enclosed a program (see Program Listing 3) that solves Mr. Goldstein's problems with Scripsit and his TP-1 printer. It isn't an elegant solution; it simply patches Scripsit to send an extra line feed after any carriage return. It also converts the plus sign (+) to the TP-1 code for automatic underlining, and the "at" sign (@) to the code for setting the left margin. Of course, you can change these to other characters if you want. This program uses the Scripsit copyright notice area as a patch area, instead of reserving memory as recommended in the Scripsit manual. *(Robert Abbott, New York, NY)*

Here's a program to help owners of the Smith-Corona TP-1 use it with Scripsit. I include two Basic listings, one for the Model I (see Program Listing 4), the other for the Model III (see Program Listing 5). It is not a patch; each time you want to use the TP-1 with Scripsit, you must in-

voke this program (which I call TP1/CMD) prior to invoking Scripsit.

To create TP1/CMD, type in the appropriate Model I or III Basic program and run it, making sure that TP-1 is written to your Scripsit disk.

To use it, type in TP1 at the DOS prompt. Your disk drives should come on for a few seconds, then the DOS prompt will reappear. Now type SCRIPSIT, or whatever you named your Scripsit program. Scripsit is now ready to work with your TP-1 printer.

This program is a software "mousetrap" that snaps up the program executed immediately after itself, which had better be Scripsit. When the trap is sprung, TP1/CMD alters Scripsit in memory before it has a chance to start executing.

The Model I version is compatible with my DOS re-entry patch (*80 Micro*, March 1981). This lets you change printers without having to save the in-memory document. *(Daniel Allred, Pease AFB, NH)*

**A:** Listing 3 is Mr. Abbott's program, and Listings 4 and 5 are Mr. Allred's Basic programs. If you use Mr. Allred's re-entry patch, always verify that something like that works, by testing it with various files, before you entrust it with something really important (not that I don't trust it, but it's just that I don't know if all DOSes will respect the patch).

**Q:** In response to Tom Phoenix of Greensboro, NC, I have found what seems to be a permanent fix for the RS-232 ventilation problem. You can obtain adequate ventilation by drilling 3/16-inch holes in the RS-232 cover in a 1-inch grid pattern. I've had this modification in place for over a year without problems with the RS-232.

Referring to Thomas Rogers of Morro Bay, CA, you can enter 238 characters from the keyboard. If you go into Edit mode and use the X command to go to the end of the line, then enter the Insert mode, you add another 18 characters for a total of 256 characters.

Lastly, for Alfred Bowman of Gig Harbor, WA, you can use a BASF drive at any position on the drive cable (zero to 3) with a Radio Shack cable if you cut the trace leading from connection 32 on the logic board of the BASF drive, solder a wire from connection 32 to connection 10, and jumper the drive for select one.

The Radio Shack cable uses connection 32 for drive select three (fourth drive). The BASF drive uses connection 32 for side one select, which is unused on the 6106 drive. Connection 10 is used for drive zero select.

My drives use this modification. All are internally addressed as the first drive, with the Radio Shack cable selecting the appropriate drive for use. This lets you put any drive in any position without having to open them up and reconfigure the jumper blocks when you move them to a new position. *(Robert Hamilton, Baldwin, NY)*

**A:** Thanks for all the useful information.

```
5 REM ***   MODEL I - TRSDOS OR LDOS    ***
6 REM *** UNMODIFIED MODEL I DISK SCRIPSIT***
10 OPEN "0",1,"TP1/CMD"
20 FOR I=1TO59
30 READ J
39 REM *** NOTE SEMICOLON IN LINE 40 ***
40 PRINT#1,CHR$(J);
50 NEXT
60 CLOSE
10000 DATA 1,3,133,113,255
10010 DATA 1,41,0,123,245,229,33,133,113,126,254,255
10020 DATA 40,24,254,10,32,14,62,141,50,113
10030 DATA 113,50,133,113,50,121,95,50,0,0
10040 DATA 33,24,69,34,19,64,225,241,195,24,69
10050 DATA 1,5,18,64,195,0,123
10060 DATA 2,2,45,64
```

*Program Listing 4. Model I patch for TP-1 and Scripsit.*

```
5 REM ***  MODEL III -TRSDOS 1.2 OR 1.3   ***
6 REM ***    SCRIPSIT VERSION 3.1 ONLY    ***
10 OPEN "0",1,"TP1/CMD"
20 FOR I=1TO59
30 READ J
39 REM *** NOTE SEMICOLON IN LINE 40 ***
40 PRINT#1,CHR$(J);
50 NEXT
60 CLOSE
10000 DATA 1,3,174,113,255
10010 DATA 1,41,0,128,245,229,33,174,113,126,254,255
10020 DATA 40,24,254,10,32,14,62,141,50,150
10030 DATA 113,50,174,113,50,73,96,50,97,96
10040 DATA 33,24,48,34,19,64,225,241,195,24,48
10050 DATA 1,5,18,64,195,0,128
10060 DATA 2,2,45,64
```

*Program Listing 5. Model III patch for TP-1 and Scripsit.*

*Terry Kepner is a freelance writer and programmer, and the vice-president of Interpro. He's been writing about microcomputers since 1979. Contact Terry c/o* 80 Micro, *80 Pine St., Peterborough, NH 03458.*

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*Continued from p. 40*

Even though CONV3TO4 has a few problems, it's a good software package overall. The manual is superb and, except for the line zero bug, the program works as documented. ■

## Superlog: An Updated Electronic Notebook

**by Michael E. Nadeau**

Superlog, like its predecessor Log, is part data-base manager and part word processor. Billed as an electronic notebook, Superlog provides a free-form means of handling information, a task that it does very well. However, you must have LDOS 5.1.3 to set up Superlog.

Superlog provides up to 32,767 blank pages per file of 1,024 characters each on which you enter data. The format you use is limited only by the character limit and your imagination. This arrangement makes Superlog an unintimidating data-base manager for the novice and a powerful organizational tool for data management needs unsuited to more structured software.

Superlog's biggest assets are its search function, its data storage capacity, and its availability from most running programs. You can search for any single-word string on a Superlog file, or you can do a multiple-word search with a wildcard option—an enhancement over the old Log.

You can have as many files as your disk storage capacity allows. You can also use Superlog with a hard-disk system, though the manual warns that the setup might be too difficult for a novice. Superlog even lets you use cassettes for data storage.

You set up Superlog on an LDOS disk as a resident utility. It is interrupt activated; you can call up a Superlog file while running another program by pressing the shift and break keys simultaneously. Pressing the break key alone returns you to your location in the other program. You could have a Superlog file of notes available at any time while writing with a word processor.

*You can search for any single-word string on a Superlog file, or you can do a multiple-word search—an enhancement over the old Log.*

Having Superlog on call in this manner requires at least two disk drives for any serious work. Also, while the manual is clear on how the interrupt feature works, it lacks any practical examples that explain this option's value.

Improvements over Log include word-wrapping (that you can toggle off), commands to expand or delete a line, and one of the clearest manuals I've seen. Log required that you print out the documentation, which meant that you needed a printer.

The 34-page manual is well organized. Instructions are in logical order with key instructions in boldface. Anyone can set up and begin using Superlog within minutes of reading the manual.

### Editing and Printing

To access most editing and printing commands, you press the shift/down-arrow keys (the control) and another letter. For instance, control-period advances a file one page. Cursor control is less complex; you press the arrow keys, or the shift and arrow keys to tab or move to the next line.

Although I appreciate the wordwrap feature, you should switch it off for editing. If you change text on a nearly full screen, you could force some of it off the bottom when the wordwrap function is on. This results in lost data.

Other editing commands let you insert or delete a line or character, clear the screen, or transfer quickly to a desired page. These editing functions aren't fancy; you'll find them on any word processor. But they get the job done efficiently.

With the three print commands, you can specify a single line feed, a form feed, or a screen dump to the printer. For printers with special features, you can change Superlog's standard line feed and form feed parameters.

### Utilities and Forms

Superlog also has a set of proprietary utilities. Several involve the initial set-up process and take advantage of the LDOS job control language (JCL) file. The user need not know how a JCL file operates.

The utility CAL/BAS creates a calendar for any specified year. CVLOG/BAS lets owners of Log convert data files to Superlog. LOGPRT/BAS prints out all or part of a Superlog file. You can print out data a page at a time while using the main Superlog file; LOGPRT/BAS is less tiresome.

Superlog performs one function well that standard data-base managers don't; it creates custom-made forms. The small-business man can design invoices, inventory forms, and shipping labels. Form making is limited only by the 1,024-character screen, but this is enough for most simple forms.

Once you've designed a particular form, you can copy it as many times as necessary with a repeat function. Superlog's form-making capabilities alone make the program worthwhile to some businesses.

### The Bottom Line

Superlog is a 100 percent improvement over its predecessor in terms of performance. About the only thing

**Superlog**

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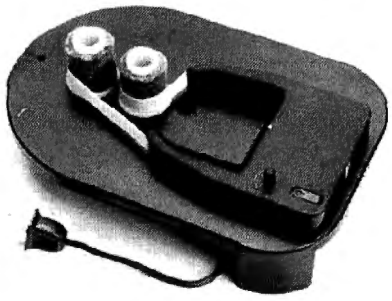

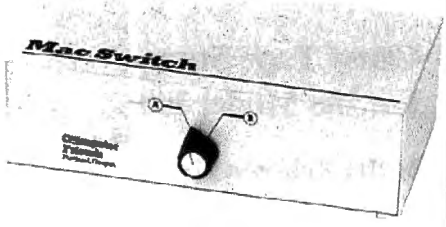


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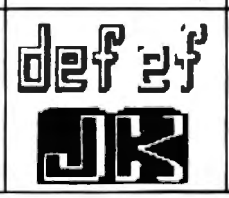
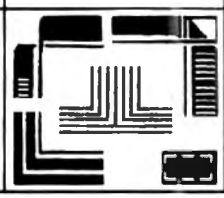
|  |  |  |  |  |  |

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KSoft doesn't include is a sort function. Sort capabilities would probably get in the way of Superlog's free-form nature.

For owners of LDOS 5.1.3, Superlog could be a real workhorse. For everyone else? Unless you have a friend with LDOS who will set up Superlog for you, the additional cost isn't justified. ■

## Classy Tape Storage For the Model 100

**by Dan Robinson**

**PMD-100**

★★★★

**Holmes Engineering**
**5175 Green Pine Drive**
**Salt Lake City, UT 84107**
**$349.95**

| | |
|---|---|
| *Easy to use?* | ★★★★★ |
| *Good docs?* | ★★★★★ |
| *Well-made?* | ★★★★★ |
| *Does the job?* | ★★★☆☆ |

What I like about the PMD-100 isn't its massive tape storage for the Model 100. It isn't its high-speed loads and saves, for the PMD isn't that fast. It isn't the PMD's accuracy, either, for it doesn't score 100 percent.

What I like about the PMD-100 is its pure class. Even though a Rolex may not be any more accurate than a Timex, it's still a Rolex; the PMD-100 is the Rolex of tape storage devices. It's solidly built, well designed, and portable. It works well, too, providing features like front-panel controls and indicator LEDs that make it easy to use.

### The Unit

The Holmes kit includes the PMD-100 itself, a trio of wafer cassettes, a cable to connect the PMD-100 to the Model 100's RS-232 port, a power cable to operate the Model 100 from the PMD-100's battery, an ac adapter, and a brief but thorough 18 pages of documentation.

Holmes Engineering's Portable Micro Drive is a little smaller than Radio Shack's cassette recorders, measuring 8 by 6 by 2½ inches and weighing about the same at just under four pounds. The PMD-100 comes in a sturdy steel case color-coordinated with the Model 100.

A wafer tape loads and saves data at 9,600 baud under battery power. A gel-cell battery holds enough charge to operate both the PMD and the Model 100 for several hours. This battery type survives charge/discharge cycles better than most, and the PMD has an automatic power-down to conserve battery life.

All of the PMD-100's controls, connections, and indicators, including the power switch, are located on the front panel. The unit is slotted for front-loading wafer tapes. It includes sockets for the Model 100's RS-232 output, an ac adapter, and third party to power the Model 100 from the PMD's battery.

Light-emitting diodes (LEDs) indicate battery charge; other LEDs show when a write operation is in progress and when the PMD-100 is active or when it has automatically powered down.

The PMD-100 wafer tape, familiar to owners of the Exatron stringy-floppy, is smaller than a business card and ⅛ inch thick. The wafer is a continuous tape, similar to an eight-track audio tape.

A metallic strip seen by a detector in the PMD signals the beginning of the tape, while another detector checks for a write-enable tab stuck to the wafer's cover. It works just the opposite of the write-protect tab used on mini-floppy disks: Remove it to prevent the PMD from over-writing or erasing an important tape.

### PMD-100 Operation

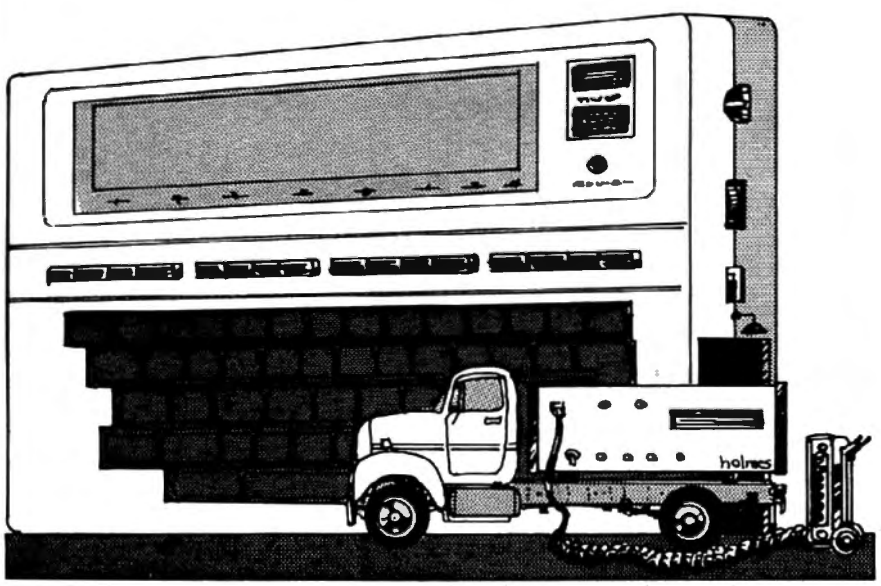
The PMD wafer's directory at the beginning of the tape stores program length and file names. You format the wafer like a disk, clearing the directory and erasing old files. The wafer tapes are available in lengths of 5, 10, 20, and 50 feet, and hold about 1K per foot. The directory holds a maximum of 10 files on each tape regardless of the wafer's length.

The PMD-100 includes a Z80 microprocessor with a 12K RAM buffer and 4K of ROM. The PMD's boot routine is a command file, Wafer.CO, stored in the Model 100 to link with the PMD-100's operating system.

### Menu Options

Selecting the Wafer file from the Model 100's main menu causes the PMD to display its own menu (see Table 2).

A single keystroke signals your choice, and the program prompts for all further inputs. Any potentially dangerous selection, such as deleting a file or formatting the tape, requires



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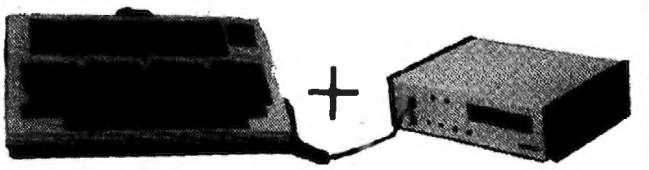

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INCLUDES: PMD-100™, Manual, Wafer tape, Charger, Coiled Cable

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**PMD:** DIM: 5½x8x2½, WEIGHT: 3¾ lbs., 16K RAM buffer, driver program is ROM based, files transferred at 9600 BAUD, Connecting Port: RS 232
**COILED CABLE:** LENGTH: 6 ft. **BATTERY:** 12V-approx. 8 hrs. of power. **CHARGER:** 110V-50/60 HrZ-18V output will recharge/power the PMD and computer.
**WAFER TAPES:** 2⅝x1 9/16x3/16.

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*The PMD's operating system has thorough error-checking, and the PMD signals errors with a beep and a "Clear Error" message.*

| Option | Description |
|---|---|
| S | Saves to tape: prompts for file name, finds file, and displays file length; verifies open directory entry, records and verifies program, updates directory, and returns to menu. |
| Q | Quick-saves: transfers file that fits in buffer and returns control to Model 100 menu. |
| L | Loads from tape: checks directory, finds file name, and locates and reads file into RAM buffer (for a 9,600-baud transfer). |
| C | Catalogues tape: displays file names on wafer and their lengths. |
| D | Deletes last file and its directory entry. |
| F | Formats tape: erases all files, clears directory entry, and displays wafer's capacity; displays warning message if format fails. |
| M | M-100 files/free: displays Model 100 directory without leaving program. |
| E | Exits program: returns to Model 100 menu. |

*Table 2. The PMD-100's menu.*

that you make a confirming entry.

The Quick save option comes in handy when your file fits in the PMD's 12K buffer. The PMD makes the transfer and immediately returns control to the Model 100's menu. The PMD winds, checks, writes, verifies, and updates the wafer's directory while your Model 100 is free to go on to bigger and better things. If there is a glitch, since the Wafer program won't be active to present its error messages, the PMD flashes its Write LED and won't power down until you switch the unit off.

A portion of the PMD's ROM includes a boot routine you load through the Model 100's TELCOM program and use to construct the wafer command file in the Model 100's memory. It's a well-documented, step-by-step procedure, and you only have to do it once.

The PMD's operating system has thorough error-checking and—unless you've muffled the Model 100 with its Sound Off command—the PMD signals errors with a beep and a "Clear Error" message.

But Holmes may have gone a little

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too far in its error-trapping. If you load a file from the PMD and receive any type of I/O error, the PMD leaves you without a penny's worth of data. Even if only the last few bytes are trashed, you can't save the file.

Unfortunately, the directory doesn't maintain a record of the tape length, and the PMD can't display free space on the wafer. When reading the directory to see if there's enough space for your file, you have to tote up the various file lengths and subtract the sum from the known length of the wafer. If you try to save a file with insufficient free space, the PMD can't tell from its directory read and won't inform you there's no room at the inn until it has dribbled off the end of the tape.

### Conclusion

The Holmes Portable Micro Drive may not be especially small or light. It may not have supersonic speed or bull's-eye accuracy. But it does solve the unit's battery problem—a significant advantage for Model 100 owners. ■

## Choosing Your Alma Mater

**by Christine Adamec**

College Directions, a comprehensive four-disk advisory program characterized by plenty of hand-holding, helps college-bound students systematically select a school from over 1,300 institutions nationwide.

Though the program is designed for high school students, an adult planning to return to school full-time will find it useful as well.

The first section, College Selection, enables you to define what factors are most important to you in choosing a school. College Analysis then takes the criteria you provided and searches its college data base for appropriate matches. Through the College Exploration option, you can call up an information sheet on any of the four-year colleges in the program's data base (see Fig. 3).

With College Planning, the next option, you estimate college expenses for the entire four years. This section also includes three types of personalized letters you can print out to colleges of your choice: one requesting informa-

*Continued on p. 216*

**College Directions**

★★★★½

**Jefferson Software**
**723 Kanawha Blvd. E.**
**Charleston, WV 25301**
**Models III and 4**
**Two disk drives**
**$250**

| | |
|---|---|
| *Easy to use?* | ★★★★★ |
| *Good docs?* | ★★★★★ |
| *Bug free?* | ★★★★★ |
| *Does the job?* | ★★★★½ |

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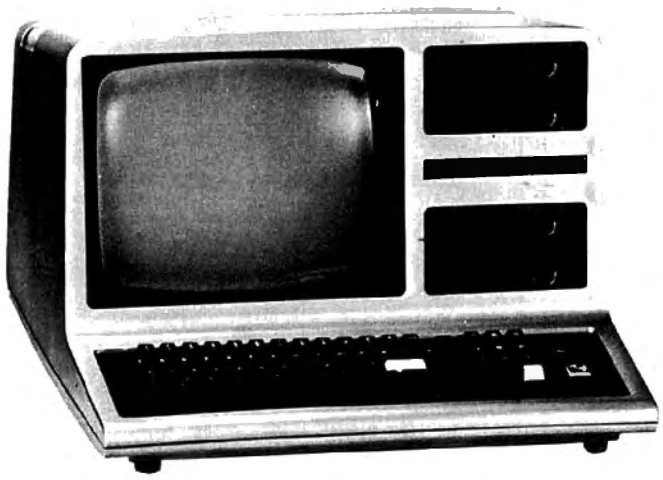

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                    COLLEGE DIRECTIONS - FOUR-YEAR VERSION          PAGE  1
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THE SCHOOL...

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IN TERMS OF FINANCIAL AID, THIS SCHOOL OFFERS:

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*Figure 3. Printout of sample college information sheet.*

*Continued from p. 212*

tion, another accepting an invitation to join the freshman class, and a third declining to attend.

The program's use of menus, submenus, and sub-submenus that prompt for one-letter responses makes it so easy to operate that the instructions in the fifth section are unnecessary even for first-time computer users.

### Using the Program

Menus in the College Selection section prompt you to define key concerns governing your choice of a school to attend. When you call up the General Considerations option, for example, College Directions prompts you to answer specific questions about a possible college environment: Should the school be public or private? What sizes, both of student body and surrounding community, would you prefer? Must the campus be wheelchair-accessible? Is the availability of financial aid a consideration?

Other questions help you narrow the field down by asking you to specify what you expect to spend for tuition, room and board, and how selective admissions standards (based on grade point averages and SAT or ACT scores) should be.

Unfortunately, the distinctions the program makes among some types of college majors are less pointed and somewhat inconsistent. For example, all potential engineering majors are lumped into the same category, whereas potential business majors can specify areas like accounting or management.

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After you enter the codes for up to five states, the program analyzes the data and presents you with the results. Ironically, working with my own responses to its prompts, the program narrowed my choices down to one school: the University of New Hampshire—the college I actually did attend!

Incidentally, while College Directions doesn't require a printer, the college-bound students who tested the package for me found a printout of the college analysis useful for further consideration.

They also appreciated the program's little touches: the smiling face cursor, the whimsical designs during loading, the thank yous, and use of their first names. The only intimidating aspect for the computer novice is the constant disk-swapping the program requires.

**Keeping It Relevant**

Recognizing how quickly the information on these disks could become obsolete, the manufacturer plans to update the program annually; the first update will cost under $100.

The program's price is high for an individual user, though not for an entire school, where it could benefit hundreds of students, year after year. ■

## Computer Caveats: Buyer Beware

**by Carl Oppedahl**

Through frequent use of real-life examples, the *Computer Buyer's Protection Guide* does a good job of discussing both well-established federal and state laws and common-sense principles that protect consumers' rights in the computer market.

The book opens with a discussion of general buying considerations in selecting a computer. Kutten covers several important points including the importance of selecting software before hardware, the relative merits of dot-matrix and daisy-wheel printers, and so on.

He then turns to the Uniform Commercial Code (adopted by every state except Louisiana), of which Article 2 provides a uniform law of sales. Customers, retailers, and manufacturers all use and benefit from Article 2 every day, often without knowing it: it provides, for example, the "warranties of merchantability and fitness" mentioned in almost every newspaper story on consumers' rights.

Other chapters discuss methods of effective complaining when things go wrong, and the relative merits of local and mail-order buying. Kutten describes the Federal Trade Commission rule requiring mail-order companies to deliver merchandise within 30 days of payment unless a longer time is set forth within the advertisement. (Though the book doesn't mention it, the rule applies only to orders placed through the mail, not by phone. It is rarely invoked, since the majority of mail-order computer sales are charged to a credit card, and reputable companies don't charge the card until the goods are about to be shipped.)

One other mail-order point deserves mention: Kutten suggests not doing business with mail-order companies that don't list toll-free numbers—good advice, in general. But toll-free numbers cost a lot of money. The best price for expensive, brand-name items such as printers often comes from a place without a toll-free number.

Kutten also points out that ordering from a company in another state often saves sales tax. He's not quite accurate, though, when he says categorically that "there is no sales tax on interstate shipments." Many states have agreements with neighboring states to allow mutual collections of sales taxes, and many states demand that the tax be imposed if the distant retailer has a branch in your state.

This hits closer to home than you may think. Though most state tax collectors haven't taken notice of it, most Radio Shack stores aren't separate corporations, but instead are local offices of the Fort Worth company; they should charge sales tax on interstate shipments.

In the chapter on rejection of goods, Kutten suggests that whenever you want to reject goods you've already accepted, you should return them to the seller "even if it means money out of [your] pocket." But Kutten should limit this advice to disputes with well-established businesses. If there is a real risk that a company may close its doors, and if the defective goods nonetheless have some value, the wiser course may be to hold on to the goods.

Kutten doesn't face the problem of

***Computer Buyer's Protection Guide***

★ ★ ★

**L.J. Kutten**
**Prentice-Hall Inc.**
**Englewood Cliffs, NJ 07632**
**192 pp.**
**$19.95 hardcover;**
**$12.95 softcover**

| | |
|---|---|
| *Well-written?* | ★★★☆☆ |
| *Organized?* | ★★★★☆ |
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| *Readable?* | ★★★☆☆ |

✓ See List of Advertisers on Page 227

software warranties squarely. While the Uniform Commercial Code and various federal laws give consumers strong rights against sellers of defective goods, it's not clear that software counts as "goods" for legal purposes. Kutten acknowledges this in the chapter on UCC sales, but never tells the reader what rights buyers of "non-goods" software have, nor how to protect those rights.

As for software that does fall within the category of "goods," and for which the law provides warranties, the seller may disclaim all warranties by selling the software "as is" or "with all faults." Kutten naively states that "because very few people would buy new merchandise sold 'as is' or 'with all faults,' these words are seldom used."

But a quick tour through any computer store reveals that many retailers sell software "as is"—a practice not limited to $10 adventure games. The Model 100 comes from the factory with a carefully crafted "limited warranty" that accomplishes legally what cannot be done physically except with a soldering iron—the software (contained in ROM chips) is separated from the rest of the computer (which carries a 90-day warranty) and is sold "as is."

Fortunately, because franchise stores, including the well-known Radio Shack discounters, are separate corporations, they don't generally fall prey to the tax collectors.

Kutten devotes an entire chapter to methods of payment, including such rarely used means as cash, certified checks, cashier's checks, bank money orders, personal money orders, postal money orders, and CODs (cash on delivery). He cautions you to be suspicious of any mail-order seller who demands a cashier's check or money order before he ships merchandise. If you've read the fine print enclosed with credit card bills, you know that federal laws give generous rights to mail-order buyers, including the ability to protest incorrect and unauthorized charges.

On one or two occasions, Kutten takes naive positions on consumer issues. For example, in the chapter on methods of payment, he states that "[a] seller is not allowed to impose a surcharge for credit card purchases," citing a subparagraph of title 15, section 1666f of the United States Code. If one reads the other paragraphs of the section, one learns that while sellers are forbidden to impose credit-card surcharges, they are specifically authorized to give discounts for cash. The law leaves things sufficiently murky so that a seller can simply argue that what appears to be a credit-card surcharge is simply part of a discount-for-cash provision.

Kutten's book gives no clue about the buyer's recourse when such a product doesn't do what an advertisement or the instruction book says it does.

Its shortcomings notwithstanding, the *Computer Buyer's Protection Guide* is well-written and informative. The principles Kutten describes apply to local and mail-order purchases of all kinds of goods, not just computers. ■

# T.CAD software $249.95

Easy to use CAD-system. Computer Assisted Drafting: draw, zoom, edit, plot exact scale plans, details. Productive hands-on CAD starter for architects, engineers, drafters, artists or students. Developed and supported by practicing design firm. For 2-disk Models III/4/4P equipped with Tandy's high-res screen option.

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- Built in hex-decimal-label calculator.
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- Checks each new or edited line for validity when entered.
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### ZEUS ASSEMBLER

- Pause and single step assembly listing.
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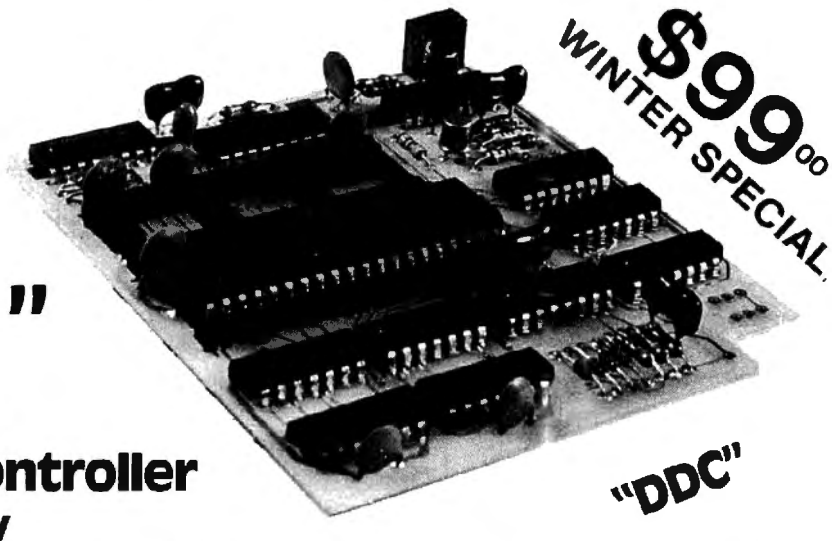
# Aerocomp's Proven Best-By Test! The "DDC"

## Double Density Controller

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## ★ Technical Superiority

At last! A double density controller for Model I with HIGHER PROBABILITY OF DATA RECOVERY THAN WITH ANY OTHER DOUBLE DENSITY CONTROLLER ON THE MARKET TODAY! The "DDC" from Aerocomp. No need to worry about the problems that keep cropping up on existing products. AEROCOMP'S new analog design phase lock loop data separator has a wider capture window than the digital types currently on the market. This allows high resolution data centering. The finest resolution available with digital circuitry is 125 ns (nano seconds). The "DDC" analog circuit allows infinately variable tuning. Attack and settling times are optimum for 5-1/4 inch diskettes.
The units presently on the market use a write precompensation circuit that is very "sloppy". Board to board tolerance is extremely wide - in the order of ± 100 ns. The "DDC" is accurate to within ± 20 ns.
The bottom line is state of the art reliability!

## ★ Test Proven

Tests were conducted on AEROCOMP'S "DDC", Percom's "Doubler A"* and "Doubler II"* and LNW's "LNDoubler"** using a Radio Shack TRS80*** Model I, Level 2, 48 K with TRS80 Expansion Interface and a Percom TFD100 * disk drive (Siemens Model 82). Diskette was Memorex 3401. The test diskette chosen was a well used piece of media to determine performance under adverse conditions. The various double density adapters were installed sequentially in the expansion interface.
The test consisted of formatting 40 tracks on the diskette and writing a 6DB6 data pattern on all tracks. The 6DB6 pattern was chosen because it is recommended as a "worst case" test by manufacturers of drives and diskettes. An attempt was then made to read each sector on the disk once - no retrys. Operating system was Newdos/80, Version 1.0, with Double Zap, Version 2.0. Unreadable sectors were totalled and recorded. The test was run ten times with each double density controller and the data averaged. Test results are shown in the table.

## ★ Features

TRS80 Model I owners who are ready for reliable double density operation will get (1) 80% more storage per diskette, (2) single and double density data separation with far fewer disk I/O errors, (3) single density compatibility and (4) simple plug-in installation. Compatible with all existing double density software.

**SUMMER SPECIAL $99.00**
for the Best DD Controller on the market.

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| "DDC" and LDOS | $169.95 |
| "DDC" and Newdos 80 | $179.95 |

★ TEST RESULTS ★

| MFR & PRODUCT | SECTORS LOCKED OUT (AVG) |
|---|---|
| AEROCOMP "DDC" | 0 |
| PERCOM "DOUBLER II" | 18 |
| PERCOM "DOUBLER A" | 250 |
| LNW "LNDOUBLER" | 202 |

Note: test results available upon written request. All tests conducted prior to 8-25-81

Aerocomp's 14 day money back guarantee applies to hardware only. Specials will be prorated. Shipping $2.00 in Cont. U.S. See opposite page for details. Add $4.00 shipping & handling for DDC & DOS.

## Data Separators

The advances that make the "DDC" great are incorporated in the new AEROCOMP Single Density Data Separator ("SDS") and Double Density Data Separator ("DDS").

### ★ Has your original manufacturer left you holding the bag?

If you already own a Percom "Doubler A", "Doubler II" or LNW "LNDoubler" or Superbrain, the AEROCOMP "DDS" will make it right. Look at the test results:

| | SECTORS LOCKED OUT | |
|---|---|---|
| MFR. & PRODUCT | WITHOUT "DDS" | WITH "DDS" |
| PERCOM "DOUBLER II" | 18 | 1 |
| PERCOM "DOUBLER A" | 250 | 0 |
| LNW "LNDOUBLER" | 202 | 0 |

Note: Same test procedures as "DDC".
* Trademark of Percom Data Co.
** Trademark of LNW
*** Trademark of Tandy Corporation

**Plugs directly into your existing Double Density Controller.**

★ "DDS" ..... $49.95
(Use 1791 chip from your DD Controller)

★ "DDS" with disk controller chip included ..... $79.95

★ Disk controller chip ..... $34.95

(Shipping $2.00 Cont. US - see opposite page for details)

### Do you need a Single Density Data Separator?

The internal data separator in the WD1771 chip (R/S Expansion Interface) is NOT recommended by WD for reliable data transfer. Do you have any of these problems: Lost data, tracks locked out, CRC errors, disk retry? YOU NEED ONE!

★ "SDS" ..... $29.95
(For Mod. I; shipping $2.00)

**See opposite page ▸▸▸▸▸▸**

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Shipping & handling $2.00 per controller

- ★ MOUNTING KIT w/o Drives & Controller..$99

Shipping & handling $4.00 per kit

### COMPLETE DRIVES

TRS80 Mod. I & III, IBM PC & TI 99/4A. Power supply & enclosure. Specify silver or almond. 5.25 inch.

- ★ 40 track single side (Tandon)..... $199
- ★ 40 track SS "Flippy" (MPI)..... $239
- ★ 40 track Dual Head (either)..... $279
- ★ 80 track SS (MPI)..... $299
- ★ 80 track SS "Flippy" (MPI)..... $329
- ★ 80 track Dual Head (Tandon)..... $379

Shipping & Handling $5.00 per drive.

### BARE DRIVES

Internal drives for TRS80 Mod. III, IBM PC, TI 99/4A, 5.25 in. (controller required)

- ★ 40 track Single Side (Tandon)..... $169
- ★ 40 track Dual Head (either)..... $249
- ★ 80 track SS (MPI)..... $269
- ★ 80 track Dual Head (Tandon)..... $339

Shipping & Handling $4.00 Per Drive.

### 8 INCH DRIVES

Drive expansion box complete with power supply and fan. Tandon Slimline.

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- ★ Two (2) 8" Double Side..... $849
- ★ 8" Bare Slimline, SS..... $260
- ★ 8" Bare Slimline, DS..... $375

Shipping & Handling $5.00 Per Drive.

### MODEL I STARTER PACKAGE

One 40 track SS drive, 2-drive cable, TRSDOS 2.3 disk & manual, freight & insurance (Tandon).

**$249**

### MISCELLANEOUS GOODIES

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- ★ 5.25" Drive Power Supply & case..... $59
- ★ 2-Drive Cable..... $24
- ★ 4-Drive Cable..... $34
- ★ Extender Cable..... $13

Shipping & Handling $2.00

### PERSONAL CHECKS WELCOME

We'll be happy to accept your personal check with any mail order without any shipping delay.

### FREE TRIAL OFFER

Use your AEROCOMP drive for up to 14 days. If you are not satisfied for ANY REASON (except misuse or improper handling), return in the original shipping container for a full purchase price refund. Applies to hardware only. Sorry, we cannot refund on software. We have confidence in our products and we know you will be satisfied.

### WARRANTY

We offer a six months warranty on parts and labor against defects in materials and workmanship. In the event service becomes necessary for any reason, our service department is fast, friendly and cooperative. Our goal is 48 hour turnaround on all warranty or repair drives!

### 100% TESTED

AEROCOMP disk drives are 100% subjected to burn-in and bench test. We even enclose a copy of the test check list, signed by the test technician, with each drive. AEROCOMP means reliability!

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Order by mail or call TOLL FREE TO THE NUMBERS BELOW. Please note toll free lines will accept orders only. We accept VISA or MASTERCARD. Be sure to include card number and expiration date. We will not charge your card until the day we ship. Order by mail with credit card or send check or money order. Personal checks welcome. No delay. Order COD. No deposit required but all COD's will arrive cash, certified check or money order only. We'll send a card showing the exact COD amount before your shipment arrives. Shipping is **not** included in the prices shown. Texas residents add 5% sales tax.

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## The 100 Gets a Disk Drive

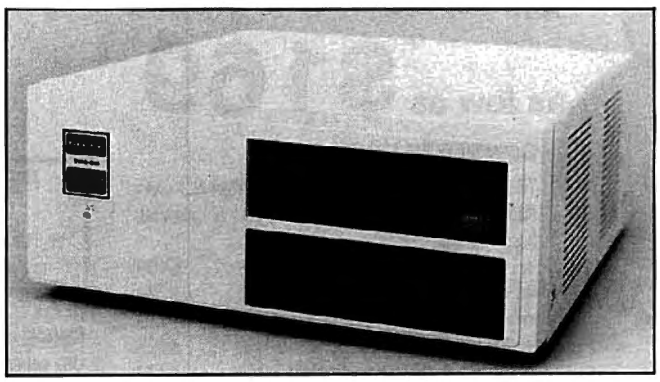
The moment Model 100 owners have been waiting for is here. Radio Shack has announced the TRS-80 Disk/Video Interface, a 5¼-inch floppy disk drive for Model 100s with 16K of RAM or more.

The single-sided disk drive ($799) stores 184K of data and plugs into the 100's ROM cartridge slot. An RF modulator and computer/television switch give you the option of connecting your 100 to your television set for a 25-line by 40-character display or to a monitor for a 40- or 80-character display. It is not portable or TRSDOS compatible.

The unit contains special controlling software that loads automatically to the Model 100. A second drive can be installed for $239.95.

For more information contact Tandy Corporation/Radio Shack, 1800 One Tandy Center, Fort Worth, TX 76102. 817-390-3300.

Reader Service ✓ 550



*Radio Shack's Disk/Video Interface lets you hook up your Model 100 to a television set or monitor and save data to disk.*

## Model 4 Utilities Package

Logical Systems (P.O. Box 23956, Milwaukee, WI 53223, 414-355-5454) has released a Model 4 TRSDOS 6.1.2 or 6.2.0 utilities package (containing BSORT and MOD324 for $49) for Basic programmers.

BSORT, a fast Assembly-language sorter, executes from Basic to let you sort, tag, and index string and numeric arrays, as well as perform midstring sorts, ascending and descending sorts, and more.

MOD324, an Assembly-language conversion aid, converts Model III Basic programs to Model 4 format, adjusts print locations on the screen, and points out lines needing further conversion.

Reader Service ✓565

## Adventure in the Castle

In the Sorcerer of Claymorgue Castle ($24.95), you are Beanwick, the faithful apprentice of Solon the Master Wizard. Using verb/noun commands, you must make your way through the castle in search of the "13 Stars of Power."

The 32K Model I/III disk adventure game is available from Adventure International, Box 3435, Longwood, FL 32750, 305-862-6917.

Reader Service ✓570

## VisiCalc Sorting Utility

XVCSORT ($25) is a machine-language VisiCalc sorting utility that lets you sort any block of data (strings or numeric constants) ascending or descending, by rows or columns, and with any number of columns or rows in the order that you decide.

The disk works with all systems running LDOS 5.1.X or TRSDOS/LDOS 6.0 and is available from Keene Computing Services Company, 407 Nagle St., Suite 43, College Station, TX 77840, 409-846-4426. Specify DOS and model when ordering.

Reader Service ✓555

## Control vs. Chaos

If you ever type in an index with page numbers, a list of names with telephone numbers, or any sequence of one line information that needs sorting, then Supersort ($39.95) is for you.

Simply enter data into a word processor, run Supersort, and it creates a new sorted file. Your old file is intact and you can edit it with your word processor.

The program sorts numbers or alphabetic lists using Model III/4 TRSDOS systems with a minimum of 16K RAM.

For more information contact Irwin Gretczko, G2 Enterprises Inc., 255 W. 90th St., New York, NY 10024, 212-787-5634.

Reader Service ✓561

## Trouble with Algebra?

Don't let algebra become a dirty word to your son/daughter or students. The Algebra System ($219), a Model III/4 educational practice aid, can help the student conquer algebraic word problems. The program contains 10 types of word problems covering age, coins, stamps, rates, and investments for over 2,000 problems.

The teaching aid checks each stage of the student's progress and corrects his/her errors. The Algebra System, or a $20 sample program (credited toward purchase), is supplied on a TRSDOS 1.3 disk from E. David & Associates, Small Computer Systems, 22 Russet Lane, Storrs, CT 06268, 203-429-1785.

Reader Service ✓553

## TRSDOS 6.2.X Source Code

Logical Systems Inc. (P.O. Box 23956, Milwaukee, WI 53223, 800-248-3535) has published the complete, commented Assembly source code for the LSDOS/TRSDOS 6.2.X.

The publication *LSDOS/TRSDOS 6.2.X "The Source"* comes in three 8½- by 11-inch softbound volumes: Volume 1/The System, Volume 2/The Li-

# Great Offers from B.T.

## MODEL 4 SUPER UPGRADE

Controller Board, D/D and D/S 40/80 + 8" Drives, Sound Board, Nameplate, Switching Power Supply, Installation Kit with detailed instruction manual

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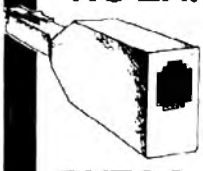

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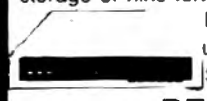

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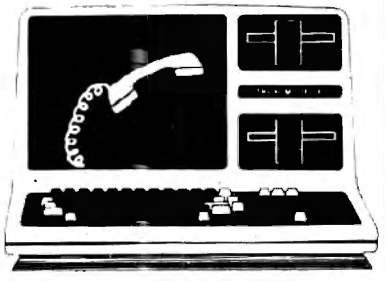

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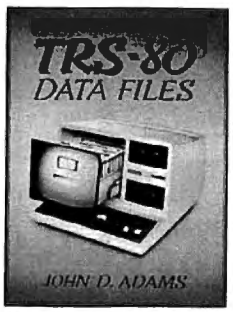


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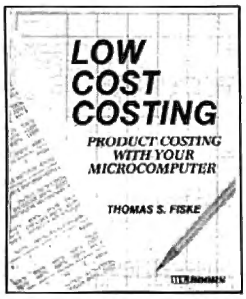


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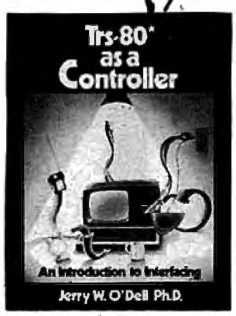


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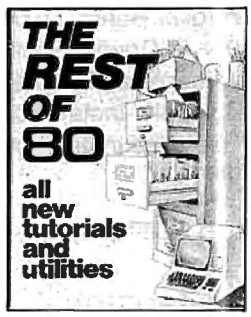


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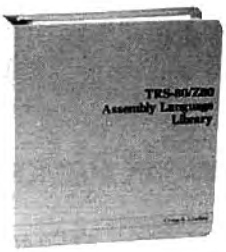


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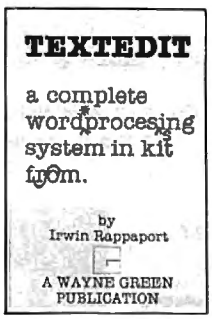


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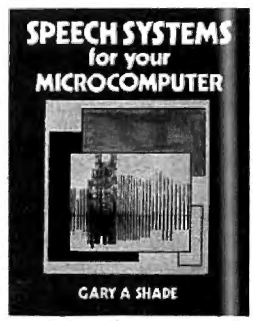


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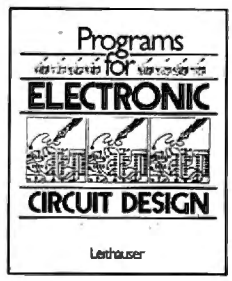


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It also includes options for printing out management reports—transactions by vehicle, transactions by period, daily cash journal, and so on.

The system runs on TRSDOS or CP/M two-drive systems. The full single-user system sells for $1,200. A demonstration copy is available for $90 from B.O.S.S. Computer Group, 4136 Burke St., Burnaby, B.C. V5H 1B1, Canada, 604-430-4612.

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Arrow key or joystick controlled moves.
Adaptable Tournament Level.
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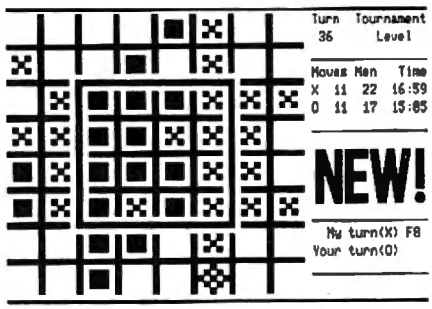
Graphics board display with Tournament Clocks, Man Count, Legal Move Count, Turn Number.

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Inc., 9190 Manor Drive, La Mesa, CA 92041, 619-698-0230.

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### Surge Suppressor

The Model 033 ($135) 120-volt ac line transient suppressor protects your microcomputer by instantaneously (in 25 nanoseconds) sensing and suppressing high voltage transients that can damage and scramble data.

The unit features maximum surge current suppression of 15,000 amperes, energy absorption of 200 joules, two three-wire grounded outlets, a 15 amp fuse, on/off switch, indicator light, and a 6-foot, three-wire grounded line cord. It is available from PMC Industries Inc., 9353 Activity Road, San Diego, CA 92126, 619-695-3520.

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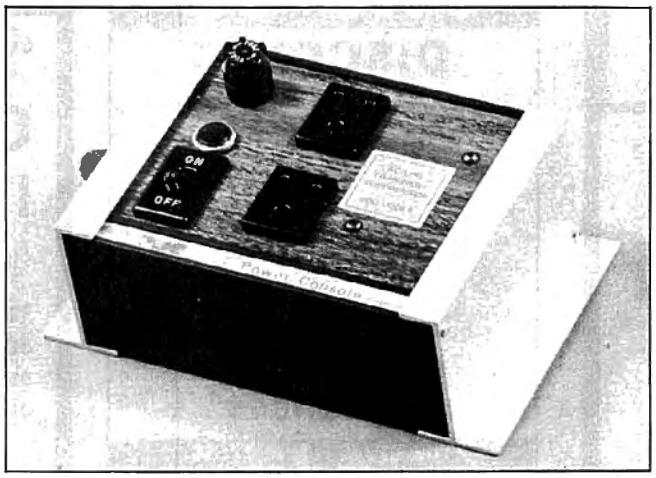


*PMC Industries' Model 033 keeps high-voltage spikes from reaching your microcomputer.*

### Game of Destruction

In the game Zolar, you must conquer the evil warlord (Zolar, of course) by breaking through his rotating walls and destroying his relentless servants. Work your way through his defenses and eliminate him before he eliminates you.

The machine-language game has a 2-player option, scoreboard (disk version only), sound, joystick option, and multiple skill levels. It comes on 16K tape ($19.95) or 32K disk ($22.95) for the Model I/III.

For more information contact The Software Exchange, 1615 Compton Road, Cleveland Heights, OH 44118.

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### Software for School Administrators

MMS for Schools, an integrated modular management software system for school administrators, consists of the Student Master File ($400), Student Scheduling ($1,100), Attendance and Class Cut ($350) modules, as well as a Grade Reporting ($750) module. The system runs on a 64K

# NICE (tm) New Interactive Computing Environment

*from XYZT Computer Dimensions, Inc.*

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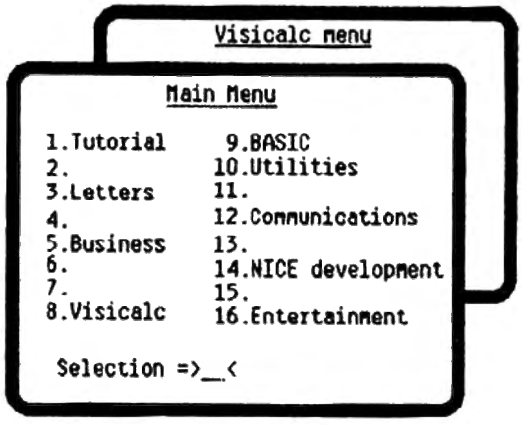
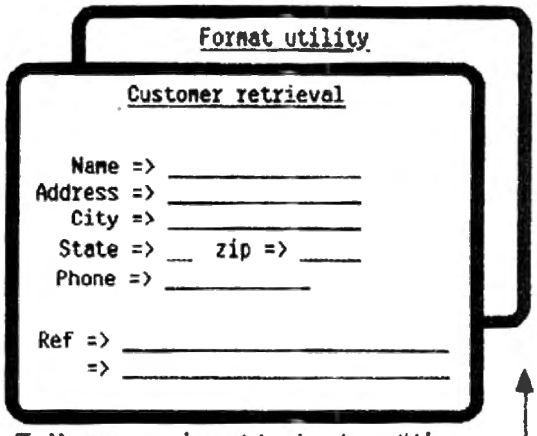



The most friendly user interface utilizing a set of menus. Runs utilities, wordprocessors, games and applications directly from menus. Can be easily modified and customized.

## Screens




Full screen input/output, editing, formatting and validation, PF keys, messages, full cursor control. Can be used directly from BASIC.

## Visicalc (tm) interface

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| 2 | | | |
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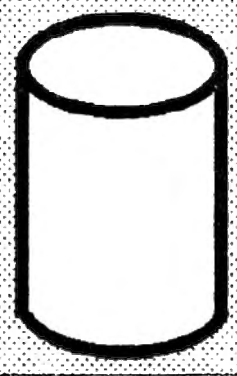
| 9 | | | |

The information kept in the database can be processed by Visicalc.

Special **built-in interface** allows data transfer from Database to Visicalc.

## Database

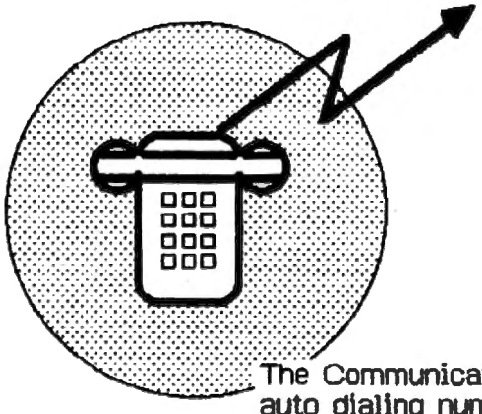


Remarkably universal and efficient data processing system.

Unlimited number of files, true multikey access, **no sorting** required.

Ideal for personal use and business systems.

## Communications

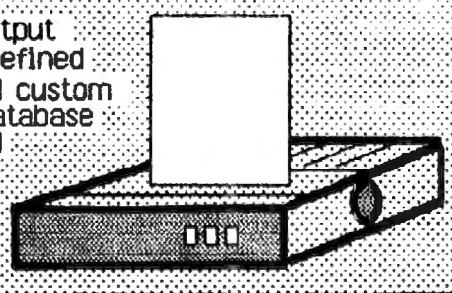


The Communication facility can be used for text and data transfer, auto dialing numbers from the data base, customized protocols, etc.

**(Communications available 1984;priced separately)**

## Forms & Reports

Information can be output in a variety of user defined formats. Standard and custom letters, merge with database invoices, inquiries and reports can easily be specified and printed



158

**The System is compatible with TRS-80 mod I/III (min 2 drive 48K) LDOS, NEWDOS/80, DOSPLUS and MULTIDOS**

price: **$450.00**

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Model III/4 with two drives (the Student Scheduling module requires three drives).

For more information on MMS for Schools contact Computer Resources Inc., Route 4, Barrington, NH 03825, 603-868-5337.

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### Jock Software

Two programs designed especially for use by athletic/activity office administrators have been introduced by Champs Inc. (P.O. Box 24054, Apple Valley, MN 55124, 612-432-4072). Both Champs programs ($399 each) run on a 64K Model III.

Champs/A is a file management system for scheduling events. The system supplies up-to-date reports, schedules, calendars, requests for home-event workers and officials, and contracts. Champs/A identifies scheduling conflicts and open dates.

Champs/E maintains up to 25 items of information on every student in athletic/activity programs. By entering information pertaining to eligibility, rosters, directories, awards, fees, and equipment you can produce master eligibility lists, team rosters, directory information, letters and awards reports, fee and equipment reports.

The programs are menu driven with screen prompts.

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### Fun with Math

Math Magic is a two-volume collection of educational Basic programs for the Models I, III, and 4. Volume 1 contains The Base 2 Trick, Triangle Number Trick, Kapreker's Constant, The Remarkable Number 153, Fibonacci Sequences, Pascal's Triangle, a loan amortization program, and more. Volume 2 includes more than 10 games, some with graphics and demos.

The volumes sell for $19.95 each (for Model I tape format and Model III/4 tape or disk format) or $32 for both. For more information, contact Recreational Mathemagical Software, 129 Carol Drive, Clarks Summit, PA 18411, 717-586-2784.

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### Parlez-Vous Francais?

Give your computer a second language. Enhance your Model I, III, or LNW system with one of eight custom character generator chips. The ROMs come with two character sets, and lowercase capability.

Choose from six U.S. fonts, a Spanish font, and a French font. You can access each language's special characters from the keyboard.

Model III or LNW systems require no soldering; Model I systems may require soldering if the keyboard has not been modified for lowercase.

Chips cost $20.50 each from The Electronic Closet, 8187 Blakely Court West, Bainbridge Island, WA 98110.

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### Trading Data

The File Transfer Program with conversion utili-

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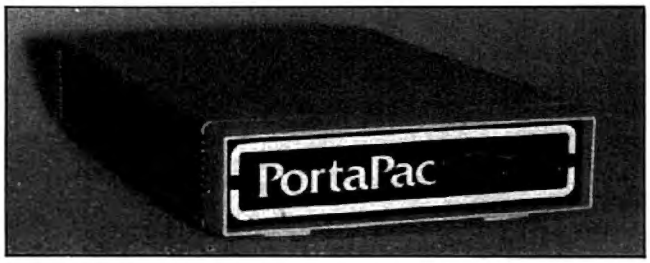
ties ($129.95) aids in the conversion of data, programs, and files from your TRS-80 I/III/4 to a Model 2000 or IBM PC. The program also works for the Apple II/III and CP/M-based machines.

A keyword fix-up utility respaces Basic programs and converts Basic code to run on the PC or Model 2000. A carriage return/line feed utility is included for use with the file transfer program and a word processor. The Cobol Fix utility helps to convert RS Cobol source code to IBM format. Included is a quick test to check your RS-232 serial port and other utilities.

The file transfer programs transfer any file or ASCII, embedded control codes, compressed binary formats, encrypted data bases, high level language programs, VisiCalc spreadsheets, and word processor files. File Transfer also includes an adapter to transfer data through RS-232 ports at 9,600 baud (you can also use modems).

For more information, contact Personal Computer Products, 1400 Coleman Ave., Suite C-18, Santa Clara, CA 95050, 408-988-0164.

Reader Service ✓563




*Model 100 add on: PortaPac powers your computer and acts like a RAM disk.*

## More Memory and Power for the Model 100

The PortaPac 100 ($395) expands the memory of your Model 100 and serves as a RAM disk via the RS-232C serial port. With its own operating system, PortaPac 100 accesses up to 32 separate files in its 60K RAM memory (expandable to 252K).

It operates for up to three continuous hours or stores data for two days on one charge of its battery. The unit transfers data from the 100 to a personal computer using CP/M or MS-DOS operating systems.

For more information contact Cryptronics Inc., 11711 Coley River Circle, Suite 7, Fountain Valley, CA 92708, 714-540-1174.

Reader Service ✓559

## Cassette Back-Up Utility

The Reproducer ($12) copies all standard-format machine-language tapes as well as most copy-protected programs.

The Model III program comes in two versions: one locates at the bottom of memory, the other at the top. It requires less than 1K of memory.

# 26-SECOND BACKUP!

TRS-80 Model I/III/4

The Rapid Disk Duplication Program can copy and verify a full 40-track double-density diskette in just 26 seconds. It can format, copy, and verify a diskette in 42 seconds. The program also accepts parameter changes for number of tracks, stepping rate, diskette name, password, and date.

The secret of the speed is:

RapidDS

RAPIDOS is a new disk operating system that has the ability to read or write an entire disk track in a single revolution of the drive. Versions of RAPIDOS are file format compatible with Model I TRSDOS 2.3, Model III TRSDOS 1.3, and Model 4 TRSDOS 6.0.

Sample execution times:

| Model | I | I | III | 4 |
|---|---|---|---|---|
| Tracks | 40 | 35 | 40 | 40 |
| Format/Verify | 28 | 27 | 26 | 26 |
| Backup/Verify | 30 | 28 | 26 | 25.8 |
| Format/Backup/Verify | 45 | 43 | 42 | 41.8 |

The above execution times assume error-free operation of the disk system. But if there are errors, the Rapid Disk Duplication Program attempts recoveries and displays complete error messages.

The Rapid Disk Duplication Program comes with a manual containing program operating instructions, explanations of error messages, causes of errors, and a description of the operating system.

Program diskette and manual only $30.00.
Requires 48K Disk System. Specify Model I, III, or 4.
Send check or money order to:

Rapidynamic SOFTWARE, INC.
14358 Dyer Street, Sylmar, California, 91342

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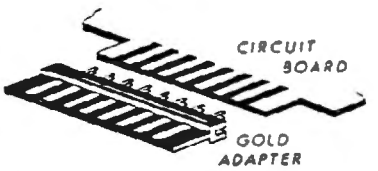
# GOLD KIT

- Memory Faults?
- Programs Freezing Up?
- Worn Edge Contacts?

If your TRS-80 gives you fits, these **GOLD ADAPTERS** upgrade edge connectors for better performance. Solder them over the tin in a few minutes ! With instructions.




**TRS-80 Mod I/III** (kit of 6 adapters) **$34.50**

34/40 pin adapters 2/$16.00

50 pin adapters $10.50

Add $1.60 shipping, $5 overseas

i/o tech, inc.
P.O. BOX 2167
Milwaukee, WI 53201

↙198

Wisconsin Residents add 5% sales tax.

# The Expert

**Chess Knowledge System**
**by William Fink**

## Sfinks 4.0 Chess

The highest rated chess program available for any microcomputer. Rated 1793/5* by the United States Chess Federation.

**Features:** various levels of play, 32 book openings, problem set-up, move suggestions and take back, game save, optional printer, audio alert and more.

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Upgrade Sfinks 4.0 to play with the book opening knowledge of a master (Sfinks 4.0 Chess is required).

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MasterCard VISA

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Florida residents add 5% sales tax.
*On Model 3 w/speedup by Holmes Eng.

TIME SAVING — MONEY SAVING
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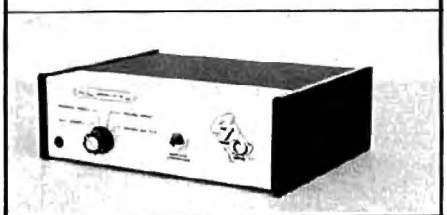

## SPOOL-Z-Q

Spool-Z-Q accepts characters at computer speed and feeds them to your printer at its much slower speed. This eliminates the time you waste waiting for your printer to finish before you can use your computer.

**FEATURES**

Spool-Z-Q is perfect for use with all parallel (Centronics standard) printers including Radio Shack printers. Spool-Z-Q is stand-alone, it doesn't steal power from the computer or printer. The many advanced features include automatic internal space character compression, copy and self-test functions, and a special "Pause-on-Formfeed" mode.

**SIZES AND EXPANSION**

Spool-Z-Q comes in 32K, 64K, and 128K character sizes. Any Spool-Z-Q can be user expanded to 64 or 128K by just plugging in chips — the sockets are already installed. There are no jumpers to fool with either, Spool-Z-Q knows how much memory is installed without being told.

**15 DAY TRIAL PERIOD**

You may try Spool-Z-Q with your system and, if you aren't completely satisfied, return it within 15 days for a no-hassle full refund.

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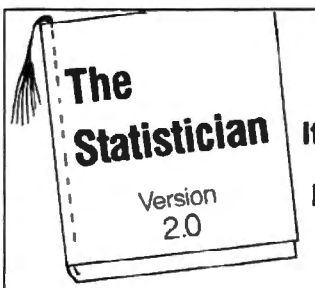


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↙ See List of Advertisers on Page 227

## NEW PRODUCTS

When ordering, specify memory size and include $2 postage and handling. California residents add 6 percent sales tax. For more information, contact Zagros Sadjadi Software, 120 Round Court, Petaluma, CA 94952.

Reader Service ✓568

### Computer Midwifery

*How to Maintain and Service Your Small Computer* ($17.95) describes simple preventive maintenance techniques and do-it-yourself servicing to keep your computer out of the repair shop. The book covers printers, disk drives, and other peripherals.

If repairs are necessary, flowcharts lead you through diagnosis and troubleshooting. You should have some knowledge of electronics (with a VOM and oscilloscope) but you need not understand digital theory. For serious problems, the book includes guidelines on what to tell service technicians.

Written by John G. Stephenson and Bob Cahill, the book is published by Howard W. Sams & Co. Inc., 4300 W. 62nd St., Indianapolis, IN 46268, 317-298-5400.

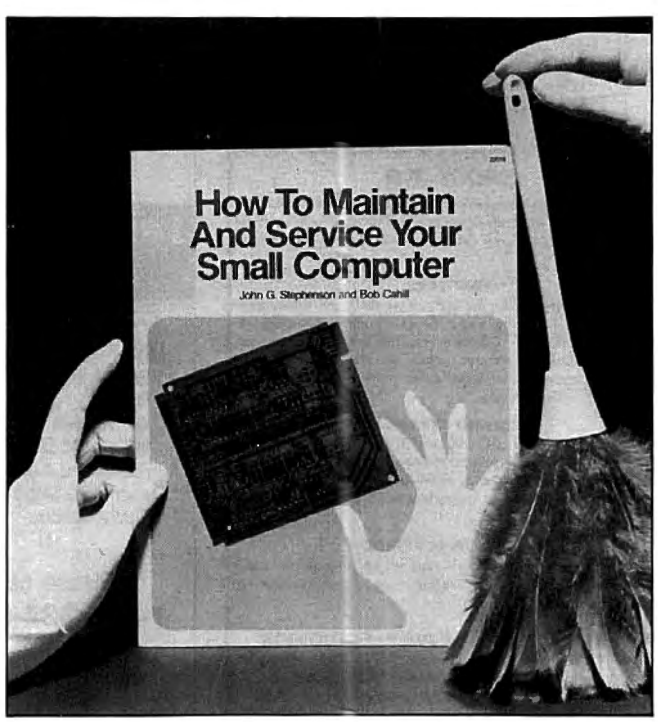
Reader Service ✓558

### Why Can't Basic Be More Like Pascal?

Basrum ($149.50), a unique development tool for Basic programmers using a 16K, 32K, or 48K Model I or III/4, acts as a Basic subroutine library and linking loader.

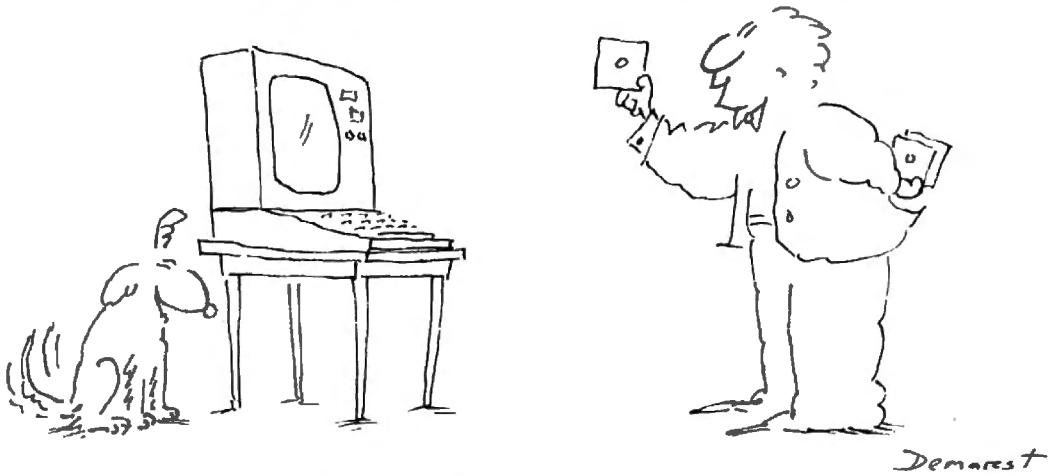
Basrum speeds program execution and saves disk space since your subroutines are no longer part of the program that uses them. And programs load faster, too. Store your subroutines in library files, available to all your Basic programs.

The utility lets you call subroutines by name, break long programs into modules, and chain programs while retaining all variables.




*This book might save you expensive trips to the repair shop.*

# Speak.




# And Listen.

**Your computer can do both. *Speech Systems for Your Microcomputer* is an introduction to voice input/output that shows you how.**

## What Voice I/O Is

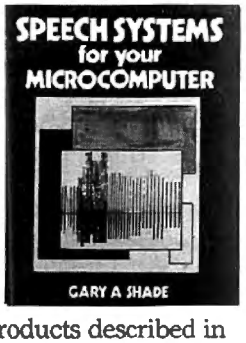
*Speech Systems for Your Microcomputer* has information on all the latest voice technology, for business, home, educational, or industrial use. You'll find out what speech systems are all about—getting your computer to produce synthesized speech and to recognize human speech. You'll learn how you can use voice I/O, in teaching programs, helping the handicapped use computers, talking home appliances, factory and test equipment, and more.

## The Latest Speech Products

A complete buyer's guide shows you what's available, from twelve-dollar products to systems that cost thousands. You can use it to determine which products are best suited to your needs and budget. Current prices and addresses are given, so you can shop around without wasting time or money. *Speech Systems for Your Microcomputer* also contains over 100 pages of reprinted manufacturers' data sheets.

## How To Do It

*Speech Systems for Your Microcomputer* shows you voice systems in action. For speech synthesis and recognition, you'll follow the construction of projects, using some of the products described in the book.




## To order

*Speech Systems for Your Microcomputer* is available for $14.95. You can call toll-free for credit card orders, **1-800-258-5473**. Or you can mail your order with check, money order, or complete credit card information to: **Wayne Green Books, Retail Sales, Peterborough, NH 03458.** Include $1.50 for the first book, $1.00 for each additional book for postage and handling. Orders are payable in U.S. dollars only. Allow four to six weeks for delivery. WGBooks are available at your local bookstore. Dealer inquiries invited.

**Speech Systems for Your Microcomputer**
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# NEW PRODUCTS

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For more information contact Wiley Inc., 841 Bishop St., Suite B-2, Honolulu, HI 96813, 808-531-4314.

Reader Service ✓554

## Enhance Your Model 100's Communications Mode

LapLog ($39.95) adds memory-buffer capabilities to the Model 100 that let you scroll through data sent or received while on line. The amount of data you can review is limited only by the Model 100's memory. Normally, the 100's communications program displays only the last eight lines of text.

LapLog's Snoopy mode displays the ASCII number of each control character in reverse video, helping you troubleshoot the source of any communications problems. The tape program operates via function keys.

The program, manual, and source code are available from PocketInfo Corp., P.O. Box 152, Beaverton, OR 97075, 503-649-8145.

Reader Service ✓569

## III/4 Integrated Package

A-B-SEE ($89.95), an advanced utility for the 48K two-disk Model III/4, integrates high performance editing, word processing, graphics, and telecommunications capabilities into a single software product.

At the heart of A-B-SEE is a high-speed, full-screen editor that supports vertical and horizontal scrolling without the need for a type-ahead buffer. You can edit most file formats including binary files. A-B-SEE has 24 editing commands.

Word processing features include wordwrap, fixed or proportional spacing, top and bottom titles, soft hyphens, widow lines, adjustable margins, and spelling dictionary compatibility.

The smart terminal mode of A-B-SEE communicates and transfers files between computers. Special utilities support screen snapshots and full-screen graphics editing.

The software includes a 200-page manual and interactive tutorial to get you up and going quickly. For more information, contact Computents Inc., P.O. Box 2291, Idaho Falls, ID 83401, 208-529-2492.

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## E-Magazines

You can access more than 130 major magazines through Information Access Company's (IAC) and DIALOG Information Services' on-line data base service. The data bases are called Magazine ASAP and Trade & Industry ASAP (includes PR Newswire).

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Coverage dates back to January 1983 and data bases are cumulative—all

# CONTROL YOUR COSTS AND MAXIMIZE YOUR PROFIT

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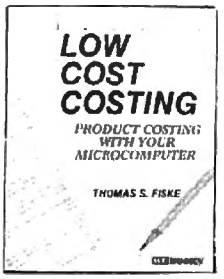


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REQUIRES: 48K, 2D. Drives
Unprotected diskette

SUPPORTS: Most Mod III DOSes
Programmed tutorial

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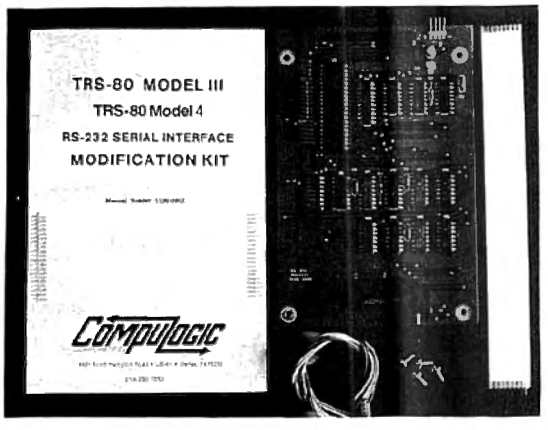
# THE RS-232

**MODEL III** **MODEL 4**




State of the art technology in board design, our direct replacement of Radio Shack's* internal RS-232 board, mounts inside the Model III or 4 on the existing brackets. All cables, screws and complete mounting instructions are included. Non-technical people will find that installation is quick, straight forward and simple requiring less than 15 minutes to complete.

Total compatability with Radio Shack* and all existing software is maintained. Software programmable baud rates from 50 to 19,200 baud are supported along with programmable word length, stop bits, and parity. May be utilized in either half of full duplex operation.

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## NEW PRODUCTS

retrospective material remains for reference.

Users access text with both free text and controlled vocabulary searching. There is no initial fee or monthly minimum charge. You pay for actual on-line time (approximately $1.50 per minute), plus a flat charge per article.

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### Spelling Bee

Whether they're gearing up for the spelling bee or just trying to make good grades in class, students will benefit from Dr. Stan ($39.95/tape, $49.95/disk), a Model III/4 spelling tutor.

Through on-screen reinforcement, Dr. Stan accepts the student's spelling list with words of from two to 18 characters. When a student spells a word correctly three times, he/she jumps ahead in the on-screen race with Dr. Stan. A misspelled word puts Dr. Stan into the lead.

For more information, contact Dee Pee Data Inc., P.O. Box 11349, Columbia, SC 29211, 803-254-9595.

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## DIFFERENT TRACK

### A Timely Gift

Order up a batch of these microclocks as gifts or incentives for customers or friends. What better way to show your involvement in microcomputers?

You can have the 1¾-inch microcomputer replica imprinted with your name or company message ($6 each when ordered in quantity). The CRT displays hour, minute, second, and month and day data.

For more information contact Impact Specialties Co., 395 Munroe Circle, Des Plaines, IL 60016.

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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.*

# The only way to WIN is to ENTER:

## *80 Micro*'s Young Programmers' Contest 1984–1985

### Grand Prize $300 and publication

3 1st prizes—$200 each and publication
3 2nd prizes—$100 each and possible publication
3 3rd prizes—$50 each and possible publication
Honorable Mentions—Free subscription to **80 Micro** and possible publication
(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 × 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**

Name_____

Age_____ Date of Birth_____

Street_____

City_____

State_____ Zip_____

Phone_____

Machine
(circle one)

- Model III
- Model 4
- Model 4 P


Include this form with your entry and return to:

**Young Programmers' Contest**

**80micro**

**80 Pine Street**
**Peterborough, NH 03458**

See List of Advertisers on Page 227

# Load 80

*On the May 1984 directory, we neglected to mention that EQUAPLOT/BAS does not run on the Model I; it's a Model III program. We apologize for any inconvenience this caused.—Eds.*

## June 1984 Load 80 Directory

| Article | Page | Cassette File Spec | Disk File Spec | Comments |
|---|---|---|---|---|
| Side A | | | | |
| —— | – | A | TITLE/BAS | Basic |
| Command Performance | 62 | B | MAKEDO/BAS | Basic |
| Monitoring Financial Health | 70 | C | REPORT/BAS | Basic |
| Designer Screens | 82 | SQUOT | SQUOT/SRC | EDTASM† |
| Designer Screens | 82 | SQUOTC | SQUOT/CMD | System |
| Bugs from Outer Space | 101 | TEXT4A | TEXT4A/SRC | Ed/Asm |
| Bugs from Outer Space | 101 | TEXT4B | TEXT4B/SRC | Ed/Asm |
| Double Vision | 113 | * | WRTSCR/SRC | EDTASM† |
| Double Vision | 113 | WRTSCR | WRTSCR/CMD | System |
| Double Vision | 113 | * | TSTDRV/SRC | EDTASM† |
| Double Vision | 113 | TSTDRV | TSTDRV/CMD | System |
| Side B | | | | |
| The (Single) Key to Scripsit and TRSDOS commands | 126 | D | SCRIPAL/BAS | Basic |
| Of Limited Values | 134 | E | EXAMPLE/BAS | Basic |
| Of Limited Values | 134 | F | BALSHEET/BAS | Basic |
| Of Limited Values | 134 | G | CHECKING/BAS | Basic |
| Of Limited Values | 134 | H | AMUSING/BAS | Basic |
| Uncommon Denominators | 139 | I | FRACTION/BAS | Basic |
| Project 80 | 170 | BARCOD | BARCODE/SRC | Ed/Asm |

†EDTASM is a registered trademark of Radio Shack and refers to their product.

*These programs are not available on the cassette.

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### VERSAPAYABLES™ $99.95

VERSAPAYABLES™ is designed to keep track of current and aged payables, keeping you in touch with all information regarding how much money your company owes, and to whom. VERSAPAYABLES™ maintains a complete record on each vendor, prints checks, check registers, vouchers, transaction reports, aged payables reports, vendor reports, and more. With VERSAPAYABLES™, you can even let your computer automatically select which vouchers are to be paid.

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