

80micro

A WAYNE GREEN PUBLICATION

the magazine for TRS-80* users

80micro

5/84

Be the Boss Of a BBS

Plus:
Equation Occasions
Your III Becomes a 4
A New Pascal Column
VisiCalc Enhancements



m: Pete S. 031050.34
: John C. 120947.36
John.

Now that you've got the BBS up and r
probably swamped with mail, bu
Jeanne for your hospitality wh



#52

A

Radio Shack's TRS-80[®]

Get Speed and Graphics

DMP-120

Ideal for data processing and general use. Get a throughput speed faster than you thought possible from a printer priced this low! Prints 120 characters per second, 51 lines per minute on an 8" line. Produces impressive graphics in bit-image mode. Bi-directional, logic-seeking print head, underline capability, and elongated and condensed modes. #26-1255 \$499.95



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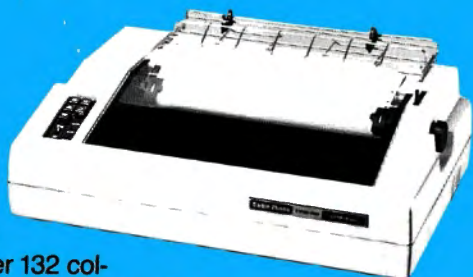
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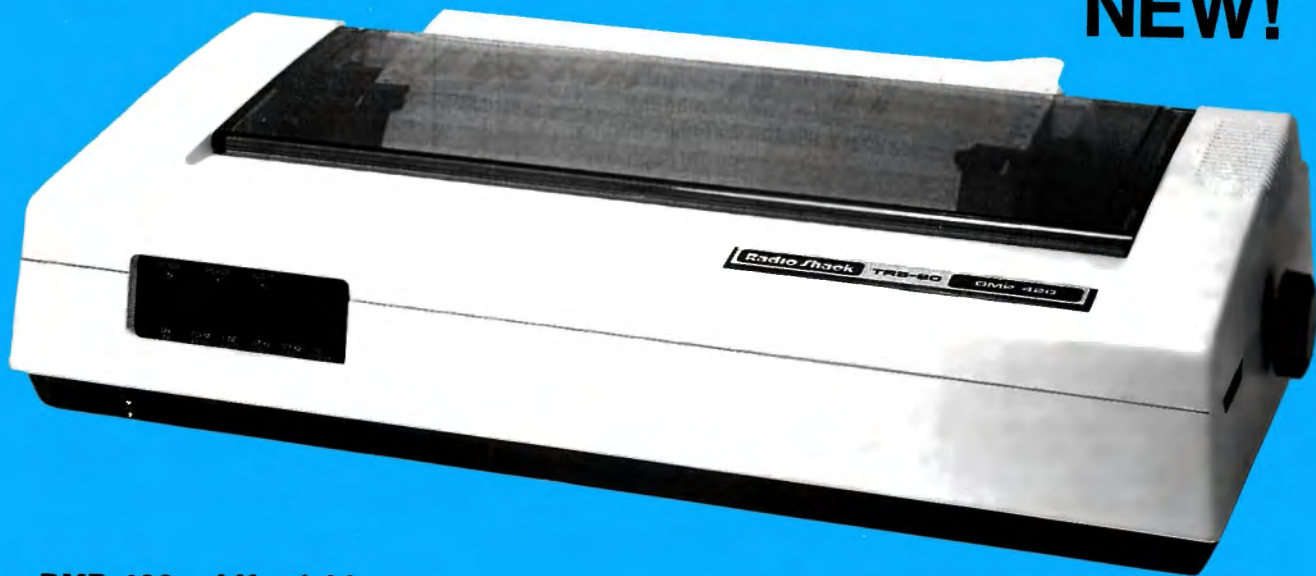
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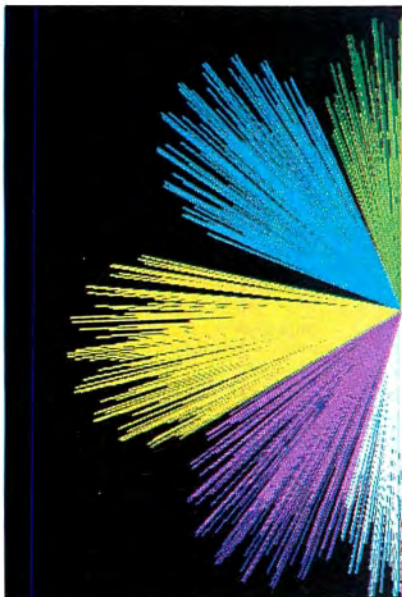
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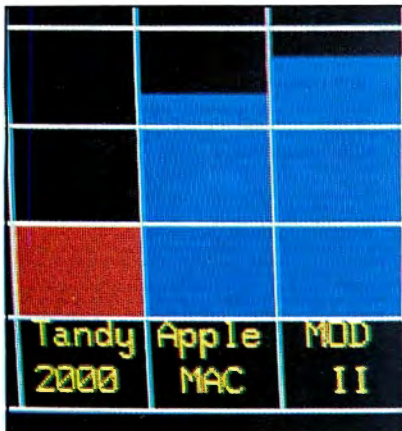
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- 58. More Versatile VisiCalc**
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- 68. Plotting Along** by *David W. Powell*
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- 126. Making the Upgrade** by *James N. Cameron*
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- 184. Pascalculation** by *Bruce Powel Douglass*
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Tandy's classic word processor, with 80 columns and extra convenience.

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- 210. Investment Analysis**
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- 217. Review Digest**

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- 169. From Soup to Nuts** by Ben Firschein
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2000 Illustration (p. 79) by John Pirman



This symbol indicates that the program is available on cassette or disk. For details, see our Load 80 ad (p. 90) and the directory (p. 242).

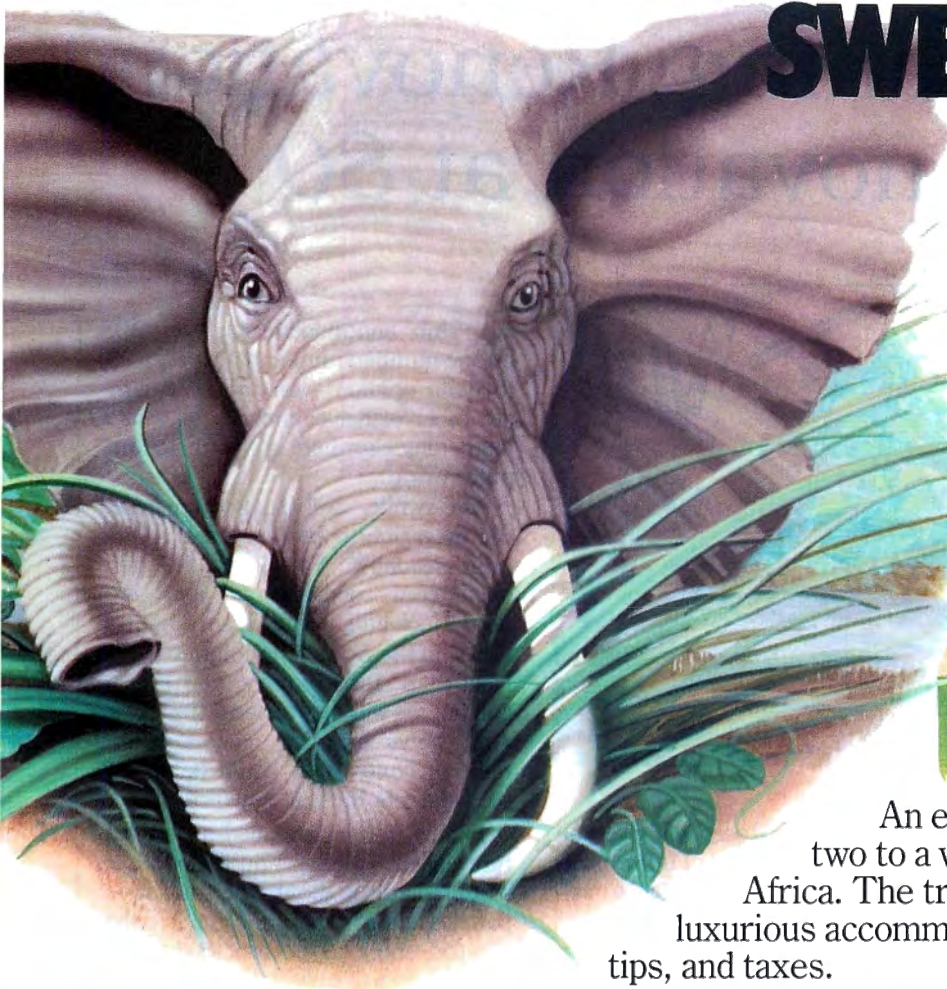
The left bracket, [, replaces the up arrow used by Radio Shack to indicate exponentiation on our printouts. When entering programs published in 80 Micro, you should make this change.

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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Spring Cleaning: Renovation And Innovation at 80

Take your time with this issue of *80 Micro*. You'll notice a number of significant new features, as well as a new look for the magazine.

For starters you'll find our cover feature, the first in a monthly series on data communications. The new column, to be called BBS Express, will show you how to write your own bulletin board system.

The idea for the column came to us from Charlie Bowen and Stew Schneider. We knew we wanted to cover data communications, but we didn't want to take the usual "Gee whiz, look at what you can do with your modem" approach. Then Charlie and Stew, past and current sysops of CompuServe's Software and Authors Special Interest Group (SASIG), came to us with the answer: a BBS, module by module, that will let you be your own sysop. The idea was great and so is the series.

BBS Express is one of two new columns premiering this month. The other is Bruce Powel Douglass's Pascals, which, as the title implies, is all about Pascal. You scientists and math buffs may remember Bruce as the author of Copernica Mathematica. Pascal is one of his specialties—he's written about the subject several times for us.

Why did we pick Pascal as the topic for a column? Our reader surveys show that it ranks only behind Basic and Assembly language in interest. As Bruce points out, it is widely used in schools. And it's what people choose when they want to learn a structured language.

Columnar Reports

While I'm on the subject of new columns, let me point out one that has already arrived and alert you to two others on the way.

First, if you're serious about hardware hacking, you've probably already noticed Roger Alford's Project



80. Every month, Roger will give you something new to build. Future projects include a bar code reader, a real-time clock, and a printer buffer.

In the next few months, *80* will introduce two new columns. The first is for beginners. If you've just bought a computer, this series will tell you how it works and how to get the most out of it. Ultimately, you'll get the background you need to understand the more technical articles in the magazine.

Richard Ramella will write the neophytes' column. *80 Micro*'s regular readers will remember Richard as the author of our old Fun House column and a regular contributor to our review section.

The second column continues our ongoing coverage of the Model 2000, started in January and featured in this month's special report. The column will tell you what software is available for the 2000, how to overcome hardware and software problems, and how to get more out of the machine.

Block Moves

We've also reorganized several of our departments. Reader Exchange pulls from the old Input, Aid, and Debug sections. It includes patches, programming tips, debugs, requests for

aid, club announcements, and BBS phone numbers. Input is now set aside for your opinions—on articles, editorials, other reader comments, or what's happening elsewhere in the microcomputer world.

Meanwhile, we've also organized the magazine to be (we hope) a little more readable. You'll find the general-interest departments and sections, including Pulse Train and Reviews, in the front. The columns—The Next Step, BBS Express, and Pascals—will be toward the back. And we've included reviews in our table of contents so you'll be able to see what's in them at a glance.

Finally, we've launched a new feature called Tidbits. You'll find them scattered throughout the magazine: patches, subroutines, and the like that are too short to be articles but too good to go unpublished. If you've got something you'd like to share with other readers, send it to Tidbits at our Peterborough address.

Not everything you'll find is new. We've still got Hardin Brothers in the fold, writing his popular column The Next Step. Those who enjoy his monthly pieces or read his three-part series on how to get started with Assembly language will be glad to know that he's working on a comparison of the major editor/assemblers. It'll be featured sometime in the fall. You'll also still be able to read Terry Kepner's Feedback Loop, the feature that generates more mail than any other in *80 Micro*.

One other matter. We finally have our bulletin board up, and by the time you read this it should be fully operational. We'll use it to provide information about what we're doing, and take comments and suggestions from readers. The number is 603-924-6985. Drop in some time and say hello.

That just about covers what's new here—for now. Keep us posted on what you'd like to see us do next. ■

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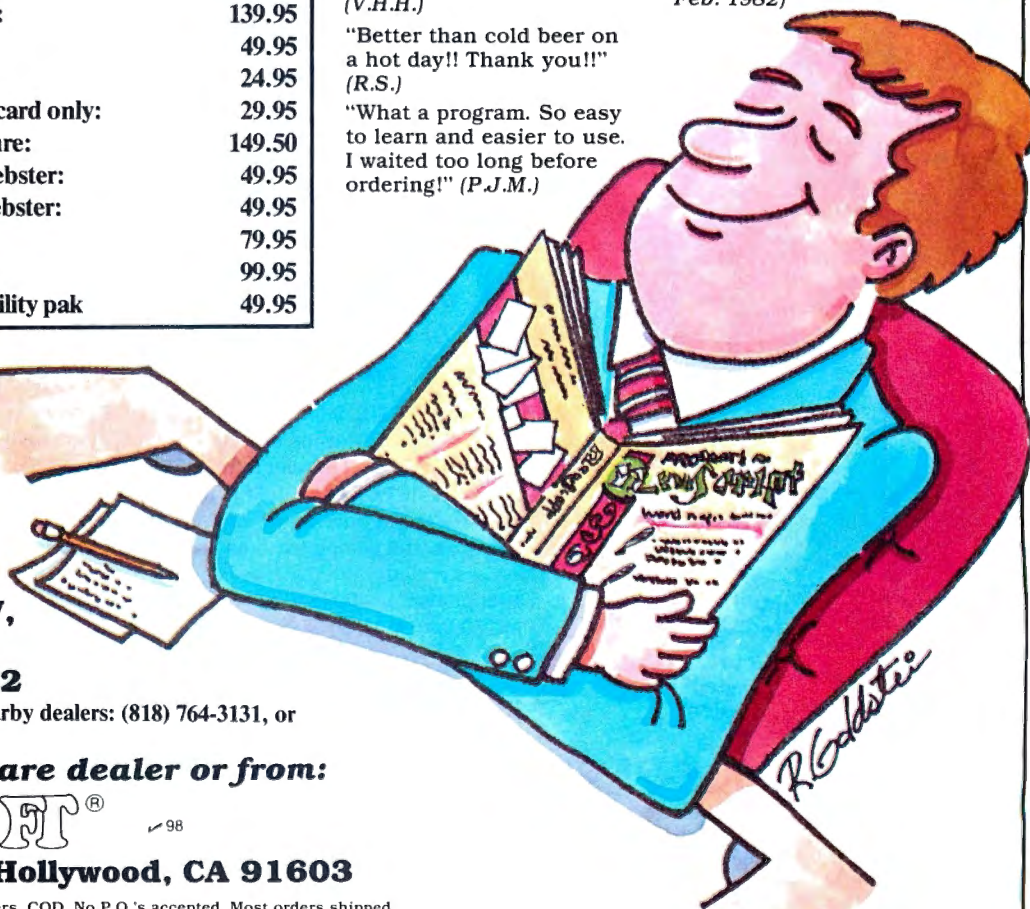
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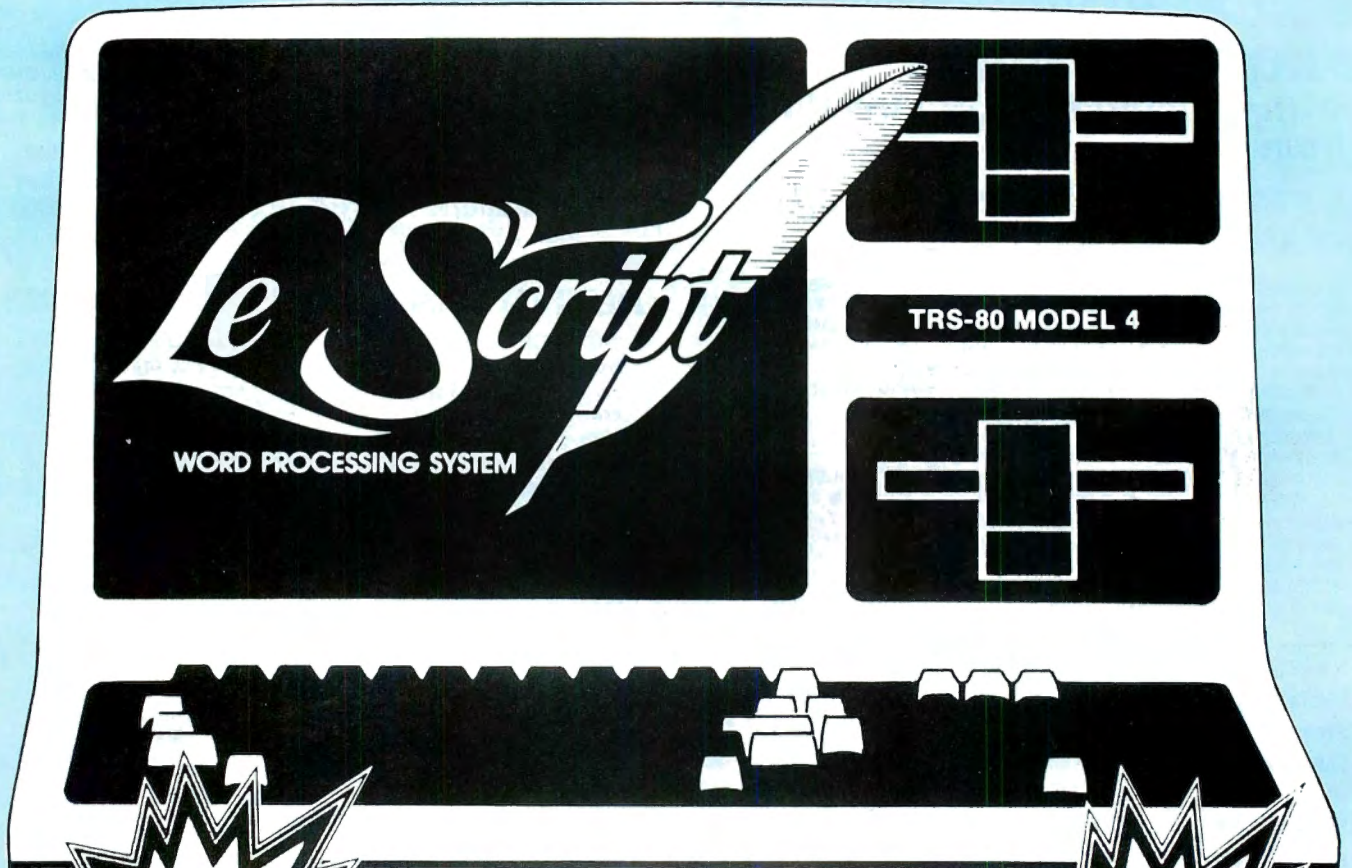
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Good Words Cheap

R. Walter Steur was correct in his review "Good Words, Cheap: The Word Machine" (February 1984, p. 48) citing the quality of this word processor. However, Mr. Steur was incorrect on two points.

The DOSPLUS 3.5 keyboard driver does not reserve more high memory than The Word Machine. The DOSPLUS 3.5 driver on my Model I uses only 496 bytes, while The Word Machine uses 510 bytes in high memory.

My other criticism is over support. I wrote to The Word Machine's manufacturer, Pel-Tek, with some technical questions and never received an answer. But then I'm not a reviewer, and the company doesn't have to impress me, right?

*Theodore J. LeSarge
Ludington, MI*

Radio Shack Repairs

Terry Kepner's article, "Bill of Fair Repair" (December 1983, p. 164) on Radio Shack service and service rates presents a slanted view of the costs of repairing and maintaining a TRS-80 computer.

Until recently I was a Radio Shack technician at the Albany, NY, service center. Radio Shack runs their computer service at near the break-even point for labor and makes its profits on parts.

When a customer brings in his TRS-80 and complains of garbage on the screen, Radio Shack almost always replaces the main logic board. The total cost is roughly \$75, about \$30 for labor and \$45 for the new board (with exchange).

My shop charges \$47.50; \$5 for parts and \$42.50 for labor. Our



cheaper parts prices more than offset the \$5 more per hour we charge for labor.

Regarding non-Radio Shack disk drives, as an electrical engineer I can tell you that there are few differences between the common drives for the TRS-80.

Excessive error problems are probably caused by dirty heads or a drive speed adjustment. Rather than do a \$25 alignment, most Radio Shack technicians could clean and adjust your drives if the company would let them. Radio Shack exchanges defective drives with rebuilt ones for about \$90. My shop rebuilds disk drives for about \$70.

As a TRS-80 owner with a heavily modified machine, I like the advantages of upgrades for faster storage, processing, and so on. Most upgrades are as good as similar Radio Shack products, and most companies stand behind their products.

The average repair center can service most upgrade hardware. Terry Kepner may have had some bad experiences with non-Radio Shack service, but poor technicians exist both in and outside Radio Shack.

In addition, a local repair service

gives its customers more personal attention. We know our regular customers' systems and their use habits, and this helps us identify problems in systems that Radio Shack's repair service often tags "Unit checks OK."

*Vincent E. Meyer Jr.
President
Wildwood Entertainment Inc.
Wildwood Data Systems
Berlin, NY*

Tandy 2000

The Tandy Model 2000 represents the worst of two worlds: It can't use TRSDOS software and it's only semi-compatible with the IBM PC.

This "deliberate" market decision may soothe the corporate ego, but it fails to serve the consumer. As a formerly loyal Models I and III user, I must face the realities of the marketplace and regretfully upgrade to an IBM-compatible system.

The Model 4 and 4P are too little too late, and the Tandy 2000 is an orphan. In baseball, it's 3 strikes and you're out. Goodbye, Radio Shack.

*Warren NG
Oakland, CA*

A Password in Time

Regarding the article "The Password Is..." by David Lantis (December 1983, p. 179) some readers may still be waiting for the program to find a password.

In his program, ZZZZZZZZ is the 2,468,228,800,000th password checked. At the rate of 100 passwords per minute, you would have to wait 46,960 years to find this password.

Since an eight-character password has 26 possible characters for the first

alphabetic position and 37 possible characters for the remaining 7 alphanumeric positions, this program checks up to $26 \times (37 \times 10)$ password combinations.

The program will probably encounter the correct password before reaching ZZZZZZZZ, but readers looking for the password "visicalc" still have to wait about 40,000 years.

My company offers a password program for the Model III that checks passwords at the rate of 50,000 per minute. PWBREAK runs on TRSDOS 1.3, TRSDOS 6.0, and LDOS, and sells for \$19.95 plus \$2 shipping.

Homebrew Software believes that the original purchaser of a software program has the right to make as many copies for his own use as he feels is necessary to protect his investment.

All of our software has unlimited back-up capability, and we require the purchaser to complete a registration card so that we can provide support for legal copies.

Al Fischer
President
Home Brew Software
Miami, OK

You should have listed the sidebar article, "The Password Is...", by David Lantis (December 1983, p. 179) in the Humor category in the table of contents. Up to 1,041 years to find a single password? This is a joke, right?

The main article, "Take It Off," by David Engelhardt (p. 177) is fine as far as it goes, but anyone not familiar with directory entries could change an FXDE entry, a config/sys entry, or a Misosys Partitioned Data Set file entry, and render his files unreadable.

Roy D. Strachan
RR 8, Site 10, Comp. 13
Prince George, B.C.

For more on "Take It Off," turn to this month's Reader Exchange column.—Eds.

Lantis Responds

Mr. Fischer seems to be more interested in self-promotion than he is concerned about the readers of 80 Micro.

Although my program is flawed, it's free. Mr. Fischer charges \$19.95. If he is truly concerned about the abil-

ity of readers to break passwords, he would publish his program.

My program wasn't meant to be perfect: It was meant to be a starting point in filling the void of useful programs for the Model 4. Mr. Fischer's program is for the Model III.

I hope someone will convert my program to machine language to speed it up; however, I wouldn't want him to charge \$19.95 for it.

When Mr. Fischer writes an article giving us his program, I will be pleased.

David Lantis

Kudos to Kepner

Congratulations to Terry Kepner for his article on CP/M boards (December 1983, p. 122). Now if you would print an article on disk drives, I would be elated.

Bruce Coyne
West Berne, NY

We'll be publishing an article on how to buy disk drives later this year. In the meantime, you might want to check our Buyer's Guide to Disk Drives in the June 1983 issue.—Eds.

The First Model I?

On Aug. 5, 1977 I bought a TRS-80 Model I computer. Judging by the date, I believe this makes me the first Radio Shack computer customer.

Written on the bottom of my receipt are the words: "Thanks! We need you." Can anyone produce a sales receipt earlier than this?

Bob Rosen
President, Spectrum Projects
Woodhaven, NY

Any takers?—Eds.

Getting the Word

I recently purchased version 1.8 of Electric Webster (Cornucopia Software, P.O. Box 6111, Albany, CA 94706) for Model I/III SuperScript users. Although the manual is easy to follow and the spelling checker is ex-

ceptionally fast, the automatic word replacement feature does not operate as described in the Electric Webster User's Manual.

I called Cornucopia and spoke with the manual's author, Tandra Hamlin, who said that the peculiarity of the SuperScript program structure made it impossible to use the correction replacement feature.

This means that Electric Webster locates the correct word spelling from its dictionary but you must manually replace misspelled words. Unfortunately, this makes using Electric Webster cumbersome.

Cornucopia assured me, however, that the automatic replace option was fully operational for any word processing program except SuperScript.

George H. Scholl Jr.
North Miami Beach, FL

80 ALERT

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

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

Prosoft (Dept. C, Box 560, N. Hollywood, CA 91603) has changed its telephone number to 818-764-3131.

80 Micro has received a number of complaints regarding Ammicro Corporation (122 E. 42nd St., Suite 1700, New York, NY 10168). Ammicro's phones are disconnected and the company has moved and left no forwarding address.

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—Dennis Kitz, 80 Microcomputing; 12/82

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Send any questions or problems dealing with any area of TRS-80 microcomputing to Feedback Loop, 80 Micro, 80 Pine St, Peterborough, NH 03458.

Q: There is a letter in the June 1983 Feedback Loop column from a gentleman who has a problem with Dennis Kitz's lowercase modification. I've found on some Model I computers that there are two ground traces on chip Z25: one on the trace side of the board, the other on the component side (under the chip, going to pins 12 and 13). Dennis mentions the ground on the trace side, but not the one on the component side. The only way to cut it is to remove the chip.

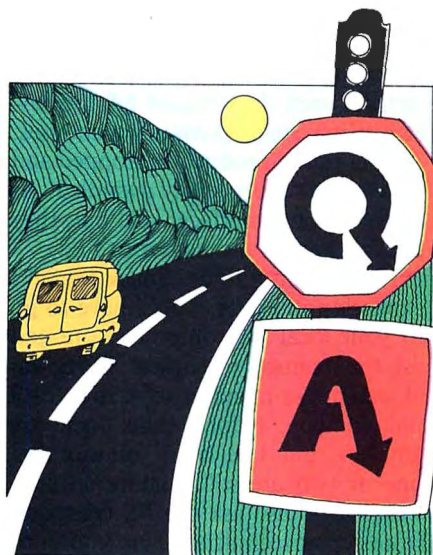
Hope this helps. (Barry Beattle, Lacey, WA)

A: Thanks for the note, I'm sure it'll help many people.

Q: Using the Model 16 and a Line Printer V, I have encountered a problem with the TRSDOS Dual command. The problem occurs after turning off dual routing: The decimal code for Dual Off is 15, which is also the LP V's code for Start Underline. Shouldn't one of these commands be given a different value? (Danny Brown, Fort Scott, KS)

A: Yes it should, but since the LP V is no longer available, that's a moot point as far as Radio Shack is concerned. I believe the only solution is to turn Dual off, and then send the Stop-Underline code to your LP V.

Q: I have a problem with my new disk system and printer: I can't back up my machine-language tapes to disk. It seems the addresses of the programs in memory are too low to be



dumped to disk since TRSDOS 2.3 won't accept any address below 7000 hexadecimal (hex). (J. S. Bellefontaine, New York, NY)

A: Your problem is rather simple to solve. On your TRSDOS disk is a program called Tapedisk. This DOS program is designed to load non-disk machine-language tapes into memory and transfer them to disk. This puts your tape programs on disk for execution with the disk drives. The programs aren't altered in any way and won't load or save data to the disk drives. In fact, once you execute one of these programs by typing its name at the DOS prompt, the computer ignores the DOS system until you reset it.

Another choice is to buy one of the machine-language monitor programs with tape and disk commands, and use it to transfer the tapes for you.

Q: I recently purchased a Radio Shack 5-megabyte hard disk for my Model III, and I've had the frustrating experience of trying to load non-Tandy software.

The problem is that the hard disk sets its high memory at FE6F hex instead of FFFF hex, thus reserving the top 400 bytes for various sys-

tem filter and JCL files that the user can initiate. The trouble is that a number of my application programs (word processor, stat program, screen editor, etc.) place nonrelocatable files at the top of memory, and thus are impossible to load even after I convert them to LDOS.

The hard disk manual states that one can load the disk's relocatable files in this reserved area until it's filled, then set a new high memory address far enough below this newly created high to allow the application program's nonrelocatable files to push the disk's relocatable files elsewhere, but that doesn't work for me. The LDOS system is apparently so large that it can't accommodate everything. Even with a stripped-down LDOS, those top 400 bytes remain absolutely impenetrable, and SYS ERR abounds.

I've consulted by phone with all the software makers, Fort Worth, and an extremely knowledgeable California Radio Shack proprietor. All concurred that the situation was hopeless unless I wanted to get into the hard disk system and change the top memory location, something I don't know how to do. (Charles Moorman, Hattiesburg, MS)

A: Have you talked with Logical Systems, the designers of LDOS? They take their system quite seriously, and might be able to tell you what to do to make everything work. If that fails to produce results, call Micro-Systems Software; they manufacture DOSPLUS. One version of DOSPLUS supports many different hard disk systems on the Model III. It's possible that their hard disk version of DOSPLUS will work with your Radio Shack hard disk drive, and with your applications programs.

Q: I recently purchased an Exatron Stringy Floppy and starter kit for my Model III. A week later I

FEEDBACK LOOP

sent a defective 20-foot wafer tape and data I/O program back to them for replacement. Six weeks later, I hadn't received anything back.

Two weeks after I received the Stringy Floppy unit, I ordered some wafers: eight 50-foot, five 20-foot, and seven 10-foot wafers. All were ordered as certified, and I paid extra for fast delivery. The order was placed through the sales representative for my area.

Two and a half weeks later the order arrived: 21 20-foot wafers, 150 feet short of what I ordered. And they didn't refund the extra money I sent for fast shipping.

When I called Exatron I found that they had moved and were now called Entrepo. They've stopped selling all hardware and software except for the 20-foot wafers.

What's going on? I can't believe they're packing it up, especially since thousands of people have bought the unit. What if it breaks? Is this just a pause, or are Stringy Floppy owners out of luck? (Kevin Vessio, Mahopac, NY)

A: Exatron is in the midst of reorganization, after going into receivership. The new managers hope to revitalize the stringy floppy business, but they aren't quite ready for complete operation. They intend to get out of the retail market and sell exclusively to OEMs (manufacturers only).

They have promised to take care of their previous retail customers by supplying parts and repairs where possible. The tapes are presently limited to 20-foot lengths.

I suggest that you call Holmes Engineering, which is manufacturing a wafer tape drive for the Model 100 computer. Their tapes should fit your drive, and they have many different lengths from which you can choose. I also suggest you send a letter to Entrepo and explain the situation with your wafer-tape order and request either a refund on the difference in price between your order and what was shipped, or that the difference be made up in additional 20-foot tapes.

Q: I'd like to add an expansion interface to my Model I. What happened to the Model I's and IIIs, and the Model I expansion interfaces

that were never sold? Were they auctioned off or are they still available? How can I get one? (A. H. Soule, Bangor, ME)

A: When Radio Shack released the Model III, they let the remaining Model I stock sell out. The same was true of the Model III when Tandy introduced the Model 4. Radio Shack stocked Model I expansion interfaces until the demand fell too low to justify keeping them in warehouses. At that point, production stopped and warehouse supply slowly dwindled. As the remaining interfaces sold out, they became harder and harder to find.

If you want a Radio Shack Model I expansion interface, you'll have to go to your local RS computer store and ask the manager to request his regional warehouse manager to search for a unit for you. I don't think there are any left, but I've heard rumors that one or two are still floating around. You might also ask the RS computer store repair technician if he knows of any still available from National Parts.

If you can't find one, you'll have to settle for a non-Tandy expansion unit from Holmes Engineering, LNW, Micro-Design, or Micro-Mint. These units are of better design and quality than the Radio Shack interface and they're less expensive, too.

Q: I have a Model I with all the enhancements. One of my programs uses maximum memory and four multi-dimensioned arrays—each with almost 800 bytes of information. I want to delete these lines after I load the arrays since they take up 3,200 bytes of memory. But doing so wipes out all the variables and arrays I set up. Is there any operating system that will protect arrays after I load them?

Also, how much usable RAM does the operator have on the new 16-bit chip machines (Model 2000, NEC, and so on)? How much of the quoted RAM (128K) is necessary for the operating system and how much for the user and programs?

I asked a NEC salesman about the Epson QX-10 (which has 128K RAM) and he reported only 29,000 bytes are available to the operator—the rest is used for the VALDOCS operating system. What good is excess RAM if you can't use it? I've got 38,000 usable bytes on my Model I even after load-

ing DOSPLUS and Basic. (Walt Stevenson, Pittsburg, KS)

A: The answer to your first question concerning Read Data statements depends on what you're doing with that data. If the data is in ASCII strings, then you aren't losing any memory. That's because Basic sets up pointers in memory indicating that your program stores the data, not your free RAM. As long as you don't change the ASCII strings, you won't use additional RAM. However, if you change one of these strings, it's relocated in its new form in RAM above your program.

On the other hand, if you're storing numeric variables in data statements, the program converts each one of these from an ASCII number to a single-precision value and moves them to RAM above your program. This wastes a lot of RAM in your program.

Rather than try to find an operating system that lets you delete program lines (one that I don't think exists), try storing all your data in a simple sequential disk I/O file. That way you don't waste any room in your program with data statements or data. The IJG book *Basic Faster and Better* (see address at end of column) goes into saving RAM and getting more out of Basic.

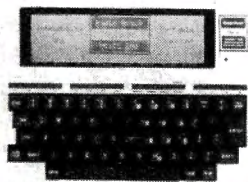
As far as 16-bit computers are concerned, Microsoft Basic is limited to a total addressing capability of 64K RAM, so it doesn't matter how much RAM your computer has. This is true of both the IBM PC and the Tandy Model 2000 (as well as their imitators). In fact, when powering up Basic in the 128K Model 2000, Basic tells you that it has 62,330 bytes of free RAM.

In the DOS environment, you get whatever quantity of RAM you want. The IBM PC comes with 64K RAM as standard; the most common configuration is 128K. The IBM clones and workalikes usually sell with 128K RAM standard as an inducement to buy. The Model 2000 also has 128K RAM as standard.

The QX-10 isn't a 16-bit computer. It uses dual Z80 CPUs. It's sold with 128K RAM, but you can address only 64K at one time. VALDOCS uses memory banking techniques to switch between the two 64K banks to give the illusion that you're working with a full 128K. The 29K of user memory is what's left out of the 64K RAM in use at

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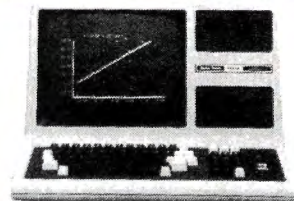
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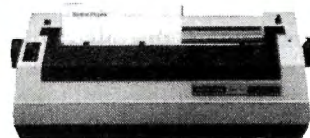
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the moment. The other bank is switched in place when you want to go to other parts of the VALDOCS system, without losing your place in your document or program.

The only major exception to this system is the Apple III, whose Basic can address all the RAM available in the machine.

Q: My early version E-board Model I worked well as a cassette-based machine, but went flaky after I added an expansion interface and disk drives. Radio Shack was aware of this and corrected the faults with the G-board. Recently I compared the E and G boards and the design changes appear to be minor. Is my hunch correct that the E-board computer can't be made to work reliably with the disk drives until the design flaws are corrected? (*Robert Hoffman, Indianapolis, IN*)

A: Thanks for your conjecture, but the real acid test is to plug a G board into a system that's been running on an E board and see if that improves the system's reliability. If it does, then you'll have gone a long way toward proving your hunch. Does anyone else have any input on this point?

Q: After seeing advertisements and reading comments in *80 Micro* acclaiming the merits of MULTIDOS, I bought it for my Model III with double-density single-sided Teac disk drives. My drives simply refuse to load MULTIDOS despite the manufacturer's (Cosmopolitan Electronics) many patches.

I'm using TRSDOS with no difficulty as well as Super Utility Plus 3.3 and many other programs. In view of the incompatibility of the DOS with my system, I asked them for a refund in October. Since they claim their DOS works on the Model III (but not mine) would you contact them and have them either fix their DOS to work on my computer, or send me my refund? (*Mortin Rabin, Herzliab, Israel*)

A: I'm sorry to hear you've had trouble with MULTIDOS. I've had nothing but good luck with it on several systems. I did contact them, however, and they told me your refund is on its way.

Q: I plan to purchase a two-drive Model 4, a DWP 120 dot-matrix printer and DWP 210 daisy-wheel printer. Having decided to get a computer, I have been buying *80 Micro* for several months. Many of the advertisements offer the hardware I plan to buy but at significantly lower prices than the local Radio Shack Computer Center. An example is the Nocona advertisement on p. 223 of the February 1983 issue. Their price for a two-drive 64K Model 4 with an RS-232 port is \$400 less than the local store's; printers are also offered at considerably less than retail.

How can they offer such savings? Is there a gimmick? Why would anyone pay more locally?

Finally, with reference to the Micro Control Systems advertisement on p. 59 of the February issue, how do they put color graphics on the CRT (do they include a color CRT?). Are there any problems that I, a rank novice, might encounter and wouldn't be able to deal with? (*Paul Schiffler, Toledo, OH*)

A: Nearly everyone has seen these ads in microcomputer magazines. What you are seeing is capitalism at work, according to the rules of supply and demand.

Radio Shack has two types of stores—company owned, and franchise. The franchise stores are independently owned but the owners have a purchase agreement with Radio Shack. Radio Shack sells them merchandise the franchiser normally can't buy from standard wholesalers, and they provide Radio Shack access to markets too small to support a company store.

Several decades ago, the company lacked the resources to put a store in every city, so they used the franchise approach as a way to sell more merchandise than they could using only their stores.

Independent franchise dealers can advertise in microcomputer magazines and set prices as they see fit. Tandy can't dictate retail prices—to do so is to violate federal price-fixing regulations.

Most franchise agreements prohibit the stores from using their Radio Shack affiliation as a selling point in advertising in major marketplaces or on a national scale. For instance, a

franchise store in Peterborough, NH, can't advertise in Boston that they are a Radio Shack store selling Radio Shack computers below retail.

In most cases the companies selling Radio Shack equipment and software below retail prices are Radio Shack franchise stores, or the exception, massive mail-order firms who've made deals with franchise store owners.

There is no gimmick. The only hidden cost is shipping. Each unit is sold complete as if you had bought it from a Radio Shack store—most are still in their shipping boxes from Tandy. The warranty is limited to 90 days if you buy from a company store or from a franchise store. If you buy from a mail-order company that's buying, in turn, from a franchise store, then the warranty is to the mail-order firm. The warranty is given only to the original purchaser.

Radio Shack company stores honor the warranty work on the merchandise regardless of where you purchased it. But if you buy mail-order, don't expect the local store to help you set up your computer or teach you how to use it.

When buying mail-order, you always take a risk. Try to make sure you're buying from reputable dealers. If you want Tandy to supply the hardware support, make sure the hardware is all standard Radio Shack equipment.

The only reasons to buy from a Tandy company store is availability and if you need the hand-holding services after purchase.

In answer to your second question, the Micro Control Systems device is an attachment to your computer. It plugs into your expansion port, using the appropriate ribbon cable, then you plug a color monitor into the unit. You can use a color television if you buy their RF module. The device doesn't change the video display on your computer, it merely adds capability for color graphics on a secondary color monitor.

Q: Regarding the cassette problem experienced by D.R. of Mason City, IA (November 1983, p. 312), the April 1980 issue of *80 Micro* (p. 110), has a CTR-41 modification enhancement that requires a minimum of circuit work.

FEEDBACK LOOP

The February 1980 *80 Micro* gives the circuits to the Data Dubber (originally produced by Peripheral People of Mercer Island, WA). I don't know whether the unit is still on the market. I also checked into the units sold by Lemons Tech, Buffalo, MO. These are passive units that use capacitance to dress up the signal, and aren't as effective.

I've read a couple of places where the disk technology received its Winchester label from the IBM project designation (3030) it was developed under. (Roger Anderson, Larimore, ND)

A: Looks like you really examined the CTR-41 issue quite closely. Thanks for sharing your research results.

Q: I bought a used TRS-80 Model III with two disk drives. At power-up, drive zero starts to run and doesn't stop unless I press the break key and push the reset button. This puts "CASS?" on the screen. Then I insert a disk in drive zero and press the reset button again for TRSDOS. Is this cheaper than a trip to the shop?

I have found that my machine dies when it executes a PRINTCHR\$(23). I remove them from purchased programs and avoid them in my own. What would be better? (Charles Miller, Garner, NC)

A: Sure it's cheaper than taking your computer to a repair shop, but you're also taking a risk. It's somewhat like reasoning that it's cheaper not to change the oil in your car; while that works in the short run, over the long haul you'll destroy your car's engine, and need repairs costing much more than a simple oil change.

If you mean that your computer locks up when you hit that statement, you had better take it in to a repair center and soon. The CHR\$(23) switches your display to 32-character mode; if it kills the computer instead this means that something is drastically wrong with your video/computer circuitry.

Q: Recently I discovered a bug in "The Floppy Doctor," a memory and disk drive diagnostic package I purchased from The Micro Clinic in May 1981. I sent them a letter advising them of it, but it was returned to me

because they have moved. Can you help?

The bug I discovered is that a disk formatted to 80 tracks, double-density, in DOSPLUS 3.50 gives the error message "Data is not being transferred from drive to controller! Testing aborted..." in Tests B and C. The same disk shows no error if formatted to the same specifications with DOSPLUS 3.3D or LDOS 5.1.2.

Also, the disk, when formatted with DOSPLUS 3.50, works fine in the 3.5 environment, indicating that the DOSPLUS format utility is not at fault. Further testing shows that any disk formatted by DOSPLUS 3.50 works fine under regular use, but fails Floppy Doctor's tests. (Philip Herbst, Staten Island, NY)

A: First of all, while you may have found a bug, it isn't Floppy Doctor's fault that DOSPLUS 3.50 causes a problem. Floppy Doctor was written several years before 3.5 was released. Besides, Floppy Doctor was designed to test hardware, not the format techniques of various disk operating systems.

The fact that Floppy Doctor flunks the DOSPLUS 3.50 formatted disk while passing the DOSPLUS 3.3D and LDOS disks indicates that the fault lies with the manner in which DOSPLUS 3.5 formats a disk. Something DOSPLUS 3.5 does to the disk as it's formatted is messing up Floppy Doctor when it tries to read that disk.

Q: Concerning your answer to R.B. of Rochester, NM (November 1983), who wanted to use a ROM programmer to make a replacement chip for his bad second ROM chip, a 2716, 2732, or 2764 chip is not pin-for-pin compatible with the 3-chip Level II ROMs. In Dennis Kitz's book, *The Custom TRS-80*, he goes through a great deal of detail describing how to make them work, but it's unnecessary.

The 2532 EPROM is pin-for-pin compatible, and can be used as a direct replacement, with two discrepancies: pin 21 on Level II ROM chips B and C is an active negative select (*CS). On ROM A it's an active positive chip select (CS). On the 2532, pin 21 is for the 25-volt programming voltage (Vpp). The absolute maximum voltage rating for this 2532 pin is -0.3 to +28.0 volts. The suggested

voltage for normal read/write operations is +5.0 volts. Other than this, the 2532 is pin-for-pin compatible with the ROM A, and would probably work with ROMs B and C.

A simple elegant solution is to bend pin 21 on the 2532 away from the socket as it is inserted. This way there's no way the absolute voltage rating can be exceeded. In fact, this is how I replaced my ROMs with 2532s.

Most EPROM programmers who program the 2732 will also program the 2532. However, unless your EPROM programmer hardware specifically states it handles the 2532, don't try it.

The advantage to replacing the ROMs is that you can customize them any way you want, such as changing Level II Basic to work correctly with upper- or lowercase, fixing the shift/down-arrow control key flaw, fixing the cassette routine for higher reliability, fixing reset so that you return to Basic instead of rebooting the disk drives, and fixing the computer so you can break out of a printer lockup without using the reset button. (Nevin Mattingly, Huntington, UT)

A: Thanks for the information.

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

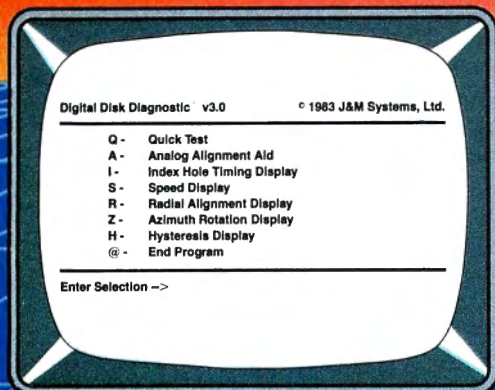
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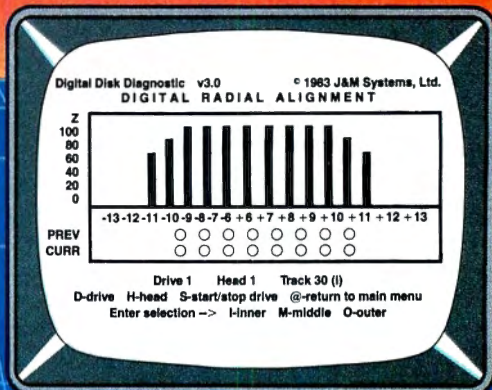
IJG Inc., 1953 W. 11th St., Upland, CA 91786, 714-946-5805. Publisher of *TRS-80 Disk and Other Mysteries* (\$22.50), *Microsoft Basic Decoded and Other Mysteries* (\$29.95), *The Custom TRS-80 and Other Mysteries* (\$29.95), *Basic Faster and Better* (\$29.95), *Machine-language Disk I/O and Other Mysteries*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

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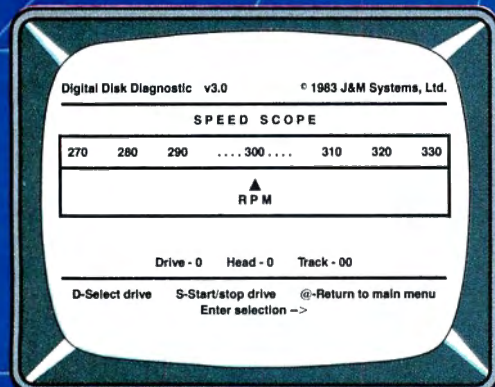
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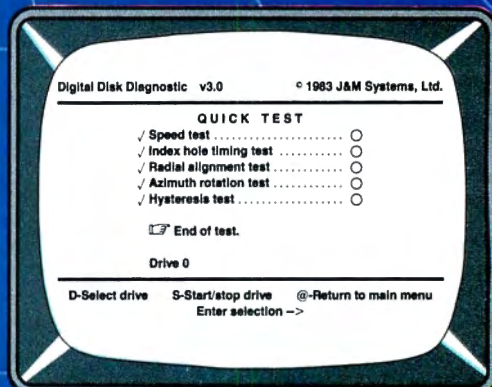
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The Fate of the 4

Radio Shack's workhorse keeps a low profile.

One year ago this April, Radio Shack introduced the TRS-80 Model 4, the third edition of its pioneering Z80-based desktop. Like its archrival, the Apple IIe, the new Tandy offered an 80-column display, 64K RAM, and a comfortable software base.

When Apple pointed to games and graphics, Fort Worth countered with faster processing, more disk storage, and a sober, businesslike image. In short, the 4 upheld Tandy traditions, fitting perfectly into its role as the plain vanilla of the TRS-80 lineup. It even had a vanilla-colored case.

However, as far as its public profile today goes, the 4 might as well be invisible. First, Tandy's Model 100 portable stole its limelight almost immediately, even as it became clear that 1983 was the year of 16-bit instead of 8-bit machines.

The line rallied with November's debut of the transportable Model 4P, but that was upstaged a few weeks later by the MS-DOS Model 2000 introduction. And the new year brought Apple's 32-bit Macintosh—the first computer built entirely of bells and whistles—and a media blitz that pushed IBM, let alone the Model 4, from mass consciousness.

As the machine's first birthday approached, *80 Micro* asked Radio Shack and outside observers the question: Has the Model 4 dropped out of sight as newer, flashier micros enter the market? The answer at present seems to be no, but there are reservations about the survival of any 8-bit desktop and specific concern about the lack of 4 software.

Chris Christiansen, an analyst with

edited by Eric Grevstad



There's still a market, but is there software?

Boston, MA's Yankee Group, confessed that the 4 had slipped his attention: "To be truthful, I don't know a whole lot about it. I think it's selling well, but I don't have any figures."

Ron Jeffries, publisher of the *Jeffries Report* industry newsletter, was more skeptical: "Well, I think it sells. I don't think it's a big hit, but I think it's a solid seller for Radio Shack. I also think there's a larger question as to how viable any of the 64K Z80 CP/M machines are. The ones that seem to be doing the best are those that come with a lot of bundled software such as the Kaypro. So when you compare the Model 4 to the Kaypro, which I think is a fair comparison, the Kaypro wins hands down."

Since Tandy doesn't release figures, it's hard to say exactly how well the Model 4 is selling. Christiansen estimates Radio Shack's 1983 sales, not counting the Model 100 and Color Computer, at 550,000 units, compared to 650,000 for Apple. Combining that figure with a line in Tandy's

annual report, which gave the Models I/III/4 a three-to-two sales edge over the II/12/16, that would yield approximately 300,000 Model 4 sales—not bad, but no match for Cupertino's claim of 100,000 Apple IIe orders in December alone.

In Fort Worth, the Model 4 buyer in Tandy's computer merchandising department, David Frager, gave a sunny picture of sales while downplaying Jeffries' concern about 8-bit obsolescence: "I think there's a lot of room to grow," Frager told *80 Micro*. "There are a lot of people who can still use an 8-bit machine who don't need 16 bits and don't want to pay for them."

Software Uncertainty

For any micro, room to grow depends on software availability. To some extent, the 4 can still coast on the Model III's vast library, but its skimpy TRSDOS 6.X selection is its weak spot.

"We've had a lot of people really express concern about the amount of software for it now," admitted Doug Dillhoff, Radio Shack's software product planner. "Which is true; it's been out there for quite a while and we should have a complete library for it, and we don't. We are looking for other packages, and when we can get them we'll get them out."

How bad is the software shortage? Frager contended, "The 4 has a very powerful software base with CP/M and TRSDOS [6.X]. The fact that it also runs TRSDOS 1.3 is another bonus."

But Tandy has never claimed that CP/M will mean mountains of new programs, merely access to existing

CP/M 2.2 software. (As Jeffries put it, "I can't imagine anybody that's developing new CP/M 8-bit software these days, other than a few little garage outfits. That's just not the way the world's going.")

That puts the ball back in TRS-DOS' court—where, for the most part, the 4's new features such as its function keys, faster clock speed, and larger display are gathering dust.

There is, Dillhoff noted, an excellent selection of programming languages: "We've got quite a bit out there. We've got CP/M for it; we're coming out with Bascom (compiler Basic), Fortran, Pascal, Cobol, ALDS (which is Assembly language), and we're looking for others. We're currently looking at a C package for it."

Non-programmers, on the other hand, are still waiting for applications.

"There is [software] coming down the road."

Tandy's February 1984 catalog offers three spreadsheets (Multiplan, Enhanced VisiCalc, and Target Planner-Calc), Scripsit and SuperScripsit, and PFS:File, but everything else is Model III material.

"I've seen other [Model 4] software," Dillhoff said. "More than likely it'll have the Tandy logo, but it'll be done by someone else."

"It is in the works, and some of it's in quality control tests. There is more coming down the road."

Asked about applications, Frager refused to give specifics or comment on owners' fantasies of integrated packages (such as AppleWorks, the Ile's \$250 imitation of Lotus Development Corp.'s 1-2-3). "I can't say," he told 80. "I'm sure you know our policy; we don't give advanced product information." He was, however, aggressively optimistic.

"Yes, you will [see new software]," he promised. "We come out with Model 4 packages every week. Every week I come out with new packages. It's not that we're not releasing [any]. I guarantee you we'll have half a dozen packages in the next two months."

Where will these programs come

from? "You're going to see that we continue to do a lot of software in-house," Frager said, "but yet when there are packages that are excellent sellers that are third-party we try to pick them up also."

How Much Competition?

As a small business or sophisticated home computer, the Model 4 fits into the low end of the desktop market, compared to \$3,000 office machines like the Model 2000 or IBM PC. Thanks to Macintosh, that market may be changing. How will Tandy's \$1,999 mainstay fare against Apple's \$2,495 Lisa spinoff?

"I don't see the Macintosh hurting the 4 at all in terms of sales," Frager said. "The Macintosh has limited use although it's a very powerful machine." Dillhoff agreed, describing the Mac as overpriced for a one-disk system and predicting that its innovative architecture—"almost time-sharing with the peripherals"—would sap the strength of its 68000 CPU.

As for more direct competitors, Jeffries doesn't anticipate many, but concedes the 4 a place in the market: "I don't think we'll see new [8-bit machines], but there's a market niche that they fill," he said. "If a Z80 machine does the job for you, there's no compelling reason to go and buy a 16-bit machine."

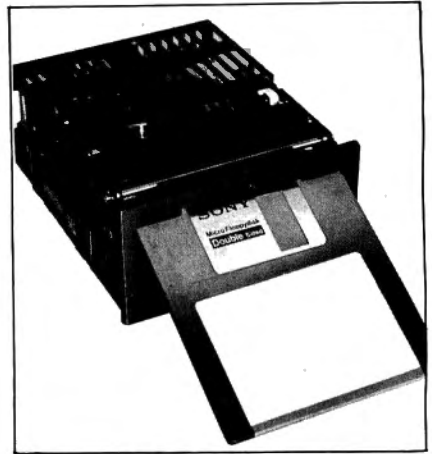
That's backhanded praise at best, but it seems to sum up today's prospects for the Model 4—steady sales, reliable performance, and lots of options for Z80 programmers, if little glamorous software for end users. If the Model 2000 is the hot fudge on Tandy's sundae, the firm's foundation is still plain vanilla. ■

—E.G.

Microfloppy Momentum

Will 3½-inch disks become standard?

The opening months of 1984 have seen two campaigns, both with eager candidates, behind-the-scenes lobbying, and trips to woo the press in New Hampshire. One race seemed locked up, but saw a dark horse win in the primary; the other be-



Sony's 3½-inch drive leads the microfloppy race.

gan as a free-for-all, but one entrant has pulled far ahead. The campaigns involve the Democratic presidential nomination and the move to set a standard for sub-5¼-inch disk drives. Gary Hart beat Walter Mondale in New Hampshire, but the Sony 3½-inch disk has thrashed its competition.

"We basically feel that the 3½-inch [drive] has become the de facto standard [in smaller disk formats]," said John Boose, Hewlett-Packard marketing manager, during a visit to the 80 Micro offices. Hewlett-Packard uses 3½-inch drives in its touch-screen HP-150 desktop, as well as in scientific micros and Winchester hard disk units.

Asked about Sony's competitors, firms hoping to establish three- or 3¼-inch standards, Boose said, "We don't see anybody shipping any quantities of anything else. There seemed to be a little bit of [interest in] three-inch, but that seems to have gone away, and there's nobody that I know of who's shipping 3¼-inch."

The three sizes have been battling for some time (see 80 Micro, June 1983, p. 310). Sony uses a hard-shelled disk, which hides its medium behind a spring-loaded metal shutter; Memorex, Verbatim, 3M, and BASF, as well as Sony, supply the pocket-sized disks. Hitachi and Maxell, respectively, offer similar drives and disks in a three-inch size, and the darkhorses Tabor and Dysan are pushing a conventionally jacketed floppy, shrunk to 3¼ inches.

While Sony seems far ahead of its rivals, it's equally far from replacing the ubiquitous 5¼-inch floppy. Hew-

lett-Packard is one of only two and a half major manufacturers to choose the 3½-inch unit.

The half would be Sony itself, whose SMC-70 micro hasn't made a dent in the marketplace. The other manufacturer, signing up in January, is Apple—whose choice of micro-drives for Macintosh might be described as a Sony win in the big California primary.

The Floppy National Committee

Even before Apple's endorsement, claims Myles L. Tintle Jr., general manager of Sony's data products division, the 3½-inch unit was ahead with the party organization—the American National Standards Institute (ANSI), whose X3B8 committee sets benchmarks for floppy disks. Tintle accompanied Boose to *80 Micro*, giving a perspective from his seat on the ANSI committee.

According to Tintle, both the Sony and Hitachi lobbyists presented their would-be standards to ANSI in September 1982. A proposal to adopt the 3½-inch standard was defeated in April 1983, largely because IBM had just announced it would market its own 3.9-inch floppy.

"Since then IBM withdrew its product," Tintle said, "and last October the decision was made to proceed with 3½. The 3 and 3¼ people felt there was enough strength to pursue a standard [for those sizes as well], so the steering committee has provided them with projects to pursue standards on those technologies. I would guess the 3½-inch disk is about six months ahead of the other technologies as far as the standardization process."

A draft standard, prepared by 23 of X3B8's 74 member companies, is proceeding through ANSI's process now, Tintle said: "Conceivably there could be a final standard issued and printed by the end of this year. I think probably by mid-1985 we'll have an international standard."

Floppy Swapping

While the ANSI standard is only for unformatted media, Tintle added, another committee is working on standards for formatting disks, bringing microfloppy makers much closer to the dream of disk interchangeability than now exists with 5¼-inch units—which range from single-sided, single-



Two Sony customers: Hewlett-Packard's 150, Apple's Macintosh.

density to double-sided, quad density, and so on.

"5¼ is not a standard, really," Boose pointed out. "You can't take an Apple disk and put it in an IBM, or vice versa. What we hope to accomplish is, first off, the physical size; the next step is to get the logical format, number of tracks, number of sectors, et cetera.

"If you achieve all these, you have a shot at data compatibility, and that's what's important to us. To get the last step, full program compatibility, you're looking at a copycat, an exact look-alike such as the Compaq or whatever. We feel that somewhat stifles our creativity; we like to have the touch screen on the 150 or other things that differentiate our product.

"But as for data compatibility," Boose concluded, "I think it's a better shot than 5¼ ever had. [Besides Sony,] Shugart and Tandon are producing drives, 23 vendors have agreed on a standard, which is unheard of in ANSI's history to have a standard agreed on before the fact. Apple came out with Macintosh, which I think added fuel to the fire for 3½. And we've had absolutely no problem getting software suppliers to adapt to the disk; all of our software's on 3½ and we haven't had any problems."

Looking Ahead

Tintle admitted that a complete standard hasn't evolved. Hewlett-Packard began using 3½-inch drives in November 1982, and finds itself with 70-track disks while ANSI has since endorsed an 80-track format. At present, the HP-150 is limited to 270K

of storage on a single-sided microfloppy, while Macintosh uses a nonstandard disk controller to squeeze in 400K.

However, Boose said, there's more room where that came from. Besides moving to 80 tracks, the Hewlett-Packard manager said, "We'll be introducing a double-sided version this year that'll store 640K. And that's using 256-byte sectors; we can go to 512- or 1,024-byte sectors if we want to.

"As we proceed on into different formatting techniques such as vertical recording, and Sony's announced they're doing that, in '85 we'll be able to get up to about 1.2 megabytes of formatted capacity. And the potential exists to get up to the neighborhood of 4 or 5 megabytes."

Besides ample storage, Boose said, microfloppies offer more reliability: "Our warranty data shows that the 3½-inch drives are about four times as reliable as our 5¼ drives. The mean time between failures of the drives is now estimated to be around 13 or 15 years." As for the hard-shelled disk, besides standing up to being pocketed or written on, "the rough life of the disk is about 35 hours of access."

The only thing that would seem to keep the new drives from taking the industry by storm is price, and both men predicted costs will fall sharply. Sony disks are running about \$1 apiece more than premium 5¼-inch floppies at retail, Tintle said, while the single-unit price of a drive has fallen from \$400 to \$250.

"We are now starting what we call our second generation," he said. "Our design direction is to go thinner,

lower power, lower cost, and keep the same disk as a constant. Our goal is to produce that product and sell it in the neighborhood of \$60."

That would be a bargain for OEM manufacturers, but Tintle wouldn't comment on an industry rumor about an even better bargain—that Sony is selling Apple drives at cost in order to promote the 3½-inch standard via Macintosh.

He also couldn't name any other microdrive customers, except for portable test equipment companies like GenRad; Gavilan, he said, "clearly saw that the world was going 3½" after originally choosing Hitachi's 3-inch drives for its portable, but switched to Shugart's instead of Sony's unit for the former's slimmer profile.

"For the first year and a half [of production] I visited every company, personal, portable, mini, micro, and I'd say almost every one of them has bought a [3½-inch] drive and is in some various [evaluation] process," Tintle said. "But they have design windows; you've got to catch the company just as they're starting work on something."

Meanwhile, the 3½-inch drive looks like the leading challenger to the 5¼-inch incumbent—but, like the leading Democrat, it still has an uphill fight ahead. Boose cites industry estimates that the microflop market will climb from \$6.5 million in 1982 to \$417 million in 1986, but double-sided 5¼-inch floppies will jump from \$354 million to \$2.98 billion. ■

—E.G.

No Unity for Unix

A multiuser melee.

Imagine two welterweight boxers in a title bout. One wins the first round, the other takes the second. As the fighters square off for round three, two heavyweight champions suddenly enter the ring and turn the proceedings into a tag-team match.

That's roughly the situation in the battle to establish a standard computer operating system. Until now, the focus has been on single-user systems; Digital Research Inc. won the 8-bit

round with CP/M, but Microsoft Corp.'s MS-DOS dominated the 16-bit judging in round two. Now that fight's been overshadowed by the advent of 32-bit multiuser systems, and one company is an odds-on favorite to establish a de facto software standard.

That company is AT&T, and its contender is Bell Laboratories' in-house system, Unix. DRI wooed the telephone titan into its corner against Microsoft, but there's a second heavy-



AT&T's Scanlon: An end to "hardware tyranny."

weight to be reckoned with: IBM, which might take either side or take on all comers.

AT&T gave its Unix campaign a strong foothold in the mid-1970s by establishing the system as a standard in its own and government computer centers and by licensing Unix cheaply to colleges and universities.

This "Unixization" policy, according to AT&T Technologies Computer Systems Vice President Jack Scanlon, has paid off handsomely. All in all, "about 70,000 computers of approximately 70 different types now run Unix systems," Scanlon told attendees at Washington, DC's Uniforum, a Unix users' trade show. "The total number of installations is expected to increase by a factor of two to three during 1984."

There are two attractions to Unix, which make up for its being bigger, slower, and harder to learn than the single-user DOSes micro program-

mers are used to. One is, of course, that it's a multiuser system, able to handle different terminals' tasks from a central station.

The other is that, while CP/M is synonymous with "Zilog Z80" and MS-DOS means "Intel 8086/8088," Unix runs on a variety of microprocessors. Since creating Unix System III in 1979 and licensing it commercially in 1981, AT&T has been busy working with Motorola, Intel, Zilog, and National Semiconductor on "porting" Unix to different chips.

The Motorola 68000 is perhaps Unix's most popular partner; today, there are about 50 firms offering multi-user 68000 systems. Radio Shack has a piece of that action, offering Xenix—Microsoft's version of Unix System III—on the Model 16B.

Xenix is by far the most successful independent version of Unix, but the imminent appearance of AT&T's own minis and desktops may mean hard times for independents. Scanlon's speech in Washington was part of AT&T's drive to establish a single standard—Unix System V, the System III sequel unveiled in January 1983.

Other January events further undermined Microsoft's position. DRI rushed to AT&T's side, replacing Microsoft as subcontractor for implementing Unix on Intel's 80286—a chip expected to be a chart-topper by late 1984—and announcing a joint project with AT&T to develop a library of System V software for Intel and Motorola microprocessors.

And IBM, the reluctant player in a market where it isn't setting the pace, chose a third party's version of Unix in releasing its Personal Computer Interactive Executive or PC/IX. Everyone expects IBM to develop its own Unix competitor, but many onlookers thought Big Blue would choose Xenix rather than Unix in the interim.

Despite these setbacks, Microsoft has no plans to throw in the towel. When PC/IX debuted, for example, the Bellevue, WA, firm's reaction was that the announcement came out of IBM's New York office and that the "real" PC team in Boca Raton, FL, was still free to choose any software it liked.

And as for AT&T and DRI's System V versus Microsoft's modified System III, Xenix marketing manager John Ulett told *80 Micro*, "It's really

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more of a marketing issue than a functionality issue. [For now,] I defy anybody to walk up to a system and tell me whether it's running System III or System V.

"The value [of System V] is not in being able to run System V software today, because there is no System V software," Ulett said. "It's all Xenix. So we're going to keep Xenix compatible with where it is now, but also [make sure] that in the future the System V software will be able to run on Xenix."

While Ulett vows lots of software products and OEM hardware contracts for Xenix, Scanlon's view of one big Unix world, spanning everything from desktops to mainframes, is appealing. With System V as a standard, the AT&T exec told his Unix forum audience, "the long reign of hardware tyranny is approaching its end."

Today, Scanlon said, companies' software investments leave them "locked in" to one system, "no matter how good another vendor's future hardware might be." The result is a world of "plug-compatible" clones: "Since we couldn't move our software to different hardware, the best we could do was slide compatible hardware under our software."

Scanlon even tantalized listeners with visions of flexible software standards leading to entirely new types of computers, since designers will be no longer forced "to replicate, perhaps with a few new bells and whistles, the same kind of architecture that old [software] is now running on."

With DRI firmly in Bell's corner, then, the multiuser bout looks like a three-way fight: Microsoft, betting on Xenix's installed base and current edge in software availability, against the two biggest names in the industry.

IBM has entered the arena from the hardware side, its PC's standard architecture promoting standardized MS-DOS software; now AT&T is taking the opposite approach, claiming its software standard will liberate hardware designers. Since no one's yet seen IBM's multiuser system, it's too early to pick a winner—but it's clear that, for once, IBM is not the overdog.

Finally, how will the move to Unix affect the vast majority of today's micro users, those who work alone on unattached desktops? New 32-bit ma-

chines will be important, Ulett says, but multiuser systems shouldn't mean much in the near future.

"The two major [computing] markets are the people running workstations where they're running word processors, data bases—that kind of horizontal applications software—and the market running vertical applications like construction, accounts payable, manufacturing, other vertical segments," he explained. "And those vertical applications are the ones that are more applicable to multiuser operating systems [like Unix]."

"In the office environment where you're running spreadsheets and word processors there's not a real need to have a Unix system. Those people will ultimately want to be able to share those letters and memos and spreadsheets and so forth among themselves in the office, and that's where a local-area network comes in. That's probably just as valid, probably more valid, than a multi-user system," he concluded.

"I'll probably outrage some Xenix customers by saying that." ■

—E.G.

Not Now, Never

Offbeat ad strikes out.

It may have made a point, but it didn't make many sales. Gamester Software, a small firm based in Kettering, OH, challenged buyers in a recent *80 Micro* ad, combining a classic marketing strategy ("Limited Time Only!") with a blast at program pirates. Neither buyers nor pirates paid attention.

"Order Now—Or Never!" blared Gamester's headline on p. 58 of the January 1984 issue. "Due to the proliferation of software piracy, we are only offering these programs for the duration of this ad (1 month)! If you wish to order either or both quality programs, this is absolutely your only opportunity! All future orders will be returned!"

The programs—Voice Master, a utility that lets Model I/III owners call and play back any sounds stored on cassette, and The Swarming, a machine-language arcade game set in a beehive—cost \$19.95 each. As Feb-

ruary's issue and Gamester's deadline appeared, *80* phoned company president Bob Krotts to see how many had been sold.

"So far, about a dozen of each," Krotts confessed. "Your February issue is on the newsstand, but some subscribers locally just got their January copies. So I'm going to keep accepting orders until the [February] newsstands are gone, which'll be about three and a half weeks.

"But we've had about two dozen calls and about a dozen orders, and that's it. It's really disappointing; they're good programs."

Piracy, Krotts asserts, has always plagued software vendors. "We've found in the past that we can stick an ad in and always get the most response the first couple of months. After that, everybody has a copy.

"The game market is there, but no one wants to purchase any games as such," he said. "They'd rather get it from other people, and if they want a game, two to one they can get it from someone.

"There's nothing you can do about it, really, short of trying like heck to put a game on a disk that's so scrambled you can't break it. And then [pirates] take that as a challenge and someone breaks it."

As for Voice Master and The Swarming, even Krotts' extended deadline didn't help, as *80* found in a follow-up call. "We sold about four or five more and that's it," Krotts said on Feb. 9, as the March issue reached subscribers.

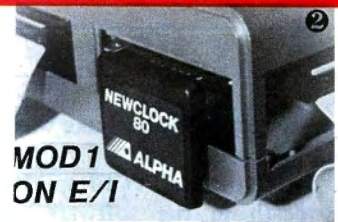
"What I'm doing [now] is getting all of our other programs together from all of our earlier ads and putting together about an eight-page catalog, tentatively titled 'Gamester Software's Last Will and Testament.' We've got about 1,000 people on our mailing list, and we'll send it out to them and see what happens. If that [brings orders], we'll stay in software. If not, we'll get out of business.

"The reason I got into software is that I got a Model III for myself, and I'll just go back to writing for myself again. Don't get me wrong on this; I still fully support the Model III, but if no one else is going to, we just can't see any justification for continuing in the business."

Does Krotts feel the ad made its point? "We were trying to stay loyal to the TRS-80 market," he said. "The

Newclock-80 \$69.95

The right time at the right price! Keep the time and date with quartz accuracy, even when your computer is off. The backup lithium battery (included) will last for over 2 years. Software on tape or disk, please specify. Use "TIMES" once to set the clock. Use "SETCLK" to set your computer's internal clock (at power up) or use "TSTRING" so that the "TIMES" function reads the Newclock. Connection: Model I: plugs into the keyboard or expansion interface. Model III: plugs into the 50-pin I/O bus. Compatible with all operating systems.



Printswitch \$59.00

Do you have 2 printers? Get a Printswitch. Stop plugging and unplugging those printer cables. With the Printswitch, you can have 2 printers connected to your computer and you can select either one at the flick of a switch. Works with any printer, plotter, or device that uses the parallel printer port. Simply plug the 14 inch Printswitch cable into your computer, and plug your existing printer cables into the Printswitch. This is the nicest unit on the market. Superior quality board with gold plated edge connectors. For Models I,III, 4 and 4P.



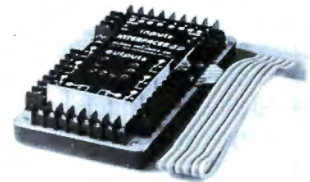
Alpha Joystick \$27.95

When it's time for fun, don't be without your Alpha Joystick. Do you know that most action games are Joystick compatible? Stop pounding on your keyboard and enjoy real arcade control. The joystick can also be used with BASIC programs; simply do J=INP(0) to read the joystick position (8 directions and fire button). Model I: plugs into keyboard or expansion interface. Model III, 4 and 4P: plugs into 50-pin I/O bus. The Alpha Joystick comes fully assembled and tested, ready to plug in and enjoy. (Specify Model I, or Model III,4).



Interfacer-80 \$159.00

Low cost input and output device. The outputs consist of **8 relays** (rated 2 Amp @125V), easily controlled using "OUT" commands. For example, OUT 0,0 turns all the relays off. Eight LED's show the states of the relays. The **8 inputs** are optically isolated, so it's safe and easy to connect external devices (switches, sensors, thermostats, etc.). Simple "INP" commands read the inputs. Connection: Mod I: 40 pin bus. Mod III, 4, 4P: requires 50-pin I/O bus converter (\$39.95), plugs into 50-pin I/O bus. Comes complete with power supply, cable, and detailed manual. (Up to 8 interfacers can be connected to your TRS-80 using our Y- cables).



Analog-80 \$139.00

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

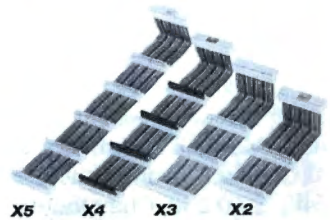
Extension cable, 4 foot: • For printer and drive (34-pin)...C165:\$22

• 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.

Our cables are made with high quality gold plated connectors to ensure utmost reliability.



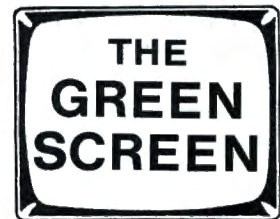
NO RISK

We know that ordering by mail can sometimes be a hassle, but with Alpha, you are fully protected.

- 1) Our 15 day money back guarantee protects you from disappointment.
- 2) All our products are tested on a TRS-80 and warranted to 90 days (parts & labor)
- 3) We ship 90% of our orders within 24 hours.
- 4) We are committed to help you

Green Screen \$12.50

Do your eyes a favor, put on a green screen. Tens of thousands are in use for a good reason: they work. Contrast is enhanced and eye fatigue is greatly reduced. Our green screen is curved; it fits right on the face of the tube. (Fits Models I,II,III,4,12,16)



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(212) 296-5916.
Hours: 9-5 Eastern Standard Time

Add \$3.00 Per Order For Shipping And Handling. We Accept Visa, Mastercard, Checks, M.O. C.O.D. Add Sales Tax. Overseas, FPO APO: Add 10% Dealer Discounts Available C.O.D. add \$3.00 extra.

point we were trying to make was really not a point; it was really trying to find out if there's, so to speak, life after death in the software games market, and if people are willing to buy good programs. Apparently they're not." ■

The Commodore Shuffle

264: Now you see it. . .

Last January, Commodore upstaged its rivals at Las Vegas' Consumer Electronics Show with the new 264 home computer, which was in turn upstaged by the sudden resignation of the company's president and chief executive officer, Jack Tramiel (see *80 Micro*, April 1984, p. 20). Three weeks later, "upstaged" changed to "preempted." Four more Commodore execs resigned in Tramiel's wake, and the firm consequently postponed the 264's debut indefinitely.

Besides systems engineering director Bill Miller and chip-making and computer assembly supervisor Roy Thomas, the evacuees included Donald Richard, acting president of Commodore's U.S. unit, and marketing vice president Myrrdin Jones. Richard assumed the presidency of Mountain View, CA's Polo Microsystems, makers of a dual-processor (80188 and Z80) desktop; Jones moved to Sperry Corp., which recently started marketing a high-speed IBM PC clone.

As for Commodore, the low-end leader announced that general manager Sol Davidson was handling the quartet's responsibilities until the Feb. 21 arrival of new president and chief executive Marshall Smith. Davidson's first declaration involved the delay of the 64K, \$500-odd Commodore 264, which took the Las Vegas limelight with its promise of built-in word processing or spreadsheet software.

According to Davidson, Commodore was "reexamining" the new unit, which would go on sale "when there's a need for it"—possibly "before the end of 1984, [though] we'll just have to watch carefully.

"I think our zeal in [announcing the 264] was greater than our determination in [bringing it to] the marketplace," Davidson told the *Wall Street*

Journal, saying that Commodore hadn't finalized the machine's price and firmware options. In the meantime, sales of the \$200 C64 micro are the envy of Commodore's competitors.

Comings and goings in the executive suite are nothing new to Commodore, but its founder's and the others' departures were grist for industry gossip. There was even one rumor that Tramiel had discovered or foreseen some hidden trouble ahead and bailed out while Commodore was still solvent; the firm may indeed lose the advantage of being its own chip supplier—as the micro market changes from an 8- to a 16-bit world, Commodore will have to either upgrade its

silicon facilities or buy chips like everyone else—but stories of future trauma seem farfetched.

"I think [a major problem's] very unlikely," Ron Jeffries, publisher of the *Jeffries Report* industry newsletter, told *80 Micro*. "Commodore's in great shape. They have the world's best-selling computer right now; all they've got to do is keep cranking them out."

Rather than hurting the company, Jeffries said, the 264's delay "may help them a great deal by not creating a bunch of confusion in the marketplace. The 64's a very capable machine. What they need to do is just promote it real well, and sell another couple million of them." ■

END BYTES

Sale—80 Percent Off

- Is VisiCorp worried about competition in the **WINDOWS** market from Microsoft? Well, the San Jose, CA, firm has slashed the price of its VisiOn applications manager from \$495 to \$95 (though the programs it coordinates, like VisiOn Calc and VisiOn Word, remain in the \$400 range).

- Another **PRICE CUT** comes from Grid Systems Inc., which has dropped its sophisticated Compass portable (256K RAM, 384K bubble memory, flat panel display, Intel 8086 chip) to \$5,995—a 17 percent reduction—and renamed it the Model 1101. Grid's new Model 1107 (\$12,495) is billed as "the first espionage-proof portable computer," with a magnesium case to thwart RFI eavesdroppers.

- News from **CHINA**: *Computerworld's* "International Report" claims "the TP series of microcomputers developed by the Beijing Polytechnical University is reportedly gaining in popularity in the U.S., Sweden, New Zealand, and Africa." Chinese analysts say exports of the Z80-based micro "will soar once an international distribution network is established."

- The day before the Macintosh's debut, **APPLE** Computer Inc. announced that 1983's fourth-quarter profits were down 75 percent from 1982's, despite a 48 percent gain in sales (from \$214 million to \$316 million). Apple's marketing and R&D budgets, hiked 89 and 78 percent respectively in response to increased competition, grew twice as fast as revenues.

- Nothing grew as fast as **IBM**, whose 1983 profits jumped to \$5.48 billion, compared to \$4.4 billion a year ago. Big Blue's revenues for the year were over \$40 billion, with sales up 38.4 percent from '82.

- Dot-matrix **PRINTERS** may be dominant today, but International Resource Development Inc. isn't betting on them in the long run. The Norwalk, CT, market analysts cite the emergence of under-\$500 daisy wheels and fast, quiet thermal transfer printers as likely to reduce matrixes' share from 72 percent of the market (in 1983) to 20 percent ten years hence.

- After a year of testing, **EASTERN AIRLINES** has followed TWA and United and lifted its ban on in-flight use of portable computers (American is still testing). Model 100 owners can earn their wings any time except during takeoff and landing.

- Looking for financial security? Try **GETTING OUT** of the home computer business: Comparing the last quarters of 1982 and 1983, Texas Instruments' profits rose 82 percent after the firm dropped its loss-leading 99/4A micro. ■

In Touch

The Alpha Newsletter

Welcome to this first issue of the Alpha Newsletter, *InTouch*. Rather than mailing it to our more than 20,000 customers, we are publishing it here in *80-Micro*.

We are excited: Our super VS-100 voice synthesizer is becoming a new industry standard, much like the Alpha Joystick did a few years ago. People realize how easy it is to get a clear, crisp voice from their computers and they are finding hundreds of uses for their talking computers.

The first prize this month for unexpected use goes to the gentleman who uses his VS-100 to order his cat off his TRS-80 keyboard while he is away. More seriously, this month we heard of the following applications:

- **Talking cash register.** ("Your change is \$13.62" or "Put that gun down, we have already called the police")
- **Phone answering machine.** With the VS-100 and some additional hardware, the TRS-80 was turned into a fancy programmable voice output answering machine.
- **Second generation typing tutor** with keyboard echo.

There were, of course, the obvious applications in education and games (talking adventures).

We would also like to share some of our customers' comments on the VS-100 voice synthesizer. It may look like we are touting our own horn, but we worked very hard on this project. The reward is all the mail that we receive, and here are some *typical* remarks.

"I was amazed at the quality and the low, low price. I've been searching for a voice synthesizer for years. They all cost at least \$150. Good job." - B.D. Illinois

"I congratulate you on producing a remarkable piece of software." - I.K. New York

"...love the VS-100 overall." - R.M. California

We have hundreds of similar comments in our files, but our favorite is the one from M.H. in Kentucky:

"Even my wife was impressed with it, and she is darned hard to convince that I need another 'add on' for the computer."

We thank you all for your appreciation.

TALKER 2.0 is the feature of the month. We worked almost a year on it, and it will blow your socks off. As a tough customer who previewed it wrote: "I have tried to crash the software... I have been unable to do so. I have tried illegal control codes; same, no crash."

What is TALKER 2.0? It is a super driver for your VS-100. It will make your computer a full featured talking machine. This is how simple it is to use: Type "TALKER" from DOS. That's all. From this point on, your computer can perform all the following feats and more.

- Text is automatically converted to clear, intelligible speech.
- The keystrokes as well as output to the video display can be automatically spoken letter by letter or word by word.
- To get speech from BASIC, simply type PRINT★ *any expression*. The expression can be a string, number, constant, variable, array, function, etc. PRINT★ speaks only; it doesn't affect the screen.

- PRINT! speaks *and* prints on the screen as a usual PRINT statement. TAB, @, and USING can all be used with PRINT! This means that you can get any BASIC program to talk in minutes. Load the program, add a few!'s after the PRINT's where you want speech output. That's all. The PRINT to the screen will not be changed. The program will run as before, except that now it's talking.

Here is another example of the VS ease of use. Let's say you want to play with the Text to Speech translator. This line is all it takes:

```
10 INPUT A$ : PRINT★ A$ : GOTO 10
```

Now, everyone in earshot will gather and want to try it too. There is so much more to say about TALKER 2.0, but we are running out of space. (The forty page VS-100/TALKER 2.0 Manual is available for \$5 + \$1 S&H applicable to purchase).

We would like to conclude this month's edition with another customer's quote. We think you will share her opinion. "I wanted to thank you and the courteous lady that helped me when I phoned in my order. I must admit that I am hesitant to order through the mails or by phone to a company that I cannot visit in person. But so far, you have dashed that hesitation to bits."



ALPHA Products

79-04 Jamaica Ave., Woodhaven, NY 11421 ✓ 17

Take It Out

If David Engelhardt took the time to read the Model 4 technical manual, he wouldn't have written "Take It Off" (December 1983, p. 177). The manual clearly states that the Purge utility will delete any file on his disks. The proper syntax for that command is:

```
PURGE filespec:D (I)—to remove an invisible file
PURGE :D (I)—to remove more than one invisible file
PURGE :D (I,S)—to remove unwanted system files.
```

In any case, the system asks if you want a specific file purged before removing it, unless you specify the parameter (Q=N).

*James R. St. John
3124-A Nebraska Court
Great Lakes, IL 60088*

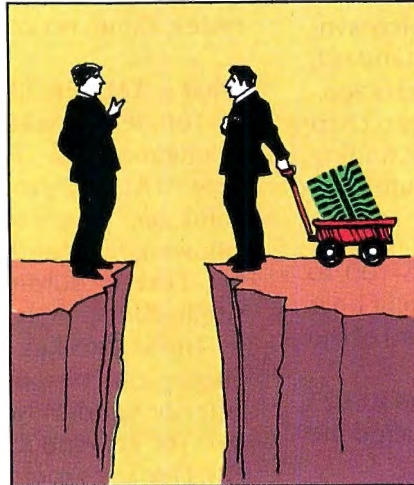
David Engelhardt's article, "Take It Off," neglects to point out that the Model 4 technical reference manual contains a simpler method for deleting owner passwords on p. 190 (see Table 1). Use the ATTRIB command to modify the password.

Mr. Engelhardt's process for modifying byte zero of the directory entry changes the protection status to full access. You can also change the first 4 bytes of the directory entry's second line to 96, 42, 96, and 42 hexadecimal. The first 2 bytes are the owner password and the last 2 are the user password. 96, 42 is the hash code for no password (eight spaces).

*Daniel J. Fox
P.O. Box 481
Columbus, IN 47202*

Engelhardt's Reply

Mr. St. John is correct concerning the Purge command. It is the easiest



way to remove protected and invisible files from a disk. "Take It Off" provides an alternate method for arriving at the same solution.

But Mr. St. John missed the article's most important point. My program lets you eliminate file protection to remove or copy the file. I have yet to find a method for copying purged files.

Mr. Fox also raises a valid point. But since Radio Shack couldn't predict when I would receive a Model 4 technical manual, I wrote "Take It Off" without it. Rather than wait, I wanted to provide other Model 4 owners with useful information.

I feel that my process for changing byte zero is sufficient. Once you gain full access, passwords are irrelevant.

Thanks for the chance to clear the air and address the confusion concerning my article.

*David Engelhardt
10221 W. 101st Place
Broomfield, CO 80020*

One-Line Patch

I've written two patches that let me run Thomas Longstaff's TRSDOS one-liner (Reader Exchange, February 1984, p. 40) on NEWDOS80 2.0.

Both one-liners produce a directory of disks fed into drive 1, one after another:

```
10 FORX = 1TO50:LPRINT:LPRINT"Directory for Diskette No. ";X:CMD"Route,Do,Do,Pr":CMD"DIR 1":CMD"Route,Clear":INPUT"Change Diskette in Drive 1. Press ENTER to continue - BREAK to END";C:NEXT
```

```
10 FORX = 1TO50:LPRINT"Directory for Diskette No. ";X:CMD"DIR 1,P":INPUT"Change Diskette in Drive 1. Press ENTER to continue - BREAK to END";X:NEXT
```

*C.L. Robertson
6 King Richard Drive
Londonderry, NH 03053*

DMP-100 Graphics

I enjoyed Thomas Tinsley's "Graphics on the Line Printer VII" (April 1983, p. 306), but Mr. Tinsley

File Type	Extension	Owner Password
System	/SYS	LSIDOS
Filter	/FLT	FILTER
Driver	/DVR	DRIVER
Utility	/CMD	UTILITY
Basic (including overlays)		BASIC
CONFIG/SYS		OCC
Drive code tables	/DCT	UTILITY

Table 1. Model 4 passwords.

READER EXCHANGE

failed to mention that his programs work on the DMP-100. In fact, the LP VII and DMP-100 are completely compatible.

I have a DMP-100, but no disk drives, so I converted the Basic programs to run on cassette. You should make the following line changes to each listing:

```
10 POKE16527,176
100 POKE16526,0:X=USR(VARPTR
(PARM%(1)))
200 INPUT" P FOR PRINT, S FOR
SCREEN";A$:IF A$="S" THEN POKE
16526,3:X=USR(VARPTR(P%(1)))ELSE
IF A$="P" THEN POKE16526,6:X=USR
(VARPTR(P%(1)))
```

In other words, you change:

```
X=USR1 to POKE 16526,0 :
X=USR(VARPTR(PARM%(1)))
X=USR2 to POKE 16526,3 :
X=USR(VARPTR(P%(1)))
X=USR3 to POKE 16526,6 :
X=USR(VARPTR(P%(1)))
```

Finally, I converted Delmer D. Hinrichs' "3-D Printer Graphics" (May 1983, p. 236) to run on the DMP-100 and cassette. Send a SASE and I'll mail you a listing.

Bill McGrath
9629 Bustleton Ave.
Apt. 110
Philadelphia, PA 19115

Bug No Bug

I disagree with Marcio Erlich (Debug, February 1984, p. 38). What he considers a bug in CALCS-III is an important feature, providing the ability to print chained data files.

The AIDS manual instructs users to affix a pound symbol to the file name to generate numerical field totals (e.g., SAMPLE/DAT#). Even if you forget the pound sign after the file name, you can recover and print any pending totals by entering it alone after you print the file.

Mr. Erlich's fix works if you want totals printed only at the end of files. But with several thousand file records on many disks, I need to print chained files.

Rev. George Burnell
Villanova University
Villanova, PA 19085

Help Wanted

I'd like to hear from anyone who could tell me where I could purchase commercial graphics packages for my Tandy color graphics printer.

Jorg Scheele
Postrabe 5
D-3042 Munster 1
West Germany

I read with interest your report on the Exatron Stringy Floppy ("Growing Pains for Stringy Floppy," September 1983, p. 294). Near the end of the article you mentioned the ESF owner's association—do you have their address? Support for the ESF is thin down here, too.

T.M. Stewart
Milson Line
R.D. 8
Palmerston North
New Zealand

According to the 80 Micro news department (November 1983, p. 284), A+J Micro Drive is now selling and supporting ESF drives, wafers, and programs. You can reach them at 1050 E. Duane Ave., Suite 1, Sunnyvale, CA 94086, 408-732-9292.

—Eds.

I'm looking for a text to speech software driver for a Radio Shack voice synthesizer (26-1180) that I use on my 48K two-disk Model I. Converting the individual phonemes to keystrokes is driving me crazy.

Gil Morris
3805 Fait Ave.
Baltimore, MD 21224

Error Trap

The price quoted for Map-Mate in the February 1984 New Products section (p. 272) is incorrect. Map-Mate retails for \$95 and is available from Softshell Corp., P.O. Box 18522, Baltimore, MD 21237, 301-686-1213.

DEBUG

We found several errors in Karl Sarnow's "Molecular Matters" (February 1984, p. 100). The correct line entries are listed below:

```
1020 IF 2*I <= NG THEN NB(I)=2 ELSE
NB(I)=0
1210 PRINT"Occupation of MO no. ";I;
INPUTNB(I)
1390 LPRINTUSING$$;P(I,I);
1610 FOR I=1 TO 2:LPRINT" ":NEXT I
1650 IF I1=1 THEN LPRINT"Spin density
for ";NS;"- ion":FOR I=1 TO N:LPRINT
USING$$;I;:NEXT I:LPRINT" ":FOR
I=1 TO N:LPRINTUSING$$;SS(I);:NEXT
I:LPRINT" ":GOTO 1170
1670 ST(I)=SS(I)+C(I,NO(NX(2)))2
1680 SS(I)=SS(I)-C(I,NO(NX(2)))2
1730 LPRINT" ":LPRINT"Spin density
for ";NS;" triplet state"
```

—Eds.

In Mark Kennedy's "Ground Control to Major John" (February 1984, p. 62), the one ;:GOTO80 command in line 460 should be :GOSUB80.

—Eds.

A reader in San Diego discovered a problem with my article, "Synthetically Speaking" (January 1984, p. 142). It seems I neglected to tell Model III and 4 owners that they must switch the external bus to input data (see the Figure). Sorry for the inconvenience this may have caused.

David Engelhardt
10221 W. 101st Place
Broomfield, CO 80020

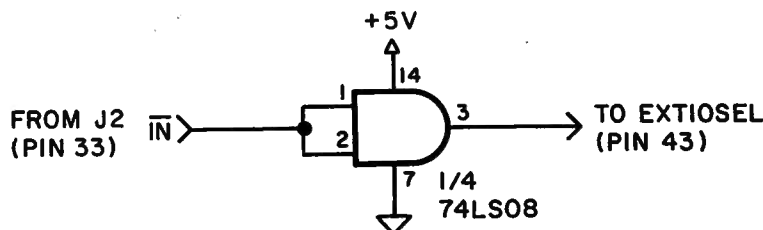


Figure. Correction for Synthetically Speaking.

Imagine... a letter quality printer
compatible to your TRS 80

Introducing the **JUKI** MODEL 6100

Letter Quality, Daisy Wheel Printer/Driver Software Specifically Developed For Use With The TRS-80™ And SuperSCRIPSIT™ !!!



\$699⁰⁰

All control codes must be preceded by a <CLEAR>

UNDERSCORE	<CLEAR> <>	UNDERLINES EVERYTHING
BOLD PRINT	<CLEAR> <>	GEE IT LOOKS BOLDER
SHADOW PRINT	<CLEAR> </>	THIS SHADOW IS WILD HU?!
1/2 LINEFEED F	<CLEAR> <*	I LOVE SuperSCRIPSIT™
1/2 LINEFEED R	<CLEAR> <*	Ca(OH) ₂ + H ₂ SO ₄ → CaSO ₄
PAUSE PRINTER	<CLEAR> <?>	I HATE PAUSING.
TOP OF FORM	<CLEAR> <?>	

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Updating a Favorite: Model 4 Scripsit

by Richard Green

edited by Lynne M. Nadeau

Model 4 Scripsit is basically the same old program, slightly enhanced to take advantage of the 4's improved video display. Tandy has made a few improvements and removed at least one bug. But, as with the original versions, you can't beat Scripsit for producing short documents and correspondence.

Model 4 Scripsit has a 22-line by 80-character display. The 23rd line of the screen display is a solid bar. Below the bar, a blank line contains commands and messages.

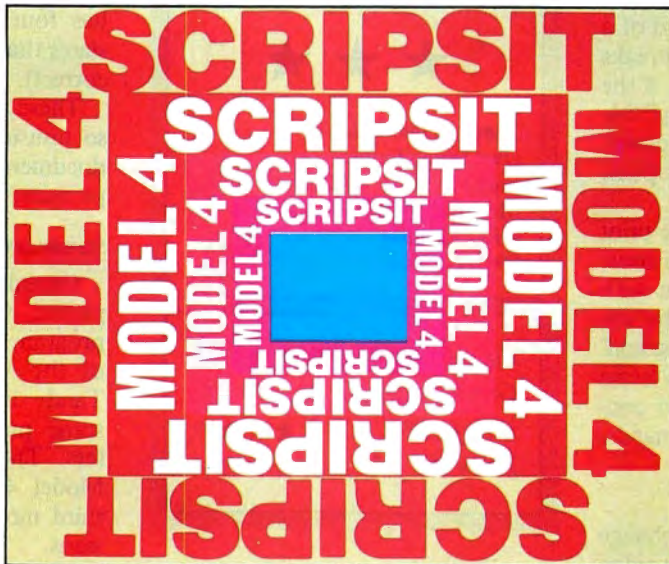
After you've filled the screen with text, it scrolls off the top of the display. Additional text appears on the 22nd line.

You control cursor movement with the arrow keys as in earlier versions of Scripsit. Moving to the top of the text is nearly instantaneous, but Scripsit reformats the text any time you use the shift/down-arrow command. In lengthy files, several seconds elapse before the cursor reaches the end of the document.

Editing Functions

Scripsit has four basic editing functions: overtyping, deleting, inserting, and exchanging. Overtyping is the simplest function. You can permanently change any text on the screen by typing new text over the old.

Delete is more involved. Holding the clear key shifts certain keys into an alternate function. Holding the clear key while pressing D deletes the char-



acter under the cursor. Holding the clear key, then pressing D followed by Z deletes the word under the cursor. You delete a sentence, including the period and the blank following the period, with clear-D-X, and a paragraph with clear-D-C.

You can mark larger amounts of text as a block, then delete the whole block with clear-D-Q. If you want to delete all text from the cursor position to the end of the file, use clear-D-I. When you call this function, the message DELETE TO END OF TEXT (Y OR N) appears on the message line. Pressing Y immediately deletes all text to the end of the document.

Scripsit has three insert functions. The first inserts a single character and moves all text on that line to the right one space. The insert line function opens a space in the document to the cursor's right. You can insert any amount of text into this space. When the insertion is complete, press the clear

and F keys together to close the space.

The third insert function is insert block. In Scripsit, you can define any amount of text, from a single character to the whole document, as a block. You give every block a one-character name (any letter or numeral on the keyboard except H, F, P, or -). You insert a block anywhere in the text by pressing clear-S-Q followed by the block's name.

The fourth editing function is exchanging. Model 4 Scripsit has three exchange functions. If you place the cursor anywhere in a word, then press clear-E followed by clear-Z,

Scripsit exchanges the word under the cursor with the word immediately preceding it. You can exchange paragraphs in a similar fashion by pressing clear-E followed by clear-C.

Exchanging blocks is even more flexible. Calling the block exchange brings up the message NAME OF BLOCK TO EXCHANGE?. You enter the name of any block. Scripsit exchanges the named block with the block in which the cursor is located.

The description of these functions makes them seem obscure and difficult to learn; nothing could be further from the truth. Scripsit comes with a set of stick-on labels for the 14 special-function keys.

Except for the tab key, you call all function keys by holding the clear key and pressing the function key. A few minute's practice makes this operation automatic.

Unfortunately, you call the tab by pressing the clear and right-arrow keys

simultaneously. Since both are on the keyboard's right, you can't do this without looking at your hands. A better arrangement would be to use the control key, which Scripsit doesn't otherwise use.

Features

Scripsit has several features that make it easy to use. A locate function finds any word (or parts of a word) anywhere in a document. Also Scripsit's global find and replace greatly eases the task of writing.

One feature unique to Scripsit is hyphenation. Scripsit will scan an entire document, placing the cursor on each word that spills over the end of a line. Pressing the hyphen key breaks the word and inserts the hyphen. If the end of the line is not on a syllable boundary, you can move the cursor left to the proper hyphenation point and insert a hyphen there.

Model 4 Scripsit retains all the print formatting features of earlier versions. You control the finished format with format lines that you type into the text at any text boundary (line, paragraph, or page markers). Format lines begin with a greater-than sign and can contain several text formatting commands.

What's Missing

You can't permanently change Scripsit's default settings for the video display or the printout. Each time you start Scripsit, you must set parameters if you need a line length different than 78 characters or an indent other than five spaces.

Similarly, you don't have an easy way to save printout format settings other than the defaults. You can save formats, but you have to save the desired settings to disk as a file, then load the file to begin a new document.

Although Scripsit can load several files from disk into memory to make one large document, it can't handle documents larger than available memory. A provision to automatically link files for printout, keeping track of headers, footers, page numbers, and print formats, would increase Scripsit's utility. Also, the ability to insert files into a document being printed would be valuable.

Scripsit has never had the ability to underline text.

Model 4 Scripsit has no provision for programmable keys, in spite of the

presence of a control key on this machine. The four function keys don't serve a purpose in Scripsit either.

You cannot read a disk's directory without leaving Scripsit and returning to the DOS. After viewing the directory, you must wait while Scripsit reloads.

Tabs are difficult to set. You must figure the position of each tab by the number of spaces from the left margin. Also, calling certain functions takes several keystrokes.

Model 4 Scripsit

★ ★ ★

Tandy/Radio Shack
One Tandy Center
Fort Worth, TX 76102
Model 4, 64K
One disk drive
\$99.95

<i>Easy to use?</i>	★★★★☆
<i>Good docs?</i>	★★★★☆☆
<i>Bug free?</i>	★★★★☆☆
<i>Does the job?</i>	★★☆☆☆☆

In addition to the few enhancements over Model III Scripsit, the Model 4 version has some arbitrary changes. Model I/III Scripsit uses the @ key for a control key. Model 4 Scripsit uses the clear key for the same function. This makes Scripsit conform to Electric Pencil and Newscript, but the Model 4 has a separate control key that Scripsit doesn't use.

Interestingly, the Model 4 caps key locks the keyboard into uppercase. This is as it should be, but since Scripsit ignores the function keys and control key, why enable the caps key?

Scripsit also has the nasty habit of accumulating blanks at the end of a document. If you don't clear them out, they can play havoc with the formatting and printout. Model III Scripsit uses the delete function to clear trailing blanks; Model 4 Scripsit uses the F key.

In the older versions of Scripsit, calling a special command and accidentally pressing an undefined key

sometimes locks up the program. The only recovery is a reboot. In Model 4 Scripsit, an error trapping function prevents this problem.

Documentation

The manual for Model 4 Scripsit is a definite improvement over the original manual. The new manual includes a tutorial in two parts and a reference section that discusses all the program's functions. It also includes an index.

The manual does contain a couple of errors. On p. 30, it fails to indicate which key you should press to display exchanged paragraphs. Also, at one point the manual claims that Scripsit has four editing functions. Later, it states that there are only three (four is correct).

These are not critical errors, but it's so unusual to find errors in Tandy's documentation that I couldn't resist pointing them out.

Summary

Overall, Model 4 Scripsit is an improved version of an already good program. The display takes advantage of the Model 4's larger screen and Tandy has made provision to print some previously unprintable characters. The increased memory of the Model 4 allows approximately one-third more text than with earlier versions.

Scripsit's long development time and wide use have resulted in a proven, bug-free program. It is not a program to use for form letters or mass mailings. Its inability to send control codes to smart printers limits its usefulness for newsletters and similar jobs requiring expanded print or fancy type fonts. However, for quick, convenient, low-volume word processing, Scripsit is unbeatable. ■

Sprucing Up The Model 16

by Dave Dischert and Dan Keen

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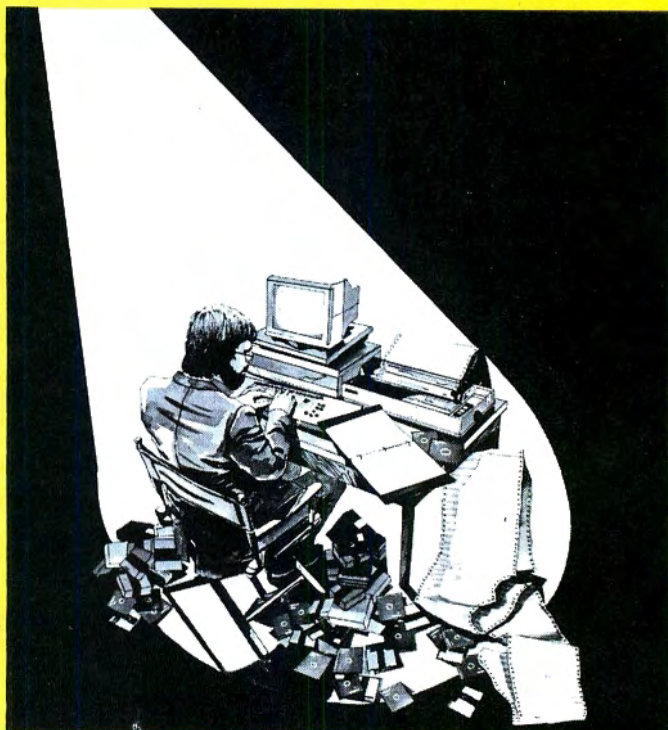
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V. E. Ryberg, Bloomington, Illinois



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Of course the program documentation of over 200 pages is a very thorough and readable reference manual to answer any questions you may have. But we encourage you to treat it as a reference manual only. We have provided the tutorial as a quick and easy way to get started. That's an advantage seldom provided by any software package.

"The tutorial was an excellent starter. It enabled me to get on with it without days and days of reading. Very helpful.

S. R. Foster, Pensacola, Florida

Continued

REVIEWS

The p-System is built around a Pascal language structure, but it's not solely for Pascal program developers. Compilers and interpreters for Basic, Fortran, Pascal, and Lisp are currently available for it.

Compatibility

The p-System is available for the Models II, 12, and 16, as well as for a number of computers from other manufacturers. The version for the Model 16 actually uses the 68000 microprocessor; it's not just a Model II program running on the 16.

This system contains a layer of routines that interacts with the computer. Naturally, every brand of computer needs its own routines to access disk drives, the keyboard, and the display. Since microcomputers use a variety of microprocessors, their host configurations are necessarily different.

To the p-System user or program developer, these routines are invisible. The system looks and responds the same, regardless of the computer's brand.

When you write a p-System program, you can transfer the source code to any other machine capable of running the system. Then you can compile it to an object code that the particular computer understands. Therefore, you can convert software written on one machine to another in a matter of minutes.

The p-System operates on computers with either 8- or 16-bit microprocessors, and a system to handle 32-bit processors is under way. This translates into hundreds of currently available programs.

Features

The system has an abundance of features, including small touches that make it pleasant to use. One item TRSDOS users will enjoy is that the time and date entries on power-up are optional. Also, the software accepts commands in either upper- or lower-case.

Even though the terminology is different from TRSDOS, it isn't hard to learn. The p-System is screen oriented and displays a menu of all possible commands across the top of the screen at all times. You usually enter commands with a single keystroke.

The p-System requires a modest amount of RAM, which leaves room for large application programs.

This system has some interesting commands not available under TRSDOS. KRUNCH fixes holes developed by killing files. It moves files around to put unused areas together sequentially. This speeds up searching through files in inventory, mailing list, and similar programs.

The Examine command locates and attempts to repair a bad disk sector. It can't repair physical damage, but can usually fix problems such as CRC errors.

UCSD p-System



PCD Systems Inc.
P.O. Box 143
Penn Yan, NY 14527
Model 16
(Model II and 12 versions available)
\$850

<i>Easy to use?</i>	★☆☆☆☆
<i>Good docs?</i>	★★★★☆
<i>Bug free?</i>	★★★★★
<i>Does the job?</i>	★★★★★

The Editor

Many DOSes include a utility program called a text editor. Its purpose is to write source code and manipulate text. You can use the p-System's editor for simple word processing but it doesn't have all the features of a true word processing program.

The p-System editor is a delight to use. By default, it automatically saves your text in a file called SYSTEM.WORK.TEXT. Whenever you invoke the editor, it automatically loads this file. These built-in default options speed up program development.

In addition, when you choose to compile the source code, the program automatically selects the work file. You do the compiling by tapping the C key.

When you quit the editor, you have the option of updating the work file or exiting without saving changes.

We had a little trouble trying to quit the editor the first time. The manual's suggestions didn't work on our Model

16. By pressing different combinations of keys, we finally found that the control and F keys terminated the session.

The unique error-handling during the compiling process makes your life even easier. If an error occurs while the p-System compiles source code, the procedure stops. The error code and line number appear. You can continue, edit, or terminate at this point.

If you choose to edit (hit the E key), the compiler quits, loads the editor along with your source code, and places the cursor next to the mistake on the offending line. An explanation of the error appears. You can correct the error then and there. This is a time-saver for the program developer.

The Manuals

The owner's manual is as thick as an unabridged dictionary, so be prepared to do a lot of reading. The manual states that it's not tutorial. It gives you an idea how each command works, but not an in-depth explanation on it. However, the package also comes with some beginning programmer guide books.

These books assume the reader has no knowledge of the system at all. They are lengthy but well written. We found them seasoned with humor that makes a dull subject more easy to digest. One of the prefaces begins with "But Toto, I feel we're not in Kansas anymore!"

However, the owner's manual is far too complex. The amount of information is overwhelming. The p-System is a breeze to use, but you would never know it from the manuals.

A summary card for quick reference supplied with the package would get the beginner up and running in a more reasonable length of time. Many instructions, such as how to get a directory on a secondary drive, would fit in a small leaflet.

We also disliked the unusual designations given to the disk drives. What TRSDOS calls drive zero, the p-System refers to as #4.

Conclusion

The UCSD p-System comes close to being a universal DOS. If you want to write programs for brands of computers you don't own, this operating system is for you. Also, manufacturers are already selling applications programs for the p-System that range

from accounting to games. Along with the system, we reviewed one of these packages, Sprinter-2.

An Application: Sprinter-2

Sprinter-2 is a word processing system, an application package designed to run under the p-System environment. It's a program for the experienced user; you can't get it up and run-



ning in short order, especially if you've never used the p-System before.

First of all, the owner's manual assumes that you've read Peter G. Martin's *Word Processing on the UCSD p-System* prior to working with Sprinter-2. It also assumes complete knowledge of the operating system.

The manual itself is more of a technical reference. It explains the construction of printer drivers, installation configurations, and the use of unusual features.

The manual doesn't mention the most frequently used text manipulations, insertion and deletion. The top of the screen shows a list of commands, so it's clear how to enter various modes. However, leaving those modes once you've completed your task is a problem.

Sprinter-2 doesn't appear to have strike-over ability. The arrow keys position the cursor over text, but the program interprets any letters you type from the keyboard as commands (I for insert, D for delete, and so on).

Sprinter Specials

Sprinter-2 has some unique specialized features. For example, you can perform conditional and logical testing using *If...Then* as well as *And...Or*.

Registers let a name represent the storage of a real number. This is similar to using a label to define a byte of memory when programming in As-

sembly language. The range of values extends from zero to one million.

Another neat feature is that you can create an alphabetical index of desired terms. The program also lists page numbers. The owner's manual boasts that it's written using Sprinter, includ-

ing the alphabetically listed index.

Sprinter-2 supports printing a multiple-column format, as well as special paragraph formats.

When you need to include printer instructions and other requests, place a period in front of the command to inform the computer that it's a request line. This is similar to Radio Shack's Model I/III Scribes, which uses a

greater-than sign to indicate a command line.

Sprinter-2 uses a numerical value of one to signify the on state and zero to represent off. For example, you'd set up justification on and justification off under Sprinter-2 with *.ju 1* and *.ju 0*. We wonder if the average person relates easily to that binary type of thinking.

Generating superscripts and subscripts is a little awkward. You must spell out entire words and symbols under Sprinter. The manual shows the example of printing H₂O:

```
H/down3v 2/extrapost2v /up3v O
```

We think this is a little too cumbersome and we've seen better ways to obtain the same result.

Underlining is also awkward, but it's more comprehensive and versatile than in SuperScripsit.

As is true of many complex programs, "it will take you several months to fully appreciate all the capabilities" of this system, to quote the manual.

Sprinter-2 is a highly sophisticated, extremely versatile word processing program. We recommend it for the knowledgeable user who has nonstandard printing needs.

For the typical nontechnical end user or secretary, we don't recommend this package. He or she needs a word processor that's quick to learn, easy to use, and does not contain the detailed features of Sprinter-2. ■

Sprinter-2

★ ★ ★

Scenic Computer Systems Corp.
14852 N.E. 31st Circle
Redmond, WA 98052
UCSD p-System
\$350

<i>Easy to use?</i>	★★★★☆
<i>Good docs?</i>	★★★★☆
<i>Bug free?</i>	★★★★☆
<i>Does the job?</i>	★★★★☆

WordStar at Work On the TRS-80

by John B. Harrell III

In my opinion, you'd have to search long and hard to find a word processing package with as much text processing capability as WordStar. Logical Systems Inc. (LSI) now provides WordStar for the normal TRS-80 mode, removing the program's reliance on CP/M. While it's not perfect and some people might find it difficult to implement, I recommend WordStar for serious word processing users.

Installation

To use WordStar, you first have to tailor your working copy of the word processor to your system's configura-

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SUPER UTILITY +	(List \$79.00) \$64.50
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tion—no easy task. Instructions for this, including directions for creating a system disk, appear in the first section of the user's manual.

These directions presuppose that you understand the operating system and know how to format a disk, create a back-up copy of the operating system, and so on. For the level of user that is interested in WordStar, this is a fair supposition.

The initial installation of WordStar is a complex operation. First, you should read the installation procedure completely and pay close attention to the optional printer controls that you can implement with the patcher in install.

You have to decide which DOS to use with WordStar. While only LSI distributes this version of the program, MicroPro International has modified WordStar to operate with LDOS, NEWDOS80 2.0, and DOS-PLUS 3.4/4.0. Alternatives let you select WordStar keyboard mapping or ROM/user keyboard mapping in conjunction with the selected DOS.

The next option is selection of a printer driver. WordStar supports daisy-wheel printers and printers in the teletype class. This includes the Radio Shack DWP-410 and DWP-210, QUME Sprint 5, NEC Spinwriter 5510/5520 thimble printer, Diablo 1610/1620/1640/1650/630 printers, and Xerox series 1700 printers.

The Radio Shack DW-II is listed on the menu, but the manual states that the DW-II function does not work. You can still use this printer with the teletype or DWP-410 options but you cannot fully use all the printer's features.

Then you must select the communications protocol. For most users with parallel printer interfaces, this means selecting "None Required." If you have a serial printer, the Install routine lets you select ETX/ACK protocol or XOn/XOff protocol.

The last standard selection lets you choose the printer driver for WordStar. Most users need only the normal ROM call using the printer device control block (DCB), which allows full use of any LDOS filters and drivers you require.

The last phase of the installation procedure is the most difficult. You tell WordStar how to control your printer for the program's special fea-

tures, such as boldface, underlining, and backspacing. You must select these control codes and enter them into the patcher for correct placement in your working copy of WordStar.

The remainder of the installation process lets you modify internal flags that WordStar uses. These flags let you establish default conditions for many internally used WordStar parameters.

You can change flags such as initial help level, insert mode toggle, direc-

from LSI, adds form-letter generation and other capabilities to WordStar. This addition lets you easily prepare form letters and generate complex documents using boiler-plate paragraphs.

WordStar document size is limited only by the physical storage capacity of your disks. The program automatically buffers text and maintains only the immediately required segment of the document in memory.

Another nice WordStar feature is an automatic back-up copy of your document each time you edit it. Returning to the original version of any document requires a few keystrokes from the WordStar no-files menu. This method has one drawback—it requires that you have the disk capacity to maintain two copies of the text file.

WordStar commands all use a control key in addition to one or more keys. Depending on your installation selections, the control key can be the shift/down-arrow keys used by the TRS-80 or the down-arrow key used by the WordStar keyboard mapping.

In addition to the basic editing functions, WordStar provides other powerful features. Set/clear is a variable tab stop for either ordinary tabs or decimal alignment tabs. You can move, copy, or delete any block, set place markers, find and/or replace text, and write to or read from additional files.

WordStar also provides a variety of special printing effects, including underlining, boldface, double striking, and strike out. You can use these anywhere within a document, including within headers and footers, and mix them where you require additional emphasis.

Special effects such as superscripting, subscripting, variable character pitch, variable line height, and alternate ribbon color are available for printers with these capabilities and are partially supported on other printers.

WordStar contains comprehensive Help screens that you can display while editing. The Help screens provide enough specific information to keep you from having to continually refer to the manual. You can specify the level of help; the minimum level (for experienced users) provides maximum

TRS-80 WordStar 3.0

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tory display toggle, justification, hyphen-help, and so on by specifying the hexadecimal (hex) address or WordStar's internal label name specified in the manual.

The manual's installation section also specifies how to repeat the procedure for a previously installed program to change selected parameters. This is a valuable feature that lets you experiment with WordStar.

WordStar 3.0

WordStar is a screen-oriented editor with an integral printing capability. You enter text on the TRS-80's screen in a default condition of 60-character lines.

You can set margins of any width up to and including 240 characters. With the exception of the special print feature characters (which you can suppress), WordStar formats text exactly as it will appear on your printout.

MailMerge, an optional program

Continued on p. 200

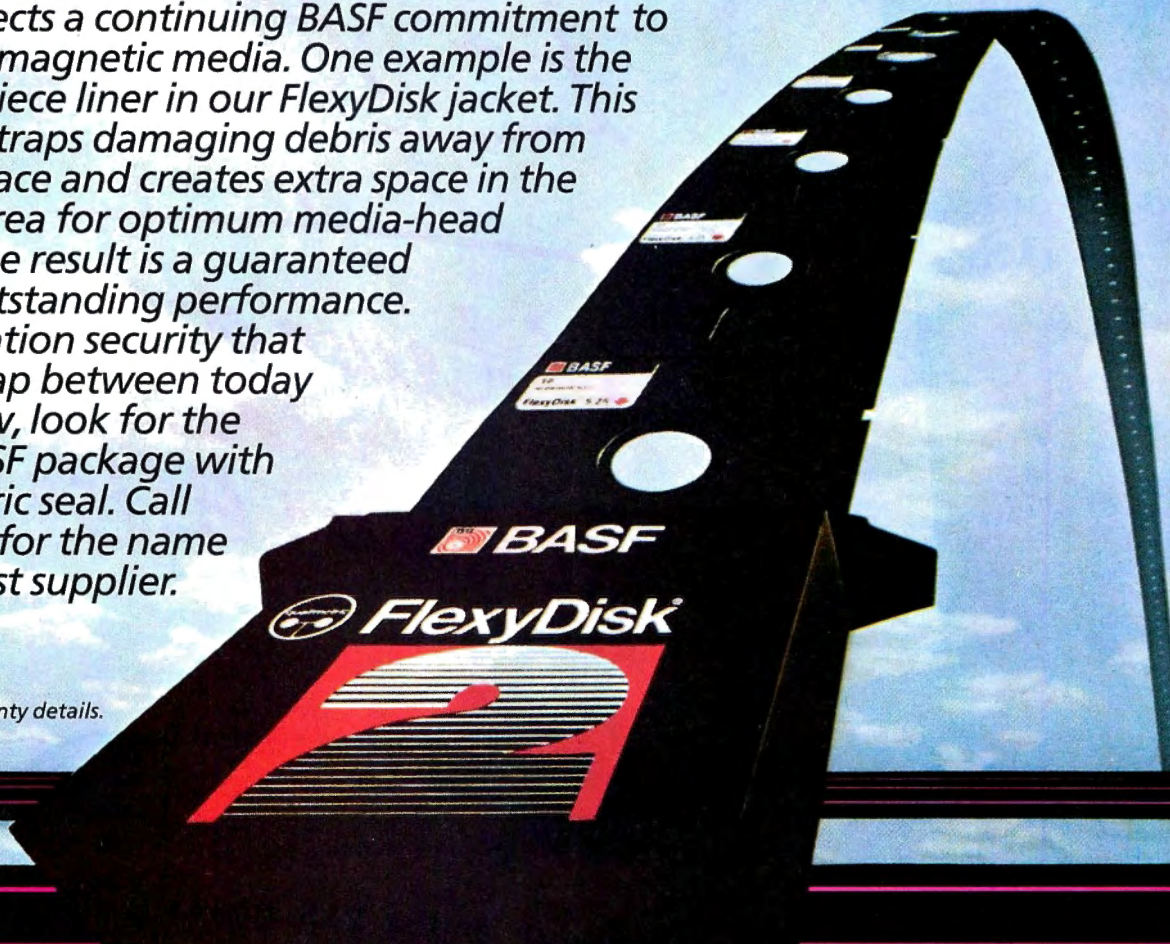
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Bulletin board systems (BBSes) have changed the way people use their computers. With a bulletin board system and a modem, you can communicate with other computer users, share ideas, and exchange programs--without leaving your house.

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Starting next month and continuing for a year, we'll write a monthly column called BBS Express to help you



create and run a bulletin board system with your 48K two-drive Model I, III, or 4. (Alternatively, you can order the finished program from us [see the sidebar].) As a preface, this month we'll discuss the theory behind computer communications.

The notion of becoming a SYSOP is appealing, but it's not as simple as it looks. Before you can communicate with your TRS-80, you must overcome some serious problems involving telephone communications and your computer's design.

Design Problems

First of all, your TRS-80 has a memory-mapped video screen and a memory-mapped keyboard. For every screen location, a memory location stores a byte representing the character displayed there. And for every key on the keyboard, the computer assigns a tiny switch to a specific memory location that it scans to determine whether or not you're pressing the key.

When you operate a TRS-80 over the phone, your commands go out the communications line. PRINT@ statements become useless because you have no print destinations. And programs that produce screen displays by POKEing ASCII values into screen memory won't work.

Your computer also receives input from the communications line. As a result, games that scan the keyboard with PEEKs and word processors that scan switches hooked up to the keys won't work.

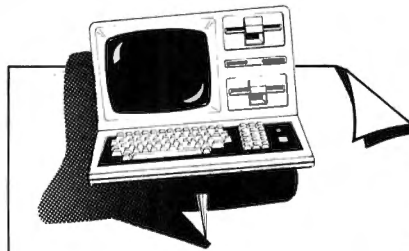
Most microcomputers use the video screen as the default output device and the keyboard as the default input device. TRS-80s are designed to function primarily with immediate or self-contained peripherals, and contain the coding necessary to use only them.

On the other hand, you can scatter minis and mainframes throughout a building or across a continent. A terminal in Tallahassee can access the main computer in Minneapolis. And the main computer can communicate with the disk drive in the next room or print a message in Pittsburgh.

On a large computer, the central processor spends lots of time routing messages and controlling access to peripherals. Personal computers can't perform such complicated message switching. If you want to run a personal computer from a distance, you're asking for trouble.

Telephone technology only com-

pounds the problem. For example, when your computer sends a character over telephone lines, the telephone company does some business with it and delivers it to a distant computer. That computer does some business with it, and echos it back over the lines to your computer. None of this happens instantaneously, and the two machines quickly get out of synchronization.



Parallel transmission
requires eight
wires to work.
The first problem
is that the telephone
company doesn't supply
ribbon cable on its
telephone poles.

The Data

To overcome these problems, you need to understand what you're transmitting and what it looks like. Some of you might find the next few paragraphs elementary; think of them as a review. Lots of new material follows.

Computers speak a confusing language of ones and zeros called binary. Single ones and zeros are called bits, and eight of them make up a byte. Your computer works by manipulating these bytes, with each one representing a letter, punctuation mark, part of a number, or instruction.

A byte can also be part of a program, but once you remove it from the originating computer and put it on the telephone line, the receiving computer can't tell what it represented.

Let's make that clearer. Suppose you somehow connect two TRS-80s to the telephone line, and send the number 191 from one to the other. The receiving computer will get a 191 if you do it right, but what does that 191 mean? It

can be a graphics character, a Z80 instruction, or part of a Basic program. Once the transmitting computer sends a byte over telephone lines, the receiver can't tell what the byte means—unless the two computers have reached some agreement beforehand.

You could decide to send and receive only the letters of the alphabet, and certain punctuation marks, numerals, and control characters. Since computers use binary numbers, you could assign a number to each letter, digit, and punctuation mark. You'd also need characters for control, such as carriage returns and line feeds.

After you decide which numbers represent what, you could make a table of the number/letter combinations and mail it to the person with whom you'll be communicating. Then he could program his computer to translate the numbers you send into the letters and digits you intended.

Fortunately, you don't have to go to that trouble; someone's done the work for you. The list you need is the American Standard Code for Information Interchange (ASCII) set (see your computer's operating manual for the complete list of ASCII values).

Parallel and Serial

To understand how you transmit and receive ASCII-encoded data, we need to discuss the hardware involved. Inside your TRS-80, bytes of data zip around on the data bus, which consists of eight wires similar to those of a printer cable. Each bit in a byte travels in its own wire on the data bus and goes from here to there with other bits, like an ocean wave approaching the beach.

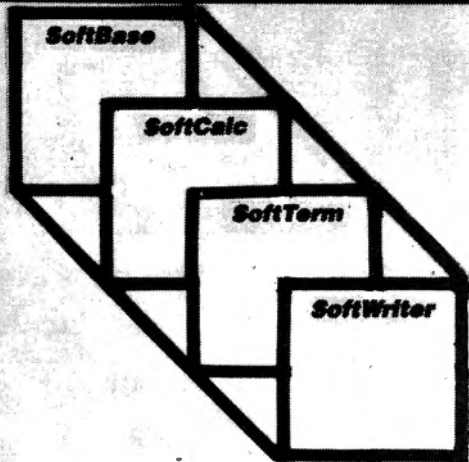
This is called parallel transmission, and it requires eight wires to work. The first problem is that the telephone company doesn't supply ribbon cable on its telephone poles. To transmit a byte of data, you need to fit it into two wires, the two the telephone uses.

A byte of data flows along the data bus with some of the wires containing a one, some a zero. Together they represent a binary number, such as 11011011.

Suppose you could send the contents of each wire over telephone lines. Since each bit is off (zero) or on (one), you

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can send the bits one at a time, in serial transmission.

A device called the universal asynchronous receiver/transmitter (UART) makes serial transmission possible. UARTs are asynchronous because the data they handle does not carry a clock signal to keep the two communicating computers synchronized. UARTs are the main working components of RS-232 boards.

A transmitting UART receives a byte of data from the data bus, collects the bits, and sends them one by one to the receiving UART. The receiving UART collects the bits from the communications line and reassembles them into a byte.

Simply having a UART in your TRS-80 doesn't mean you can communicate, however. You need a terminal program that tells the computer to access the UART.

Intelligent Software

A terminal program catches your keystrokes and sends them to the UART, then catches the input from the UART and sends it to the screen. A dumb terminal program does only this. Communications software that performs other functions, such as storing incoming messages, automatically dialing the telephone, or printing messages, is what's known as an intelligent terminal program.

Once you have two computers equipped with UARTs and terminal programs, you can connect them together by their UARTs and communicate between them.

But the telephone network is designed to send sounds, not the digital data your computer produces. Converting your ons and offs into sounds means more hardware.

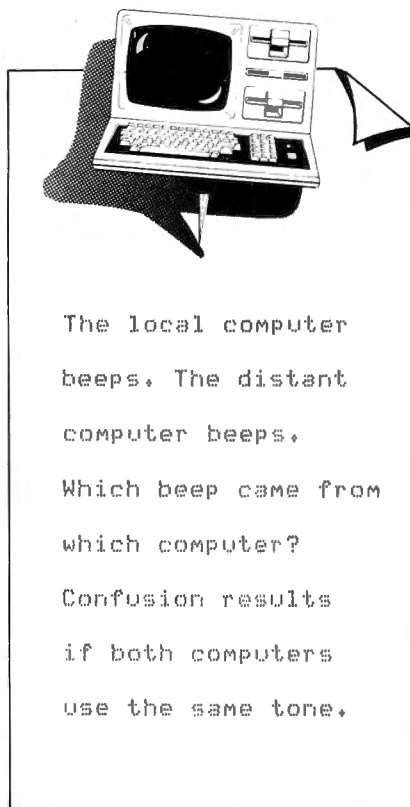
First, you should decide on a scheme of tones, say a beep for a one and a boop for a zero. Then you could code your data into a series of beeps and boops, send that out, and translate it back on the other end.

You need a device that receives the ones and zeros from the UART, modulates them into tones, then sends the tones over the long distance lines. You also need a device that receives the tones, demodulates them into ones and zeros, and feeds them to the UART for reassembly into a byte. These modulators/demodulators are known as modems.

One small problem remains. The local computer beeps. The distant computer boops. Which beep came from what computer? Confusion results if

both the distant and the local computers use the same tone to represent ones and zeros. You should give the computers different sets of tones to use so each modem will know which computer beeped. We'll call one set of tones the answer set and the other the originate set.

These terms are misleading; separate tones only let the modems tell which computer made which sound. It doesn't



matter which computer originated the call and which answered the telephone, only that one modem is in the originate mode and the other is in the answer mode.

You're almost ready to begin communicating. The terminal program scans the keys and sends the keystrokes to the UART. The UART collects bits and sends them to the modem. The modem beeps and boops to the telephone line. On the other end, nothing predictable happens. Why?

Transmission Conventions

You haven't yet decided on a convention concerning when or how fast to transmit.

The bits flying along on the data bus inside your computer stay together because a system clock keeps them synchronized. Two computers in a telecommunications set-up might be separated by a continent, two satellite links, and a hand-crank switchboard. And each computer has a unique system clock.

The receiving computer can't begin to understand the bits pumped out by the transmitter unless both use a consistent format for transmission.

To resolve this, your computer uses start and stop bits to mark the beginning and end of a data byte. Before the computer sends a data bit, it sends a start bit to get the receiving UART's attention. Then it sends the data bits, followed by 1 or 2 stop bits.

When the receiving computer sees the start bit, it knows a character is coming and accepts the data bits. Finally, it accepts the stop bits.

If both computers agree that each byte will contain 8 bits, stop and start bits seem superfluous. After all, any TRS-80 can count to eight.

But when you send and receive high-speed serial data, it's possible that a bit will get lost along the way. In fact, it's a certainty. And when your line drops one or more bits, the receiving computer's counting schedule gets upset. Without the stop bit, it would miss the error and be out of synchronization from then on.

The UART in your TRS-80 can handle word lengths of 5, 6, 7, or 8 bits. Of course, both transmitter and receiver must agree on the number of bits between start and stop bits.

The ASCII set requires at least 7 bits to a word, because the largest ASCII number is 127, which requires 7 binary bits.

When a transmitting computer isn't sending information, it creates a continuous beep, or a logic one. The first boop it sends is the start bit. The transition between a beep (a logic one) and a boop (a logic zero) indicates that a byte of data will follow. If a computer sends two or more ones or zeros together, they create a steady tone.

Perfect Timing

Your computer uses a method called bit time to regulate the frequency of bit transmission. Both UARTs must use the same bit time.

For example, with a bit time of .003333 seconds, both computers transmit a bit every .003333 seconds. If a computer hears a beep for the first .003333 seconds, the bit is a one. If it hears a boop, the bit is a zero.

It's awkward to describe a UART's setting by bit time with all those zeros and threes. The setting is commonly described by the reciprocal of the bit time, known as the baud rate.

The reciprocal of a number is one divided by that number. One divided by .003333 is approximately 300; the baud

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You can see the bulletin board in action by calling 606-739-6088 after 6 p.m. eastern standard time. We hope you'll give us a call—the board has a special section for your comments, questions, and suggestions.

Our BBS has message and data-base space, plus separate sections with limited access for private messages. Its command structure is similar to CompuServe's, and includes scanning, dynamic screen formatting, and optional line feeds after carriage returns.

Most of the board uses Basic, but time-sensitive parts, such as the receiver section, use machine code.

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rate in the above example is 300. A bit time of .00083333 equals a baud rate of 1,200.

You should not confuse baud rate with bits per second (BPS). BPS is the number of data bits transmitted in one second. Baud rate, on the other hand, represents the number of all bits—stop, start, and data—transmitted or received in a second.

Error Terror

A major part of any telecommunications system is devoted to detecting and correcting errors. Nationwide, telephone lines experience 1.5 bit errors for every 100,000 bits transmitted. That's about one error every four minutes of continuous transmission at 300 bits per second.

A discussion of all the possible plans for error-checking is beyond the scope

of this article, but we'll examine two of the most popular methods.

UARTs use a method known as parity, adding a single bit to the end of every byte. To see how it works, let's examine the byte of binary data discussed earlier, 11011011.

This byte contains six 1 bits, an even number. In an even parity setting, the UART would add a zero bit before transmission, keeping the total of 1 bits an even number. In odd parity, it would add a 1 bit and make the number of 1 bits an odd number. Discrepancies from the parity setting, when a byte with an odd number of 1 bits shows up in even parity or one with an even number of 1 bits turns up in odd parity, alert the computer to transmission errors.

Computers can also ignore parity, using a no parity setting.

Another popular method of error de-

tection, duplex, involves how your typing gets to the screen. Typing for transmission to a distant computer is like working in the dark—you can't see what you're doing. Half-duplex makes the terminal program echo the letter represented by your keystroke to your screen. But half-duplex provides no error-checking.

A full-duplex system sends your keystroke to the distant computer, which sends it back for display. Full-duplex requires your modem to receive and transmit at the same time. If you type an A, and a B appears on the screen, you can backspace and correct it. Errors can occur during transmission or echo, but you should assume they happen during transmission.

Proper Protocol

Your computer is pumping out

thousands of bits every second. On the other end, the receiver is catching the bits. What happens when the receiver's disk drive comes on? Or when the receiver has to do something with the received data, such as scroll the screen? Your computer goes on transmitting merrily, the receiver stops listening, and the data gets lost.

We've come a long way, but you still need a method for the two computers to tell each other, "Wait a minute, I'm busy."

The most common method is XON/XOFF handshaking protocol. When the receiver must stop listening, it sends an XOFF control character to the transmitter, which does one of two things.

The transmitter either stops transmitting until it receives an XON, instructing it to resume transmitting, or ends the connection when enough time has passed since the last echo for it to assume the connection is broken.

XOFF is defined in the ASCII set as DC3, device control 3. It is 13 hexadecimal (hex) (19 decimal); press control-S to enter DC3. XON is DC1 or 11 hex (17 decimal). Press control-Q to enter XON. CompuServe users know these controls as the freeze and unfreeze commands.

We tend to think of electricity traveling instantly from place to place, and from our reference point, it does. But computers work in a more precise time frame, and the time it takes for information to travel over telephone lines quickly confuses XON and XOFF commands.

For example, the receiver stops receiving to perform some action and sends an XOFF to the transmitter. But characters are still headed for the receiver, because it takes time for the XOFF message to reach the transmitter and more time for the transmitter to react.

The receiver must anticipate its needs and send the XOFF message before it needs to stop. And since TRS-80s don't have the code to do this, the terminal program has to handle it.

That's about it. Connecting two TRS-80s over phone lines is more complicated than it first appears, but you can do it if you're willing. After communicating with your computer, playing games and balancing your checkbook will never be the same. ■

Contact J. Stewart Schneider and Charles E. Bowen at Saturday Software, P.O. Box 404, Catlettsburg, KY 41129.

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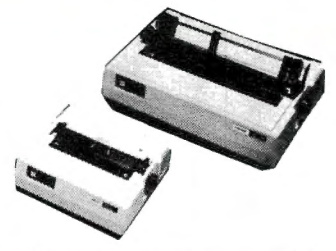
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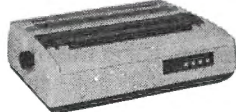
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Smart Talk

by David M. Fischer

The last word in terminal programs.

Whether you're talking to Dow Jones News/Retrieval Service in New York, a bulletin board in your home town, or another computer in your office, you can't communicate without the proper software to act as translator between the two units. Dynaterm is a Model I/III machine-language smart terminal program with features not available on some commercial products (see Program Listing 1). It can send and receive regular and compressed ASCII text and /CMD machine-language files and it loads disk files from, and saves and verifies downloads through, a 34K buffer.

In addition, Dynaterm supports disk input/output (I/O), and its buffer displays machine-code programs in hexadecimal (hex) code format, with a 64- or 32-column terminal display and reverse case for text sent to or from Model I word processors. The software works with auto-answer/auto-dial modems, automatically sensing full or half duplex, and recognizes codes for automatically opening and closing the buffer.

(Dynaterm uses a generic auto-dial interface that first appeared in *Microcomputing* [November 1979, p. 116]. Routines for auto-dial modems that use the Lynx and Hayes modem conventions, and program conversions for Model III and TRSDOS 1.3 users, appear in the accompanying sidebar.)

You can send Epson MX-80 printer control codes without leaving Dynaterm and use DOS commands without entering DOS. Dynaterm has a built-in Help menu with command explanations

and examples, and the shift-@ command aborts any function. Finally, if you exit to DOS, you can reload Dynaterm with the parameters and buffer contents intact.

Dyna-Documentation

The easiest way to discuss Dynaterm's features is to run through the program menu. Dynaterm's disk file name is MPH/CMD; to load it from DOS Ready, type MPH and press the enter key. (Because of Dynaterm's warm start feature, other file names won't work.) After the title banner, the menu shown in the Figure appears.

To use most of the options, type the appropriate letter and hit the enter key. (Choices @ and shift/up-arrow don't require that you hit the enter key; choices L and W require that you type in a file name.)

C clears or erases the buffer. Since you can't recover contents once you've cleared the buffer, this function prompts you for a second entry in case the first was an accident.

D displays the buffer contents in ASCII. Shift-@ aborts the display, P toggles a pause, and pressing the break key slows screen scroll for easier reading.

E toggles the echo function on and off. You can check the echo status by hitting E or Q (which displays the RS-232 status).

H displays the Help menu. From that menu, type the letter that corresponds to the choice you want to know about; after reading the explanation, type A to return to the main menu.

L loads a file from disk to the buffer when you type in L FILESPEC and press the enter key. To verify that you've loaded the file properly, an asterisk flashes at the top right corner of the screen. Shift-@ returns to the main menu.

P lets you dial a phone number and then go into terminal mode to await the carrier signal. The key calls a menu showing three built-in BBS numbers, stored in three sets of program lines—12650 and 13120, 12670 and 13140, and 12690 and 13160. The first line in each pair displays the board's name and phone number; the second line, not displayed, gives the number to the computer. (You can also put your own message in lines 12580 and 12590.)

To dial a built-in number, press its associated option number from the P menu; otherwise press 5 to enter the manual dial mode, type in the telephone number (up to 30 characters), and press the enter key.

Printing, Shifting, And Resetting

Option O sends the buffer's contents to your line printer. If the printer is busy, Dynaterm waits until it's free so you don't lose any data during printing. Material being printed also appears on screen; as with the display mode, shift-@ aborts the process and P toggles a pause.

U toggles ASCII text (such as word processor files) from upper- to lower-case and back.

Q and R let you see and reset the RS-232 parameters as follows: duplex (full

or half), baud rate (110, 300, 600, 1,200, 4,800, or 9,600), word length (5, 6, 7, or 8), stop bits (1 or 2), parity (disabled, even, or odd), and echo (sending characters only to a modem or also sending them to the terminal).

The RS-232 menu also displays the space available in the buffer (34K to 0K), the space used already, and the setting of 4049 hex, the high-memory vector. You can't change these parameters with the R command.

S, the upload key, sends the contents of the buffer out through the modem at the baud rate set by choice R. Again, shift-@ cancels shipment.

In Terminal Mode

Option T sets Dynaterm to terminal mode, ready to receive and send data via the host computer on the other end of the line as soon as the cursor (right arrow) appears.

Shift-@ returns control to the main menu, hanging up the phone line if you're using the phone dialing interface. Shift-* toggles the seventh bit of the NAK ready signal, resetting an 8-bit to a 7-bit word or vice versa. This helps clear up garbage that the program sometimes encounters when receiving data over 300-baud phone lines.

Shift-1 sets the screen display format to 32 characters per line, and shift-2 returns it to 64.

To send a control code, press the clear key and the letter or number. I've reserved four control keys. Clear-Q manually opens and clear-P closes the buffer (once it's opened again, the program adds new data to that already stored). Clear-/ turns the cursor off, and clear-. turns it back on.

Last Commands

After returning to the main menu with shift-@, you can write the buffer to disk by typing W FILESPEC and pressing the enter key. A checksum compares the new disk file to the data in the buffer; if a bad checksum occurs, Dynaterm resaves the data until the save is error-free. At that point, shift-@ aborts the process and closes the file.

Option @ transfers you to DOS Ready, letting you enter a DOS command. After you do so, pressing the space bar returns Dynaterm to the main menu.

Option X ends Dynaterm, saving the parameters in case you want to return

with buffer and RS-232 settings intact. To do so, add an asterisk, typing in MPH * and pressing the enter key from DOS Ready.

This warm start procedure works only after an exit, not after rebooting your computer. To make a cold start (returning to default parameters) without rebooting, use option Z.

Option ? prints the buffer contents in hex form for programs received or to be sent in compressed /CMD format. Don't confuse this with the ASCII "hex" form that some BBSes or terminals send.

Finally, shift/up-arrow plus one character lets you send that character as

**If the printer
is busy, Dynaterm
waits until it's
free so you don't
lose data.**

a printer control code. To send the Epson MX-80's emphasized print code, for instance, press shift/up-arrow and E; the escape code (27 decimal, 1B hex) and E will be displayed and sent to the printer.

Lines and Comments

Since Dynaterm's size prohibits putting remarks in the assembled listing, I'll describe the program by line numbers. The following line numbers and remarks refer specifically to the original Model I version, which loads from 5200-7C3C hex, with an entry point of 5401 hex. The buffer starts at 7C3D hex.

50-240: Sets up the number of bytes the program uses to store flags and update current addresses.

270-370: A delay routine used throughout the program. BC is a time delay (i.e., 30,000 decimal).

380-570: This routine patches into the keyboard driver, changing the cursor character from underline (95 decimal) to the right arrow (94 decimal).

580-600: Disables above routine when exiting to DOS.

610-900: Receives 1 byte from the RS-232 interface and checks to see

whether it is a control character or not.

910-990: Sends 1 byte at a time from the accumulator to the RS-232. If busy, it waits until the line is ready and then sends the proper code.

1000-1040: Sets the current baud rate and control status to the vectors defined at the start of the program.

1050-1110: Bumps the HL register pair until it reaches a carriage return (CR; 13 decimal). Similar to RST 10H in the ROM.

1120-1810: Displays the banner defined in lines 18740-19700.

1820-2080: Checks to see whether you used the file name MPH or MPH *. If the latter, the program doesn't reset the current RS-232 parameters and buffer contents. HL equals 4318 hex (the DOS command buffer, which also holds the main menu commands). If you use any other character in front of the MPH, returns to DOS and displays the correct format.

2090-2170: Initializes the system with parameters and buffer intact.

2190-3060: Displays the main menu, making sure the buffer is closed. The program stores the buffer at SPF; 1 equals the open position, and zero represents the closed condition. Scans the keyboard for the correct selection and enter key and ignores wrong choices.

3090-3390: The main menu resides here. Lines 3100 and 3110 clear the screen when printed.

3410-3440: Toggles the protocol bytes, inverts the bits.

3450-3520: Checks to see if the buffer is full. If so, displays an error message and returns to the main menu.

3530-3640: Messages for buffer overflow and "hit any key" prompt, used later in the program.

3650-4580: From the data stored at initialization, displays stop bits, baud rate, echo status, parity, bytes left, and bytes used.

4590-4880: Zeroes out the buffer; sets end of buffer (HNB) equal to start of buffer (HCB).

The Key Box



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4890-5140: Messages and dummy characters that the program fills with the correct numbers from lines 3650-4580.

5160-5540: Converts binary numbers to decimal up to five digits. Lines 5160-5230 mask the bits during conversion.

5550-5740: Beginning messages for terminal mode.

5750-6410: This is the terminal loop, which checks whether you pressed the right keys and sent control codes. The C register holds and transfers the communication codes. Follows through on buffer open and close codes; compares space left in the buffer to the high memory vector (4049 hex).

6440-6970: Determines whether to display the buffer to the screen or send it through the RS-232. Checks shift-@ for abort in either case.

6980-8130: Handles the Save and Load routines for disk, checks for proper syntax, and displays the error message for an attempt to save an empty buffer. Monitors shift-@ for abort. Returns to the menu after load, and closes the file after save. Line 7910 flashes the asterisk.

Routines: 4428 hex gets the filespec from DE, 441C hex opens the file, 4420 hex writes records in 256 bytes, 4424 hex loads a record from disk, and 0013 hex inputs a byte from a device.

8140-8700: Input routine that allows characters plus the enter key and certain characters without it. HL is the CMD buffer.

8710: Stores the current cursor location on screen (3C00-3FFF hex).

8720-8830: Prompts for choice R parameters. DEFB 03 hex keeps cursor at current position.

8840-9030: Look-up tables and equivalents for RS-232 parameters. 300 baud equals 55 hex, 9,600 baud equals EE hex.

9040-9990: Gets responses from the user and inserts the right values in the right vectors for later use.

10000-10750: Converts hex to ASCII numerics.

10760-10840: Common print routine that prints a string of characters until it encounters a CR (13) or cursor position code (03). HL equals message address.

10850-11000: Ending routine. Saves the parameters for warm start.

11010-11130: Zeroes out the buffer.

11180-11420: Displays the phone dialing menu for use with predefined numbers.

11430-13110: Clears the phone number buffer (HL) and allows input of up to 30 numbers. B register equals the

DYNATERM - VERSION 3.0 - AUTO DIALER - BY DAVID M. FISCHER

```
<C>LEAR BUFFER          <Q>QUERY STATUS OF RS232
<D>ISPLAY BUFFER       <R>S232 SET
<E>CHO (ON/OFF) SWITCH <S>END BUFFER DATA OUT
<H>HELP FOR COMMANDS  <T>ERMINAL MODE (ON)
<L>OAD FILE FROM DISK <W>RITE BUFFERED DATA TO DISK
<P>HONE DIAL A NUMBER  E<X>IT TO DOS
<O>UTPUT BUFFER TO PRINTER <@> EXECUTE DOS COMMAND
<U>C - LC CONVERSION   <Z> COLD START
                        <SHIFT ↑ > + LETTER = SENDS PRINTER CODE
                        <?> HEX DISPLAY OF BUFFER
                        COMMAND? →
```

Figure. Screen dump of Dynaterm's menu.

Of Model III's & Modems

by Thomas L. Quindry

Program Listing 2 shows the changes you must make to run Dynaterm on a Model III. Model I/III owners might also want to make the changes in Program Listing 3, which improve reliability of baud rate, word, stop, and parity settings during initialization. Listing 3 also provides defaults of 8-bit words, 1 stop bit, no parity, and 300 baud.

In all listings, even multiples of 10 are replacement lines and others are additional lines. Don't copy remarks; compilation memory is scarce.

In Listing 2, line 2650's DOS command buffer location is correct for NEWDOS/80, DOSPLUS 3.4, and TRSDOS 1.3; it might differ if you use another DOS.

Also, pressing the break key during a display of the buffer (main menu choice D) slows down the display to make it readable. To slow it even further, make the number in line 6724 larger.

Finally, using OR 07H in line 9940 causes a malfunction with my 300-baud Lynx modem. I suspect that with certain modems, this code puts the unit into answer rather than originate mode.

Listing 4 presents changes to allow TRSDOS 1.3 commands from within Dynaterm. You don't need these for NEWDOS/80 or DOSPLUS; I don't think LDOS, which uses service calls for DOS commands, works either way.

RAM overlays with some DOSes might extend up to 6FFF hex when calling commands, and certain commands may crash your program unless you change line 40 to the minimum clear memory address.

For instance, the @ (DOS Ready) command hangs up under Model III DOSPLUS, unless you change the ORG in line 40 to 7000H. See your DOS manual for minimum memory constraints.

Program Listings 3, 5, and 6 give both Model I and III owners the ability to use Dynaterm with Lynx or Hayes auto-dial modems. You need Listing 4 for both; Listing 5 applies to 300-baud Lynx or similar modems, while Listing 6 is for 300-baud Hayes owners.

The delays in Listing 5's lines 11954 and 11956 are OK to get a dial tone, and line 12470 gives the proper delay between dial pulses where I live. You might have to vary them to suit.

Line 3655 lets you hang up the Lynx with Dynaterm's Q command when a carrier signal is present. Lines 3650 through 3654 do the same for the Hayes in Listing 6. ■

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amount (30 decimal). Uses Input routine 05D9 hex in ROM. Line 12140 outputs a number to the cassette port (255 decimal). A 4 means the latches relay is closed; zero means it's open.

13120-13160: Stores predefined numbers. Substitute your own as detailed above.

13170-13740: Contains text for prompts and correct delay routines for dialing.

13750-14340: Displays the help menu. Scans keys for correct choices only; if you don't press a key, flashes the cursor CHR\$(143), 8F hex.

14350-16310: The Help messages. HL equals message address.

16320-16370: Puts the computer into the 32-column display mode, saving the current cursor position at CURSAV.

16380-16440: Sets normal (64-column) display mode.

16450-16470: Saves the current cursor position as above.

16480-16830: Dumps the contents of the buffer to the printer. 003B hex LPRINTs the character in the accumulator. Checks for busy signal at 37E8 hex (the seventh bit). Scans for P, shift-@, and break (pause, abort, and delay).

16840-16980: Saves all the flags and vectors for warm start.

16990-17100: Restores vectors saved in the above routine for warm start.

17110-17180: Holds the warm start message.

17190-17360: Patches DOS in RAM to allow execution of most Model I DOS commands and return to Dyna-term. 402E hex is the address of the pro-

gram you want executed after a DOS function is complete.

17370-17790: Reverses upper- and lowercase in the data buffer by adding or subtracting 32 decimal from current character. Excludes graphics and control codes.

17800-17840: Outputs two carriage returns (CR) 0D hex to the printer.

17850-18020: Sends the escape code 1B hex (27 decimal) and any character A-Z or 0-9 to the printer. Scans for shift/up-arrow, then outputs code to the printer (003B hex) and scans for any uppercase letters or single-digit numbers. In lines 8260-8270, INP returns the value of the ESC key.

18030-18190: Selects the cold start mode.

18200-18360: Dumps MPH with a CR into the DOS command buffer, satisfying the syntax check earlier in the program.

18370-18730: Converts 2-byte binary to hex and displays it on-screen. Lines 18660-18720 check to see if it's necessary to add the difference (55 decimal) to print a letter if the number is equal to or more than 10. (10 plus 55 equals 65 decimal, ASCII for A.)

18740-19700: Contains data for the graphics title banner.

19710: Defines the end of the program, hence the start of the data buffer.

19720: Equates the transfer address for loading and execution of Dyna-term. ■

Contact David M. Fischer at 141-20 72nd Ave., Flushing, NY 11367.

Program Listing 1. Dynaterm main program (Model I).

Note: Dynaterm works with all DOSes, but one command—@ or DOS Ready—hangs up under DOSPLUS. Model III owners can use DOSPLUS by changing line 40 (see sidebar).

```

00010 ;DYNATERM WRITTEN BY DAVID M. FISCHER
00020 ;FOR THE TRS-80 MODEL I
00030 ;LAST UPDATE: 03/22/83
00040      ORG      5200H
00050 BUFFER  DEFS  256
00060 DBUFF   DEFS  50
00070 FCBV    DEFS  32
00080 WARM    DEFB  00H
00090 LPR     EQU   003BH
00100 XCURS   DEFB  00H
00110 CHRR    EQU   94D
00120 XBAUDV  DEFB  00H
00130 ESCS    DEFS  01H
00140 MSTIT   EQU   0E8H
00150 SAV     DEFS  02H
00160 SAV2    DEFS  02H
00170 XBK     DEFS  04H
00180 KCX     DEFS  04H
00190 KDX     DEFS  04H
00200 BAUD    EQU   0E9H
00210 CTRL    EQU   0EAH
00220 INDT    EQU   0EBH
00230 CURSAV  DEFS  02H
00240 HIMEM   EQU   4049H
00250 DISPL   EQU   0033H
00260 VIDF    DEFB  00H
00270 DELAY   PUSH  BC
00280          PUSH  HL
00290          PUSH  AP
00300          PUSH  DE
00310 LD       BC,30000D
00320 CALL    0060H
5200      00050
0100      0032
0032      0020
5352 00   00080
003B      00090
5353 00   00100
005E      00110
5354 00   00120
0001      00130
0008      00140
0002      00150
0002      00160
0004      00170
0004      00180
0004      00190
0009      00200
000A      00210
000B      00220
0002      00230
4049      00240
0033      00250
5368 00   00260
5369 C5   00270
536A E5   00280
536B F5   00290
536C D5   00300
536D 013075 00310
5370 CD6000 00320

```

Listing 1 continued

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Omniterm

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TRS-80
Model 4
32K memory
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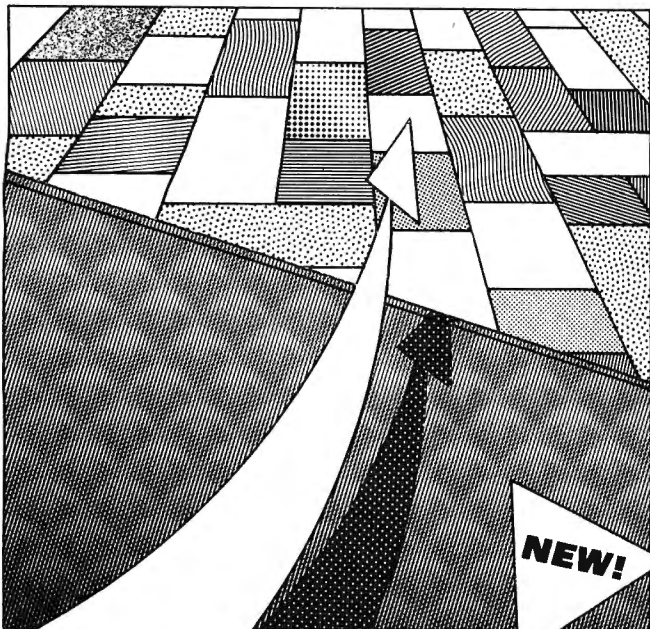
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12, 16
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Listing 1 continued

5373	D1	00330	POP	DE
5374	F1	00340	POP	AF
5375	E1	00350	POP	HL
5376	C1	00360	POP	BC
5377	C9	00370	RET	
5378	E5	00380	SETCUS	PUSH
5379	2A1640	00390	LD	HL, (4016H)
537C	22A753	00400	LD	(FIN+1), HL
537F	218753	00410	LD	HL, BLNK
5382	221640	00420	LD	(4016H), HL
5385	E1	00430	POP	HL
5386	C9	00440	RET	
5387	3A2240	00450	BLNK	LD
538A	B7	00460	OR	A, (4022H)
538B	CAA653	00470	JP	A
538E	2A2040	00480	LD	Z, FIN
5391	DD7E03	00490	LD	HL, (4020H)
5394	EE01	00500	XOR	A, (IX+3)
5396	DD7703	00510	LD	01H
5399	365E	00520	SETCR	LD
539B	CAA053	00530	LD	(IX+3), A
539E	3620	00540	LD	(HL), CHRR
53A0	018301	00550	DSDB	Z, DSDB
53A3	CD0000	00560	CALL	LD
53A6	C30000	00570	FIN	(HL), 20H
53A9	2AA753	00580	NOCSR	LD
53AC	221640	00590	LD	BC, 183H
53AF	C9	00600	RET	0060H
53B0	F3	00610	INPUT	DI
53B1	D8EA	00620	IN	A, (CTRL)
53B3	07	00630	RLCA	
53B4	3027	00640	JR	NC, NDDT
53B6	DBEB	00650	IN	A, (INDT)
53B8	4F	00660	LD	C, A
53B9	3AED58	00670	LD	A, (AHIB)
53BC	B7	00680	OR	A
53BD	2802	00690	JR	Z, ITT
53BF	CBB9	00700	RES	7, C
53C1	D8EA	00710	ITT	IN
53C3	E630	00720	AND	A, (CTRL)
53C5	CAD953	00730	JP	38H
53C8	0F	00740	RRCA	Z, OK
53C9	0F	00750	RRCA	
53CA	0F	00760	RRCA	
53CB	0F	00770	RRCA	
53CC	0E9F	00780	LD	C, 9FH
53CE	DAD953	00790	JP	C, OK
53D1	0E97	00800	LD	C, 97H
53D3	0F	00810	RRCA	
53D4	DAD953	00820	JP	C, OK
53D7	0EBF	00830	LD	C, 0BFH
53D9	79	00840	OK	LD
53DA	B7	00850	OR	A, C
53DB	FB	00860	EI	A
53DC	C9	00870	RET	
53DD	37	00880	NDTT	SCF
53DE	FB	00890	EI	
53DF	C9	00900	RET	
53E0	F3	00910	OUTPUT	DI
53E1	4F	00920	LD	C, A
53E2	D8EA	00930	OUT1	IN
53E4	CB77	00940	BIT	A, (CTRL)
53E6	CAE253	00950	JP	6, A
53E9	79	00960	LD	Z, OUT1
53EA	D3EB	00970	OUT	A, C
53EC	FB	00980	EI	(INDT), A
53ED	C9	00990	RET	
53EE	D3E8	01000	READY	OUT
53F0	D3E9	01010	OUT	(MSTT), A
53F2	79	01020	LD	(BAUD), A
53F3	D3EA	01030	OUT	A, C
53F5	C9	01040	RET	(CTRL), A
53F6	7E	01050	NEXT	LD
53F7	FE0D	01060	CP	A, (HL)
53F9	C8	01070	RET	0DH
53FA	FE20	01080	CP	Z
53FC	C0	01090	RET	20H
53FD	23	01100	INC	NZ
53FE	C3F653	01110	JP	HL
5401	00	01120	START	NEXT
5402	3E00	01130	FILL80	LD
5404	010004	01140	LD	A, 80H
5407	21003C	01150	LD	BC, 1024D
540A	3E00	01160	LOOP80	LD
540C	77	01170	LD	HL, 3C00H
540D	23	01180	INC	A, 80H
540E	0B	01190	DEC	(HL), A
540F	78	01200	LD	HL
5410	B1	01210	OR	BC
5411	20F7	01220	JR	A, B
5413	00	01230	OR80	C
5414	CDEE58	01240	CALL	NZ, LOOP80
5417	217E7B	01250	SIGN	LD
541A	11823C	01260	LD	BITS
541D	01BF00	01270	LD	HL, BANSN
5420	E8B0	01280	LDIR	DE, 3C00H+130D
5422	D9	01290	EXX	LD
5423	0604	01300	LD	BC, 191D
5425	C5	01310	X4	LD
5426	CD6953	01320	PUSH	B, 04H
5429	CD6953	01330	CALL	BC
542C	CD6953	01340	CALL	DELAY
542F	21FF3F	01350	LD	CALL
5432	063C	01360	LD	DELAY
5434	7E	01370	INNN	LD
				HL, 3FFFH
				B, 3CH
				A, (HL)

Listing 1 continued on p. 131

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other	20000	1000	40000	30%	40000
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Use these VisiCalc utilities to develop a Help screen, create a loan amortization program, sort data, combine files, and print mathematical formulas.

Screening for Help

by Alfred S. Williams

Something's missing. VisiCalc comes with a great manual and a handy reference card, but no on-screen assistance.

I've discovered a method for inserting a Help screen on your VisiCalc files. You can use the Help menu to provide specific program instructions or list VisiCalc commands.

Building a Help screen is easy. After you format a spreadsheet, move the

cursor one column to the right of your last entry. Type /GC64 to set the column width to 64 characters and enter your instructions or commands.

VisiCalc doesn't allow individually variable column widths. After you finish the Help screen, type /GC9 to return to VisiCalc's normal nine-character column width.

Your spreadsheet will have several characters dangling off its right side, similar to the example in Fig. 1. Notice that Fig. 1 includes directions to the Help screen in line 3. First-time users appreciate this feature—you might want to incorporate it.

To display your full Help menu, move the column containing it to the upper left corner of the screen and type /GC64 again. Your spreadsheet should resemble the example in Fig. 2.

Simply exclude the Help screen from your print parameters if you don't want to print it. □

```

Row 1   Col A   Col B   Col C   Col D   Col E   Col F
2       Your Company
3       Address
4       City,St. Zip
5
6       Jan   Feb   Mar
7       SALES
8       COST
9       PROFIT
% PROFIT   ERROR   ERROR   ERROR
  
```

Help @ Col. F (CW=64)

1- Enter
2- Enter
3- The pr
4- profi
Change
entry

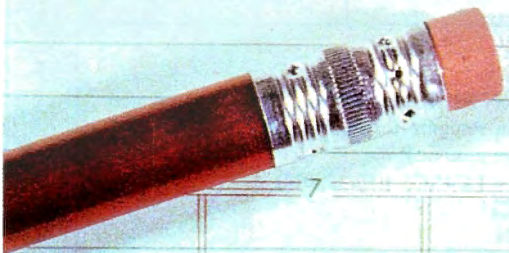
Figure 1. Spreadsheet and Help screen with nine-character column width.

```

Col F
COMPANY PROFIT/LOSS STATEMENT
=====
1- Enter Sales for the month from sales report
2- Enter Cost for the month from the cost report
3- The program will compute the monthly profit and
   profit percentage for the month
4- Change column width back to 9, and goto B6 to begin
   entry of data
  
```

Figure 2. Full Help screen with 64-character column width.

Contact Alfred S. Williams at 111 Sullivan Road, Westminster, MD 21157.



40000	100000	50000	15000	13000	350000	2500
50000	20000	60000	20000	24000	10000	300
30000	30000	30000	30000	35000	1500	—
7000	2000	2000	2000	2000	1000	250
7000	2000	3000	2000	15000	1000	10070
130000	150000	135000	78000	83000	363500	13020

Amortified

by Bruce A. Kurtz

You're contemplating the purchase of a \$130,000 home. The bank offers you a 30-year mortgage at 12 percent interest. What will your monthly payments be? And what will your balance be in the eighth month of the 22nd year?

I searched for a 48K Model III amortization program that prints a month-to-month mortgage balance with separate totals for interest and principal, but I couldn't find one. So I customized VisiCalc. Here's the result.

My loan payment schedule provides the monthly payment; a month-to-

The Key Box

All these programs run on the Model III and require 48K Disk Basic and VisiCalc. The program in Secret Formula also requires a printer.

Table 1. Entries to create loan schedule.

Entry	Function
/GRM	Sets manual recalculation
/GC9	Sets column width to nine characters
/GF\$	
/GOR	Sets order of calculations for row

The remaining entries must be made at the designated spreadsheet locations.

Location	Entry
D2:	PAYMENT
E2:	SCHEDULE
A4:	LOAN
B4:	AMOUNT
C4:	/FI9000
A5:	INTEREST
B5:	RATE
C5:	12
A6:	TERM
C6:	5
B8:	I
C8:	+ C5/12/100
B9:	V
C9:	1/(1 + C8)
B10:	PAYMENT

Table 1 continued

Table 1 continued

C10: +C4*C8/(1-(C9A(12*C6)))
 B11: VAN
 C11: +C9A(12*C6)
 B12: YEAR
 C12: 1
 B13: M-1
 C13: 12*(C12-1)
 B14: BASE M
 C14: /FI @IF(C12=1,0,(C4/(C9AC13)*(C9A
 C13-C11)/(1-C11)))
 A14: /FR
 A16: /FR MONTH
 B16: /FI
 C16: /FR B-1
 D16: /FI @IF(B16=0,0,B16-1)
 E16: /FR BASE B
 F16: /FI @IF(B16=0,0,(C4/(C9AD16)*
 (C9AD16-C11)/(1-C11)))
 A17: /FR BALANCE
 B17: /FR INTEREST
 C17: /FR PRINCIP
 D17: AL
 A18: /FI @IF(B16=0,0,(C4/(C9AB16)*(C9A
 B16-C11)/(1-C11)))
 B18: +C8*F16
 C18: @IF(B16=0,0,C10-B18)
 A20: /FR
 None: /R enter key B20.D20 (The /R denotes replicate. With
 the cursor at A20, type /R, press the enter key, type
 B20.D20 and press the enter key. You can also type /R,
 press the enter key, type B20, press the right-arrow key,
 type a period, D20, and press the enter key.)
 A20: MONTH
 B20: BALANCE
 C20: INTEREST
 D20: PRINCIP
 E20: AL
 A21: /FI1+(12*(C12-1))
 B21: /FI+C4/(C9AA21)*(C9AA21-C11)/
 (1-C11)

None: /R enter key B22.B32 NNR NRN N (The N and R after
 B32 are in response to the replicate: N=no change,
 R=relative prompt.)
 C21: @IF(A21=1,C4*(C5/100)/12,D14)
 D21: +C10-C21
 A22: /FI1+A21
 None: /R enter key A23.A32 R
 C22: +C8*B21
 None: /R enter key C23.C32 NR
 D22: +C10-C22
 None: /R enter key D23.D32 NR
 A33: /-
 None: /R enter key B33.D33
 B34: /FR
 None: /R enter key C34.D34
 B34: PMTS
 C34: INT
 D34: PRIN
 A35: YR. TOTAL
 B35: /FI+C10*12
 C35: /FI@SUM(C21.C32)
 D35: /FI@SUM(D21.D32)
 A36: /-=
 None: /R enter key B36.D36
 /GRA

Variable	Function
A	Loan amount
I	Interest rate in decimal form
N	Number of periods in years
V	1/(1+I)
M	(12*N)-1
BASE M	Finds P and I for first year of any one-year group
MONTH, B-1	Finds values for a single month
BASE B	Finds values for a single month

Table 2. Variables used in Table 1.

PAYMENT SCHEDULE				
LOAN	AMOUNT	90000		
INTEREST	RATE	12.00		
TERM		5.00		
	I	0.01		
	V	0.99		
	PAYMENT	2002.00		
	V*N	0.55		
	YEAR	1.00		
	M-1	0.00		
	BASE M	0	0.00	
MONTH	0	B-1	0	BASE B
BALANCE	INTEREST	PRINCIPAL		
0	0.00	0.00		
MONTH	BALANCE	INTEREST	PRINCIPAL	
1	88898	900.00	1102.00	
2	90000	888.98	1113.02	
3	90000	900.00	1102.00	
4	90000	900.00	1102.00	
5	90000	900.00	1102.00	
6	90000	900.00	1102.00	
7	90000	900.00	1102.00	
8	90000	900.00	1102.00	
9	90000	900.00	1102.00	
10	90000	900.00	1102.00	
11	90000	900.00	1102.00	
12	90000	900.00	1102.00	
YR. TOTAL	PMTS	INT	PRIN	
	24024	10789	13235	

Figure 3. Spreadsheet after initial entries.

month breakdown of the loan balance, interest, and principal; and each year's total payments, interest, and principal. You can use the schedule for any installment loan, such as a mortgage or new-car loan.

Getting Started

To create the schedule, open VisiCalc to a clear spreadsheet and enter the values listed in Table 1. The spreadsheet uses long formulas; be careful when entering them.

I set the first values in Table 1 for manual recalculation (/GRM) to speed the initial entry, but this creates inaccurate figures (see Fig. 3). The last instruction in Table 1 (/GRA) sets the spreadsheet for automatic recalculation and corrects the figures (see Fig. 4).

Table 1 uses an example loan of \$90,000, a 12 percent interest rate, and a five-year term. (See Table 2 for a list of the variables used in Table 1.)

PAYMENT SCHEDULE				
LOAN	AMOUNT	90000		
INTEREST RATE		12.00		
TERM		5.00		
	I	0.01		
	V	0.99		
	PAYMENT	2002.00		
	V^N	0.55		
	YEAR	1.00		
	M-1	0.00		
	BASE M	0	0.00	
MONTH	0	B-1	0	BASE B
BALANCE	INTEREST	PRINCIPAL		0
0	0.00	0.00		
MONTH	BALANCE	INTEREST	PRINCIPAL	
1	88898	900.00	1102.00	
2	87785	888.98	1113.02	
3	86661	877.85	1124.15	
4	85525	866.61	1135.39	
5	84379	855.25	1146.75	
6	83220	843.79	1158.21	
7	82051	832.20	1169.80	
8	80869	820.51	1181.49	
9	79676	808.69	1193.31	
10	78471	796.76	1205.24	
11	77253	784.71	1217.29	
12	76024	772.53	1229.47	
YR. TOTAL	PMTS	INT	PRIN	
	24024	10048	13976	

Figure 4. Spreadsheet after completing entries.

PAYMENT SCHEDULE				
LOAN	AMOUNT	130000		
INTEREST RATE		12.00		
TERM		30.00		
	I	0.01		
	V	0.99		
	PAYMENT	1337.20		
	V^N	0.03		
	YEAR	1.00		
	M-1	0.00		
	BASE M	0	0.00	
MONTH	260	B-1	259	BASE B
BALANCE	INTEREST	PRINCIPAL		84771
84282	847.71	489.48		
MONTH	BALANCE	INTEREST	PRINCIPAL	
1	129963	1300.00	37.20	
2	129925	1299.63	37.57	
3	129887	1299.25	37.94	
4	129849	1298.87	38.32	
5	129810	1298.49	38.71	
6	129771	1298.10	39.09	
7	129732	1297.71	39.48	
8	129692	1297.32	39.88	
9	129652	1296.92	40.28	
10	129611	1296.52	40.68	
11	129570	1296.11	41.09	
12	129528	1295.70	41.50	
YR. TOTAL	PMTS	INT	PRIN	
	16046	15575	472	

Figure 5. Example mortgage schedule.

The spreadsheet has two primary equations. $PMT = I * A / (1 - (V \wedge N))$ finds the payment needed to amortize (pay off) the loan. The equation in C10 of Table 1 calculates the payment. $Bal(i) = PV / (V \wedge i * (V \wedge i - (V \wedge N))) / (1 - (V \wedge N))$ generates the balance remaining after any payment. A18 calculates the balance.

To produce the circumflex (\wedge) used in many of the formulas, press shift-control on your Model III.

Once you finish entering Table 1, try running the values mentioned in the

first paragraph of this article. At the Loan Amount line, enter 130,000. Enter 12 for the interest rate, 30 for the term, and 1 for the year. The spreadsheet will display the monthly payment and the balance of interest and principal for each month of the first year.

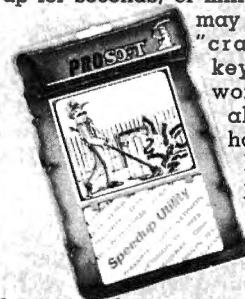
To see the balance for the eighth month of the 22nd year, enter 260 ((12 months * 21 years) + 8 months) at the Month line near the middle of the spreadsheet. Your spreadsheet should now look like Fig. 5.

To set the spreadsheet for your own

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calculations, just enter a loan amount, interest rate, and term. Change the year to see a breakdown of any year's payments, or the month to see a particular month's payment.

My loan schedule uses only two of over 30 special commands in VisiCalc (@SUM and @IF). You might try some of the others to see what you can develop. □

Contact Bruce Kurtz at 2765 Brattle Lane, Clearwater, FL 33519.

Shorter Sorts



by Frank Jansen

Sorting in VisiCalc is like pulling teeth. It's painful. You have to take data out of the spreadsheet, sort it, and then get it back into the spreadsheet in a form VisiCalc can handle.

I've written a Basic program called VC Sorter that makes the whole process a lot simpler (see Program Listing 1). VC Sorter sorts the rows of a spreadsheet using the data interchange format (DIF). VC Sorter sorts alpha or numeric data in ascending order, and numeric data in descending order.

You can avoid disk shuffle by loading the program onto your VisiCalc disk. Before you can use VC Sorter, you

must create a DIF file. Load a spreadsheet onto VisiCalc and move the column you want sorted to the left corner of the screen.

Then move the cursor over the first item you want sorted, and type /S#S. You should avoid sorting rows with fixed data, such as column headings and column totals.

VisiCalc prompts you for a file name, and the file's lower right coordinate. Press the enter key when VisiCalc prompts you for R (row) or C (column).

Your DIF file is now complete. Exit VisiCalc, go to Basic, then load and run VCSORTER/BAS. VC Sorter prompts you for a file name and the number of the first item you want sorted. The default (pressing the enter key) starts the sort on row 1.

You have three sorts from which to choose. For a sort in ascending alphabetical order, A-Z, enter 1 or 2. Enter 3 for an ascending numeric sort or 4 for a descending numeric sort.

VC Sorter saves your sort in the DIF file, and prompts you to return to VisiCalc by rebooting. Load your original spreadsheet, then type in /SL and your file name. Your sorted columns should appear on the spreadsheet.

Due to the complexity of sorting in VisiCalc, VC Sorter adds an additional zero value row at the end of your sort column. You can delete it by typing in /DR.

Variable	Function
AS	Centers print copy
CS	Tags sorts
CS(Print symbols
D#	Dummy for reading DIF files
D\$	DIF file string item
D\$(Sorting string array
D1#	DIF file numeric data
D1#(Sorting numeric array
DX	Clears numeric sort
F#	Determines string length
FI#	Alternate for F#
FR(Address from which to move item
I,10,I1,I3,I4	Loop counters
IG	Moves sort tag
IS	Sorted array loop counter
R	Sort sequence's bottom row
RC	Items to be sorted
RF(Row number from which item is moved
RS	Starting row number
RSS	Starting row address
SO	Sort type
T	Reads DIF file string value
T#	Determines move address
T\$(Print statements
TD	Name of DIF file
TS(Address to which item is moved
WL	Sort range and measure

Table 3. Variable list for VC Sorter.

Inside Sorts

VC Sorter consists of several parts (see Table 3 for a list of VC Sorter's variables). Lines 120-180 identify data; they do not affect program operation. Lines 190-210 provide the data VC Sorter needs to function. Lines 200 and

210 let the program start sorting at a row other than the first on a spreadsheet.

Lines 220-290 retrieve data from the DIF file. Line 240 determines the number of sorted rows (RC), and sets up the arrays that hold data (D\$(R)), item ad-

Program Listing 1. VC Sorter.

```

100 'VC SORTER 7/14/83 BY FRANK JANSEN:REVISED TO ACCOMODATE NUM
ERICAL SORTS.
110 CLEAR 20000:DEFINT I,R:DEFSTR F,T
120 C$(1)=CHR$(21)+C$(2)=CHR$(244)+CHR$(245)+CHR$(246):C$(3)=CHR$(
194)+CHR$(32)+CHR$(194)+CHR$(32)+CHR$(194):C$(4)=CHR$(239):GOTO14
0
130 PRINTTAB(32-(LEN(A$)/2))A$:RETURN
140 T$(1)=C$(1)+C$(3)+" VC S O R T E R "+C$(3)
150 T$(2)=" by Frank Jansen "
160 T$(3)=C$(4)+" COPYRIGHT 1983 by MRI Supply Co. "+C$(1)
170 T$(4)="340 Cevera Dr.; Dunedin, FL 33528"
180 CLS:PRINT:PRINT:FORI=1TO4:A$=T$(I):GOSUB 130 :NEXT:PRINT:PRIN
T
190 A$=C$(1)+C$(2)+" ENTER THE NAME OF YOUR SORT FILE (INCLUDE /D
IF)"+C$(1):GOSUB 130 :LINEINPUT TD
200 PRINT:PRINTC$(1)+C$(2)+" ENTER THE NUMBER OF THE ROW ON WHICH
TO START SORT (default is 1)"+C$(1):INPUT RS:IF RS=0 THEN RS=1
210 RS$=STR$(RS):F#=LEN(RS$):RS$="A"+RIGHT$(RS$,F#-1)
220 OPEN "I",1,TD
230 INPUT#1,T,D#,D1#,D$
240 IF T="VECTORS" THEN RC=D1#:R=RC+RS-1:DIM D$(R),D1$(R),FR(R),TS
(R),RF(R):C$="/"
250 IF T="DATA" THEN 270
260 GOTO 230
270 PRINT"ALPHA SORT (A TO Z) -TYPE 1 (or 2):":PRINT"NUMERIC SORT
(9 TO 1) -TYPE 3: NUMERIC SORT (1 TO 9) -TYPE 4:":INPUT SO
280 IF SO<1 OR SO>4 THEN 270
290 IF SO>2 THEN 610
300 FOR I=RS-1 TO R:INPUT#1,D#,D1#,D$
310 D$(I)=D$+C$+STR$(I+1)
320 NEXT:CLOSE
330 CHD "O",RC,D$(RS)
340 FORI1=RS TO R
350 FI#=LEN(D$(I1))-INSTR(D$(I1),"/"):RF(I1)=VAL(RIGHT$(D$(I1),FI#
))
360 NEXTI1
370 GOSUB 680
380 OPEN "O",1,"SORT/VC"
390 PRINT#1,"/GRM"
400 PRINT#1,">";
410 PRINT#1,RS$
420 PRINT#1,"/IR."
430 FORI3=RS TO R
440 FR(I3)=STR$(RF(I3)):F#=LEN(FR(I3)):FR(I3)="A"+RIGHT$(FR(I3),F#
-1)
450 PRINT#1,">";
460 PRINT#1,FR(I3)
470 PRINT#1,"/M."
480 PRINT#1,TS(I3)
490 IF RF(I3)>I3+1 THEN GOSUB 570
500 NEXTI3
510 PRINT#1,">A1"
520 PRINT#1,"/GRA"
530 PRINT#1,CHR$(00);
540 CLOSE
550 CLS:PRINT@400,C$(1)+C$(2)+" FINISHED - GO BACK TO VC"+C$(1)
560 END
570 FOR I4=RS+1 TO R
580 IF RF(I4)=>RF(I3) THEN 600
590 RF(I4)=RF(I4)+1
600 NEXTI4:RETURN
610 FORI=RS-1 TO R:INPUT#1,D#,D1#,D$
620 D1$(I)=D1#+RF(I)=I+1:NEXTI:CLOSE:GOSUB 630 :GOSUB 680 :GOTO
380
630 CLS:FOR IS=RS TO R:GOSUB640 :RF(IS)=IG+1:PRINTRF(IS);" = ";D1
$(IG):D1$(IG)=DX:NEXTIS:RETURN
640 IF SO=3 THEN DX=-1000000:WL=-999999:FOR I0=RS TO R:IFD1$(I0)=D
X THEN 670 ELSE IF D1$(I0)>WL THEN WL=D1$(I0):IG=I0:GOTO 670
650 IF SO=3 THEN 670
660 DX=100000001:WL=100000000:FOR I0=RS TO R:IFD1$(I0)=DX THEN 670
ELSE IF D1$(I0)<WL THEN WL=D1$(I0):IG=I0
670 NEXTI0:RETURN
680 FORI1=RS TO R
690 TS(I1)=STR$(I1):T#=LEN(TS(I1)):TS(I1)="A"+RIGHT$(TS(I1),T#-1)
700 NEXTI1:RETURN

```

End

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dresses (FR(R); TS(R)), and the original row number for adjustment (RF(R)).

In line 240, VC Sorter uses C\$ to peel the tag off sorted data. If the sort is numeric, the program jumps to line 610. The program reads alpha sorts at line 300 and tags the data with its original row number in line 310.

Line 330 contains the alpha sort. If you don't have CMD "O" sort capability, you should replace this routine with your favorite sort routine. To determine the new location of the row (line 370) and peel off the original row number (line 350), make sure you use a sort that rearranges the D\$ array.

VisiCalc addresses contain a letter and number with no space between them. This makes it difficult for VC Sorter to combine the string version of a number and a letter. For example, STR\$(1) produces "1", not "1". Lines 350, 440, and 690 remove unwanted space by reading only a portion (RIGHT\$) of the string.

Line 390 turns off the automatic recalculation function to speed processing. Lines 400-420 then insert a blank line in the first row of the sort.

Line 440 sets the address for the first item VC Sorter moves, and lines 450-480 insert the Move command. Line 490 determines if the last item moved is the top item on the list. If it is, the subroutine in line 570 adjusts the row locations of the remaining items.

After VC Sorter prints all the Move commands into the file, lines 510-520 reinstitute the automatic recalculation function and close the file.

Line 550 prints the display to inform you that the sort is complete. To make VC Sorter automatically return to VisiCalc, change line 560 to CMD "I", "VC". □

Contact Frank Jansen at Route 2, Box 130, N. Bangor, NY 12966.

Growing Pains

by George A. Marcoulides

VisiCalc wasn't big enough. When I entered a complex spreadsheet for my company, I often encountered a flashing screen indicating that I'd run out of

	A	B	C	D	E
1	Name	Position	Gross Pay	Deductions	Net Pay
2	Jane A.	Manager	2,300	425	1,875
3	Jill Key	Secretary	1,700	300	1,400
4					
30	Total for Shipping Department		4,000	725	3,275

Figure 6. Spreadsheet saved with /SS.

	A	B	C	D	E
1	Total for Shipping Department		4,000	725	3,275

Figure 7. Section of Fig. 6 saved with /S#S.

	A	B	C	D	E
1	Total for Shipping Department		4,000	725	3,275
2					
3	Total for Marketing Department		5,000	800	4,200
4					
5	Totals		\$9,000	\$1,525	\$7,475

Figure 8. Tally sheet composed of several DIF files.

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space. Some experimentation showed me that my formulas were tying up lots of memory.

VisiCalc's data interchange format (DIF) function solved my problems. It saves part of a spreadsheet—without formulas—on disk, and, since it saves data in a standardized format, you can load that information onto another spreadsheet at any time.

I decided to make several smaller spreadsheets, one for each department in my company, and a final tally sheet incorporating the totals produced on the department sheets.

To create a DIF file, move the cursor to the upper left coordinate of the area you want to save and type /S#S. VisiCalc prompts you to enter a file name, move the cursor to the area's lower right

coordinate, and choose a format depending on the portion of the spreadsheet you're working on. The format choices are R (row), C (column), and the enter key (default).

To recall the information on a DIF file, type in /S#L FILE NAME/DIF. VisiCalc again displays the format prompt. Press R or C to change the file's format, or the enter key to keep its assigned format.

Figure 6 shows a typical spreadsheet saved with VisiCalc's /SS command. Figure 7 shows a portion of the spreadsheet in Fig. 6 saved with the /S#S command, and Fig. 8 shows a final tally sheet produced by combining several DIF files. □

Program Listing 2. Formula lister for VisiCalc files.

```

10 CLS ' FORMULA LISTER FOR VISICALC FILES
20 CLEAR 10000
30 IF (PEEK(14312) AND 240) = 48 THEN 50 ' CHECK PRINTER
40 INPUT "PRINTER NOT READY, <ENTER> TO CONTINUE";K$:GOTO 10
50 DIM A$(200)
60 PRINT@ 143,"FORMULA LISTER FOR VISICALC FILES"
70 PRINT@ 273,"STOP AFTER EACH PAGE? Y OR N."
80 I$=INKEY$: IF I$="Y" OR I$="N" THEN 90 ELSE 80
90 PRINT : PRINT
100 INPUT "FILENAME ";B$
110 LPRINT "FORMULA LISTING FOR VC FILE ";CHR$(34);B$;CHR$(34)
120 LPRINT : LPRINT : L=3
130 OPEN "I",1,B$
140 I=1
150 ' READ FILE
160 LINE INPUT#1, A$(I)
170 IF LEFT$(A$(I),1) <> CHR$(62) THEN 210 ' LOOK FOR >
180 IF INSTR(A$(I),CHR$(34)) > 0 THEN 210 ' SKIP IF "
190 IF INSTR(A$(I),CHR$(64))+INSTR(A$(I),CHR$(43))+INSTR(A$(I),C
HR$(45))+INSTR(A$(I),CHR$(42))+INSTR(7,A$(I),CHR$(47))+INSTR(A$(
I),CHR$(94))=0 THEN 210 ' LOOK FOR MATH SYMBOLS
200 I=I+1
210 IF EOF(1) THEN CLOSE ELSE 160
220 N=I-1
230 'PRINT FILE IN REVERSE ORDER
240 FOR I=N TO 1 STEP -1
250 LPRINT " ";LEFT$(A$(I),70) : L=L+1
260 IF LEN(A$(I))-70 > 0 THEN LPRINT " ";RIGHT$(A$(I),
LEN(A$(I))-70) : L=L+1
270 IF L>53 THEN LPRINT STRING$(65-L,13):L=0 ELSE 310
280 IF I$="Y" THEN PRINT@657, "<ENTER> TO CONTINUE PRINTING" ELS
E 310
290 J$=INKEY$: IF J$="" THEN 290
300 PRINT@657, STRING$(30," ")
310 NEXT
320 '
330 END

```

End

Contact George A. Marcoulides at California State University, Department of Psychology, Dominguez Hills, Carson, CA 90747.

Formula Secret

by David A. Williams

In contrast to the previous article, I've written a program that lets you save and print only the formulas in a VisiCalc file (see Program Listing 2).

The program is easy to use. Enter Program Listing 2 and type in RUN. The program tells you to check your printer, asks if you want to stop printing after each page, and prompts you to enter a file name. That's all there is to it.

The program prints your file name at the top of the first page, indents line overflow, and prints up to 54 lines on a page. If the last line on a page is too long to print on one page, the program prints the remainder on line 55 instead of jumping to the next page.

VisiCalc stores formulas and labels in ASCII format, but in reverse order. Therefore, the contents of the lower right cell become the first item in a file. Each VisiCalc label and formula is preceded by a greater-than sign (>), the cell column, and the row identification.

Because of VisiCalc's storage quirk, my program stores files in arrays. As the program reads each line, it checks for math and function symbols to determine whether or not the line is a formula. After the program reads the entire file, it prints the formulas in reverse order. ■

Contact David A. Williams at 2452 Chase Circle, Clearwater, FL 33546.

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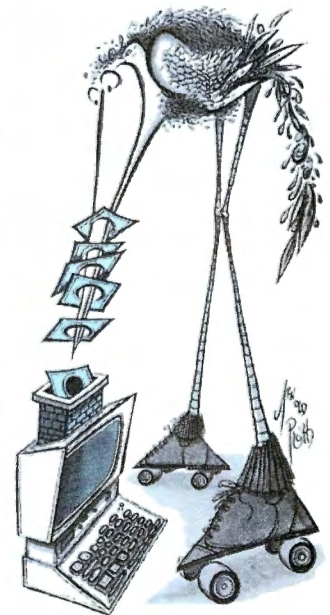
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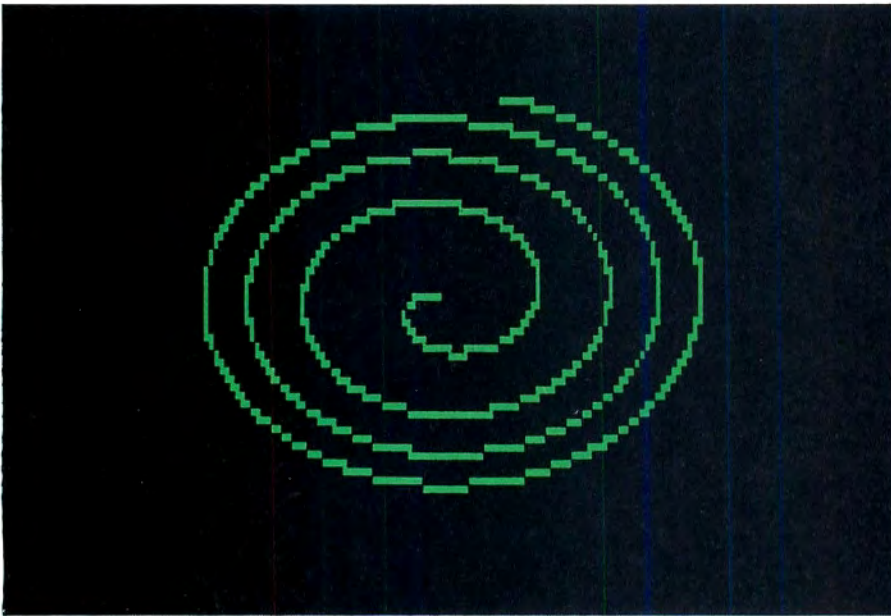


Photo 1. The graph of the polar equation $R = \text{SQR}(A)$.

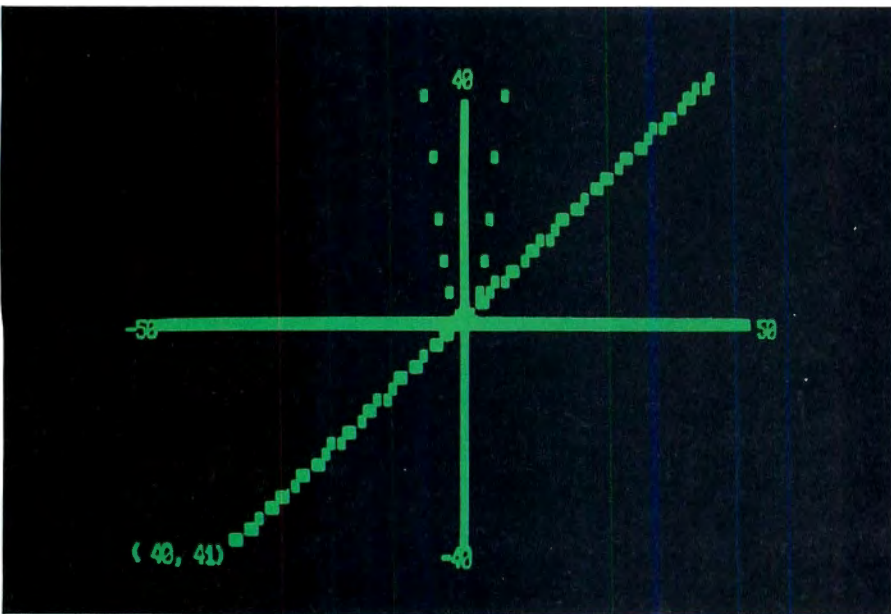


Photo 2. The graph of the Cartesian equations $Y = K0 \times X + K1$, $Y = K2 \times X^2 + K3$, and $Y = K4 \times X + K5$.

EQUAPLOT is a Basic program that calculates equations and plots their results automatically, making comparisons between different sets of data easy (see the Program Listing). It displays the resulting graphs on screen or prints them on an Epson MX-80 printer with Graftrax.

Plotting graphs on your Model I/III is useful for understanding the relationships between variables. Without a program like EQUAPLOT, calculating enough coordinate values to display the graphics is tedious, especially if you want to study the effects of changing one variable or constant in an equation.

EQUAPLOT runs on Models I and III and can display the interaction of up to four equations at once. You can stop or resume execution at any time and change variables, equations, range of values to calculate, or increments between values.

Using the Program

To use EQUAPLOT, type in and load the Program Listing. Then use Basic's edit functions to put your equation(s) in place of those in lines 70-100.

EQUAPLOT runs both Cartesian and polar equations. Cartesian equations calculate coordinates on an X and Y axis, and polar equations calculate coordinates from one point, or pole, and display the results in degrees (see Photos 1 and 2).

Write Cartesian equations in the form $Y = f(X)$ (for example, $Y = 2 * X$

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+ 7), and polar equations in the form $R = f(A)$ (for example, $R = 3 * \sin(A/2)$). Equations for a single graph must be either all Cartesian or all polar.

Use the constants K0-K9 to write your equations. You can change their values while the program runs. For example, in the equation $Y = K2 * X - K3$, you might set $K2 = K3 = 1$ to start, then change the value of the constant before and while plotting.

Now run the program. EQUAPLOT optionally displays instructions for program use, and lets you optionally change the constants from their initial value of 1.

Press the enter key to retain current values, or to skip constants you won't use. Format the equations and the display by responding to the program prompts. You can now begin plotting.

Control Functions

EQUAPLOT accesses 11 functions (listed in Table 1) through an INKEY\$ function to control the program without disrupting the display. The commands are: freeze screen, resume plotting, relocate window, set window size, define initial values, change increment value, display variable values, display axis, print out screen, change equation constants, and clear screen.

You can freeze the action any time during execution by pressing the F key. Hit the enter key to resume execution.

To use the rest of the control functions, you must first hit the enter key, then press the proper function key. Type in new format values where appropriate, or press the enter key again to retain current values. Always hit the enter key to resume execution.

If you can't remember the options, press the R key to display them in the screen's lower left corner. Press the enter key again before typing an option code.

How It Works

Here's an overview of program construction. Refer to Table 2 for an outline of program routines, and to Table 3 for a list of program variables.

First the program skips to line 890 for the title page, then initializes in lines 940-1000. Next line 990 calls a subroutine in line 590 that lets you change constants, and line 1000 calls the subroutine in line 650 that lets you set the format.

The program then jumps back to the main routine (lines 110-280). The For...Next statement in lines 120 and 250 points the variable E at successive equations that the ON E GOSUB statement in line 140 calls.

Key	Action
F	Freeze the screen

Press the enter key first to access the following options:

0	Return to plot
1	Relocate center of window
2	Set window size
3	Define new initial value for X or A
4	Change increment size for X or A
5	Display variable values
6	Display axis
7	Print the screen
8	Change the equation constants
9	Clear the screen

Table 1. List of program options.

Line number	Description
50-100	Equations (accessed by ON E GOSUB, line 140)
110-280	Main routine
120, 280	Point E to equation for plotting
130-140	Solve Y or R (dependent variable)
150-170	Display plot
180-210	Display values of variables (optional)
220-235	Monitor INKEY\$ (access display freeze and options)
270-280	Increment X or A
290-870	Subroutines
300-310	Freeze display (line 235)
330-480	Change display format (line 230)
490-540	INKEY number input
550-570	Review options
580-630	Set equation options (line 990)
640-680	Format display (line 1000)
690-700	Data for options review
710-870	Instructions (line 980)
880-900	Title page
910-1010	Initialize

Table 2. Program outline.

Program Listing. EQUAPLOT.

```

10 '
*****
*           EQUAPLOT           *
*           DWP042383         *
*****

20 'DAVID W. POWELL, VILLA ROSALES C-24, AIBONITO, PR 00609

30 GOTO 890 '      INITIALIZE PROGRAM
50 '
***** SUBROUTINES CONTAINING EQUATIONS *****
60 'FORM FOR CARTESIAN EQUATIONS:  Y = F(X)
   'FORM FOR POLAR EQUATIONS:  R = F(A)

69 P=PEEK(16614)+256*PEEK(16615)
   :RETURN'      LOCATION OF THIS LINE
70 Y = K0 * X + K1
   :RETURN'      EQUATION 1
80 Y = K2 * X[2 + K3
   :RETURN'      EQUATION 2
90 Y = K4 * X + K5
   :RETURN'      EQUATION 3
100 Y = K6 / X + K7
   :RETURN'      EQUATION 4
102 '
***** TRAP ERRORS *****

```

Listing continued

Variable	Initial value	Description
K0-K9, K(0)-K(9)	1	Equation constants
Display Format		
D(0)	1	Number of equations to plot
D(1)	1 or 2	Type of equation: Cartesian = 1, Polar = 2
D(2)	-50 or 0	Initial value of X or A
D(3)	1	Plotting increment for X or A
D(4)	0	Location of window center (X)
D(5)	0	Location of window center (Y)
D(6)	100 or 5	Window size—width
D(7)	.8 × D(6)	—height
D(8)	1	Display of variable values: Off = 0, On = 1
K	.01745329	Degrees-to-radians conversion
A		Angle (radians)
T		Angle (degrees)
R		Radius
X		Independent variable (Cartesian)
Y		Dependent variable (Cartesian)
CX, CY		Set point (horizontal, vertical)
I		Invalid value flag: valid = 0, invalid = 1
E		Equation pointer
F, FS		Miscellaneous integers
N		Miscellaneous single precision
S, SN		Miscellaneous strings
S(1), S(2)		Strings for display of variable values
L		Eraser blanks

Table 3. Variables list.

Listing continued

```

104 I=1:RESUME 108'      INVALID EQUATION VALUE
106 RESUME 190'         INVALID SET VALUE
108 RETURN'           FROM ERROR TRAP
110 '
*****
*           MAIN ROUTINE           *
*****

120 FOR E=1 TO D(0)'      E = EQUATION TO PLOT
130 '
***** SOLVE FOR Y OR R *****
140 ON ERROR GOTO 104
      :ON E GOSUB 70,80,90,100
      :IF D(1)=2 X=R*COS(A):Y=R*SIN(A)
150 '
***** SET POINT *****
160 ON ERROR GOTO 106
      :IF I=0 CX=INT(64+128/D(6)*(X-D(4))+.5)
      :CY=INT(24-48/D(7)*(Y-D(5))+.5)
      :SET(CX,CY)
170 ON ERROR GOTO 0
180 '
***** DISPLAY VARIABLES' VALUES *****
190 IF D(8)=0 THEN 230'   SKIP DISPLAY OF VALUES
200 IF I=1 THEN S(2+(D(1)=2))="INVALID":I=0

      ELSE IF D(1)=1 THEN S(2)=STR$(Y)
      ELSE IF D(1)=2 THEN S(1)=STR$(R)' DEPENDENT VAR'S VALUE
210 PRINT @960,STRINGS(L,32);
      @960,"(S(1)","S(2)");
      :L=LEN(S(1))+LEN(S(2))+3' DISPLAY VALUES, GET LENGTH
220 '
***** MONITOR INKEY$ *****
230 S=INKEY$:IF S<>" " THEN IF ASC(S)=13
      GOSUB340
235 IF S="F" GOSUB 310      'FREEZE
240 '
***** GET NEXT EQUATION *****
250 NEXT E
260 '
***** GET NEXT X OR A VALUE *****
270 X=X+D(3):T=T+D(3):A=T*K
      :IF D(1)=1 THEN S(1)=STR$(X)
      ELSE S(2)=STR$(T)+" deg."
280 GOTO 120' PLOT NEXT X OR A VALUE
290 '

```

Listing continued

After EQUAPLOT graphs a point for X (Cartesian) or A (polar) for all equations, it drops through the For...Next routine to line 270. Here it increments X or A and jumps to line 140 to start the main routine again.

In the main routine, line 140 calls the equations that get the values for Y or R. It also sets up an error trap so the program doesn't stop when you divide by zero. If you are using polar equations, it changes R and A into the screen coordinates X and Y.

Line 160 calculates and displays the Set points for X and Y. A second error trap disposes of values set off the screen. Line 140 eliminates this error trapping routine to make debugging the rest of the program easier.

EQUAPLOT displays the coordinates upon request in lines 200-210. If it can't calculate a value, the program displays a message declaring Y or R invalid. Lines 230-235 monitor INKEY\$.

To speed execution, EQUAPLOT first assigns values to frequently used variables in lines 940-950. Subroutines that the program calls frequently are at the beginning of the listing. Remove remarks and spaces to save more time and memory space.

The program evaluates the expression $D(1)=2$ in line 200 and replaces it with -1 if it's true and zero if it's false. This changes the array number S(n) and the display position of the word "invalid" (see also lines 660 and 967). Using expressions in this way is a handy technique. You can demonstrate it by plotting the equation $Y = 10 + 20 * (X > 0)$.

Lines 69, 965, and 967 find out whether the equations are Cartesian or polar. Line 965 calls the subroutine at line 69, the line preceding your first equation. Line 69 PEEKs locations 16614-16615, which point to the memory location just before the line containing the Basic command in use. This PEEK gets the address just previous to the beginning of line 69.

The program must identify the address of the equation in line 70. The first two locations of a line point to the beginning of the next line; in this case line 70 is the location of your first equation. EQUAPLOT calculates this address after returning to line 965.

If you enter this equation properly, the first letter of the line is a Y if your equation is Cartesian or an R if it is polar. In line 967, the program starts PEEKing for an $ASC(R)=82$ or $ASC(Y)=89$. If it finds one, it sets the D(1) flag. If it first finds a zero or remark statement, EQUAPLOT displays an error message and stops.



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Name _____
Address _____
City _____ State _____ Zip _____

Tidbit #4

Before checking on the price of a stock market option (put or call) you have to know the letter code for the expiration month and strike price. This routine solved the problem for me.

Bill Snyder
Columbus, OH

```

1 CLEAR 500:DIMMM$(13),PP$(13),M1$(20),P1$(20)
2 CLS:INPUT"WHAT IS THE LETTER CODE FROM THIS STOCK";SS$:INPUT"F
IRST LISTED MONTH (3 LETTERS PLEASE)";M$:INPUT"STRIKE PRICE";P$:
INPUT"<C>ALL OR <P>UT";C$
3 FOR X=1TO12:READMM$(X),PP$(X):IFM$=MM$(X)THENA$=PP$(X)
4 NEXT:FORX=1TO20:READM1$(X),P1$(X):IF P$=M1$(X)THENB$=P1$(X)
5 NEXT:RESTORE:IF A$=""OR B$=""THEN PRINT "PLEASE START AGAIN":F
OR XX=1TO1500:NEXT:GOTO2
6 A2$=CHR$(ASC(A$)+3):IFASC(A2$)>76 THEN A2$=CHR$(ASC(A2$)-12)
7 A3$=CHR$(ASC(A$)+6):IFASC(A3$)>76 THEN A3$=CHR$(ASC(A3$)-12)
8 IF C$="P" THEN GOSUB 17
9 TT$=SS$+A$+B$:IF LEN(TT$)<5 THEN TT$=TT$+CHR$(46)
10 T2$=SS$+A2$+B$:IF LEN(T2$)<5 THEN T2$=T2$+CHR$(46)
11 T3$=SS$+A3$+B$:IF LEN(T3$)<5 THEN T3$=T3$+CHR$(46)
12 PRINT:PRINT:PRINT:PRINT"THE CODE FOR FIRST MONTH ("M$") IS =
"TT$:PRINT"THE CODE FOR THE MIDDLE ONE IS = "T2$:PRINT"AND, FOR
THE LAST ONE, IT IS = "T3$
13 IF C$="P" PRINT"THIS IS A PUT!"
14 END
15 DATA JAN,A,FEB,B,MAR,C,APR,D,MAY,E,JUN,F,JUL,G,AUG,H,SEP,I,OC
T,J,NOV,K,DEC,L
16 DATA 5,A,10,B,15,C,20,D,25,E,30,F,35,G,40,H,45,I,50,J,55,K,60
,L,65,M,70,N,75,O,80,P,85,Q,90,R,95,S,100,T
17 A$=CHR$(ASC(A$)+12)
18 A2$=CHR$(ASC(A2$)+12)
19 A3$=CHR$(ASC(A3$)+12):RETURN
    
```

Cartesian equations

$Y = K0 * X + K1$
 $Y = K2 * X^2 + K1 * X + K0$
 $Y = 1 / (K3 * X) + K5$
 $Y = \text{SQR}(K0 - X^2), Y = -\text{SQR}(K0 - X^2)$
 $Y = \text{ABS}(K2 * X)$
 $Y = \text{RND}(K4 * X)$
 $Y = \text{SGN}(K0 * X)$

Straight line
 Parabola
 Hyperboloid
 Plot these two equations simultaneously to get a circle.
 Letter V

Polar equations

$R = K0 * A$
 $R = K1 * \text{SIN}(A)$
 $R = K2 * \text{SIN}(K3 * A)$
 $Y = K3 * A * \text{SIN}(A)$
 $R = A * \text{COS}(A) + A * \text{SIN}(A)^2 + 1 / \text{COS}(A)$

Spiral
 Circle
 If $K3 = 3$, trefoil
 Loops
 Beetle: initial angle = -638 degrees,
 increment = $+1$, window size = 64×32 .

Table 4. Example equations.

You can print the screen to an Epson MX-80 printer with Grafrax using option 7. You can also change this routine for different printers.

Program Improvements

Here are a few hints for using EQUAPLOT and developing it further. You can change the program to plot more than four equations at once, but the display tends to look messy.

When you type in the instructions and headings, use the down-arrow key to format the display, and when you display the axes, redraw them after you change the window size or location. It's also a good idea to jot down your equations and constants for reference during plotting or when making changes in the values of constants.

For modifications, I suggest adding an option to select different equations while running EQUAPLOT, rather than plotting them all at once, or adding the capability to plot parametric equations and inequalities.

You can also change window locations and sizes to see what happens to equations for different variable values. EQUAPLOT initially calculates the window height from your input for width, so the display is roughly proportional.

Solve pairs of equations by freezing the screen when their curves meet and noting the variable values. Next refine these values by setting the initial value of X or A to a spot before the curves cross and decrease the increment to observe the coordinate values when the curves meet. Relocating the window and reducing its size might also help.

Some of your program changes might fool the routine that decides whether you are using Cartesian or polar equations. Eliminate lines 69, 965, and 967 so you can set the equation type when you give the display instructions. In line 660, eliminate the expressions $*(F + 4 + (F > 1))$ and $:IF F = 0 F = 1$.

EQUAPLOT uses information about the type of equation to set the initial format values in line 662: D(2), the initial value of X or A; and D(6) and D(7), the window size. You can change these values to suit your own applications.

Table 4 gives sample equations and values for formatting the display. However, to fully enjoy EQUAPLOT and learn the most, you should include your own equations. ■

You can reach David W. Powell at Villa Rosales C-24, Aibonito, Puerto Rico 00609.

Listing continued

```

*****
*                SUBROUTINES                *
*****

300 '
***** FREEZE *****
310 S=INKEY$
    :IF S="" THEN 310 ELSE RETURN
330 '
***** OPTIONS USING INKEY$ *****
340 N=-1
    :PRINT @960,STRING$(L+1,32);@960,"OPTION?";:L=7:GOSUB 500
    :ON N+1 GOTO 350,360,370,380,390,410,430,460,470,480
    :GOTO 340
350 RETURN
360 F=4:GOSUB400:F=5:GOSUB400
    :GOTO 340' LOCATES WINDOW
370 F=6:GOSUB400:F=7:GOSUB400
    :GOTO 340' SIZES WINDOW
380 F=2:GOSUB 400:X=D(2):T=X:A=T*K
    :GOTO 340' INITIAL VALUE DEPEND. VAR.
390 F=3:GOSUB 400
    :GOTO340
        VARIABLE INCREMENT
400
N=D(F):S=SD(F)+"="+STR$(N):PRINT @960,S;:L=LEN(S)

    :GOSUB 500:D(F)=N:RETURN 'SUBR. FOR OPTIONS 1 TO 4

410 D(8)=ABS(D(8)-1):PRINT @960,"VALUE DISPLAY ";
    :IF D(8)=1 THEN PRINT "ON";ELSE PRINT "OFF";
420 FOR F=1 TO 1000:NEXT:PRINT @960,STRING$(18,32);
    :GOTO 340' TOGGLE DISPLAY ON/OFF
430 FOR F=1 TO 127:SET(F,24):SET(64,-F*(F<48)):NEXT
440 PRINT @30,STR$(D(7)/2+D(5));
    @990,STR$(-D(7)/2+D(5));@512,STR$(-D(6)/2+D(4));
    :S=STR$(D(6)/2+D(4)):PRINT @576-LEN(S),S;
    :GOTO 340' DISPLAY AXIS
450 ' LPRINT TO EPSON MX-80 WITH GRAFTRAX
460 LPRINT CHR$(27);";";
    :F=VARPTR(S):POKE F+65536*(F>32767),64
    :FOR FS=15360 TO 16320 STEP 64:FB=INT(FS/256)
    :POKE F+2+65536*(F+1>32767),FB
    :POKE F+1+65536*(F+2>32767),FS-256*FB
    :LPRINT S
    :NEXT:GOTO 340
470 FOR F=0 TO 9:PRINT @960,"K";CHR$(F+48);"=";K(F);
    :N=K(F):L=3+LEN(STR$(N)):GOSUB 500:K(F)=N
    :NEXT :GOSUB 630:GOTO 340' CHANGE CONSTANTS
480 CLS:GOTO 340' CLEAR SCREEN
490 '
***** INKEY NUMBER INPUT *****
500 S="":FS=1
510 SN=INKEY$:IF SN="" THEN 510
    ELSE IF SN="R" THEN GOSUB 560:RETURN
    ELSE IF FS=1 PRINT @960,STRING$(L,32);:FS=0' INPUT NUMBER
  
```

Listing continued

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O N E D I S K A C C O U N T I N G

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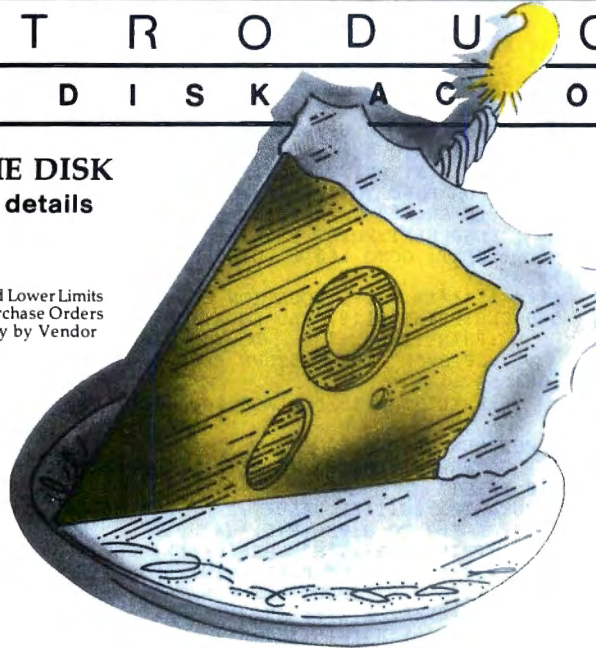
CUSTOMER FILES
Maintains Order Status
Prints Labels
Prints Customer Balances
Prints Statements

3

MAIL LABELS
Stores by Variable File Names
Sorts by Zip Code
Sorts by Name

4

INVENTORY
Sets Upper and Lower Limits
Generates Purchase Orders
Lists Inventory by Vendor



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5

ACCOUNTS RECEIVABLE
Open A/R Accounts
Generates Monthly Statements
Interest and Non-Interest Accounts
Listing of Accounts Balances

6

ACCOUNTS PAYABLE
Enter Charges to Accounts
Enter Payments to Accounts
List Payable Balances

7

CHECK WRITING
Print or Record Checks
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```
520 IF ASC(SN)=13 THEN IF S="" THEN RETURN
      ELSE N=VAL(S):PRINT @960,STRING$(LEN(S),32);
      :RETURN' END INPUT
530 IF ASC(SN)=8 THEN S=LEFT$(S,LEN(S)+(LEN(S)>0))
      ELSE S=S+SN' BACKSPACE, OR ADD NEXT DIGIT
540 PRINT @960,S;" " ;: GOTO 510' GET NEXT DIGIT
550 '
***** REVIEW OPTIONS *****
560 RESTORE
      :FOR F=0 TO 8: READ S: NEXT' SKIP 10 DATA ITEMS
570 FOR F=0 TO 9
      :READ S: PRINT @960,F"-S";
      :FOR FS=0 TO 70: SN=INKEY$
      :IF SN<>" " THEN PRINT @960, STRING$(LEN(S)+4,32);:RETURN
      ELSE NEXT:PRINT @960,STRING$(LEN(S)+4,32);
      :NEXT: GOTO 560' DISPLAY OPTIONS, DELAY
580 '
***** SET EQUATION CONSTANTS *****
590 CLS:PRINT @128,"ALL EQUATION CONSTANTS = 1 INITIALLY"
      :PRINT:INPUT " DO YOU WISH TO CHANGE THEM (Y/N)";S
      :IF S="N" THEN RETURN ELSE IF S<>"Y" THEN 590
600 CLS
      :PRINT TAB(15)"CHANGE EQUATION CONSTANTS

INPUT NEW VALUES,
OR PRESS <ENTER> TO RETAIN CURRENT VALUE"
610 PRINT"
CONSTANT","INITIAL VALUE"," NEW VALUE"
620 FOR F=0 TO 9:FS=(F+6)*64
      :PRINT @FS+2,"K";CHR$(F+48);@FS+20,K(F);
      @FS+40,;:INPUT K(F):PRINT @FS+40,K(F);" ";
      :NEXT' INPUT NEW CONSTANT VALUES
630 K0=K(0):K1=K(1):K2=K(2):K3=K(3):K4=K(4)
      :K5=K(5):K6=K(6):K7=K(7):K8=K(8):K9=K(9)

:RETURN' TRANSFER VALUES FROM ARRAY TO SIMPLE VARS.
640 '
***** FORMAT DISPLAY *****
650 CLS:PRINT "INPUT DISPLAY INSTRUCTIONS,
OR PRESS <ENTER> TO RETAIN CURRENT VALUE."
      :PRINT @192,"VARIABLE";@224,"INITIAL VALUE";
      @240,"NEW VALUE"
660 RESTORE:FOR F=0 TO 8:FS=64*(F+4+(F>1)):READ SD(F)
      :PRINT @FS,SD(F);@FS+37,D(F);@FS+51,;:INPUT D(F)
      :PRINT @FS+52,STRING$(9,32);@FS+51,D(F);
      :IF F=0 F=1:READ SD(F)' INPUT NEW FORMAT VALUE
662 IF F=1 THEN D(2)=50*(D(1)=1):D(6)=100+95*(D(1)=2)
      ELSE IF F=6 THEN D(7)=D(6)*.8' START OF PLOT, WINDOW SIZE
665 NEXT F
670 CLS:X=D(2):T=X:RETURN
680 DATA NO. OF EQUATIONS," TYPE: CARTESIAN=1, POLAR=2",INITIAL VA
LUE OF VAR.," VARIABLE INCREMENT","WINDOW LOCATION: X"," WINDOW LO
CATION: Y","WINDOW WIDTH," WINDOW HEIGHT","COORD. DISPLAY: ON=1, OF
F=0"
690 '
***** DATA FOR OPTIONS REVIEW *****
700 DATA RETURN,WINDOW LOCATION,WINDOW SIZE,INITIAL X/A,INCREMENT,
DISPLAY VALUES,DISPLAY AXIS,PRINT GRAPH,CHANGE CONSTANTS,CLEAR SCR
EEN
710 '
***** INSTRUCTIONS *****
720 CLS:INPUT"

DO YOU WISH TO SEE THE INSTRUCTIONS (Y/N)";S
:IF S="N" THEN RETURN ELSE IF S<>"Y" THEN 720
730 CLS:PRINT TAB(20)"INSTRUCTIONS
"
740 PRINT"

1. REPLACE THE EQUATIONS IN LINES 70, 80, 90 AND 100 WITH YOUR
OWN EQUATIONS. YOU MAY USE THE CONSTANTS K0 - K9 IN YOUR
EQUATIONS, AND SET THEIR VALUES LATER. THE EQUATIONS CAN BE:"
750 PRINT"
-CARTESIAN, SUCH AS..... Y = K0 * X + K1,

-OR POLAR, SUCH AS..... R = K8 * COS(A).
760 PRINT"

2. NOW RUN THE PROGRAM."
770 GOSUB 870
780 PRINT"
3. CHANGE THE INITIAL VALUES (=1) OF THE CONSTANTS K0 - K9,
IF YOU WISH. THESE MAY ALSO BE CHANGED DURING PROGRAM EXE-
CUTION."
790 PRINT"
4. FORMAT EQUAPLOT, FIRST INSTRUCTING THE PROGRAM HOW TO
DISPLAY THE EQUATIONS:
```

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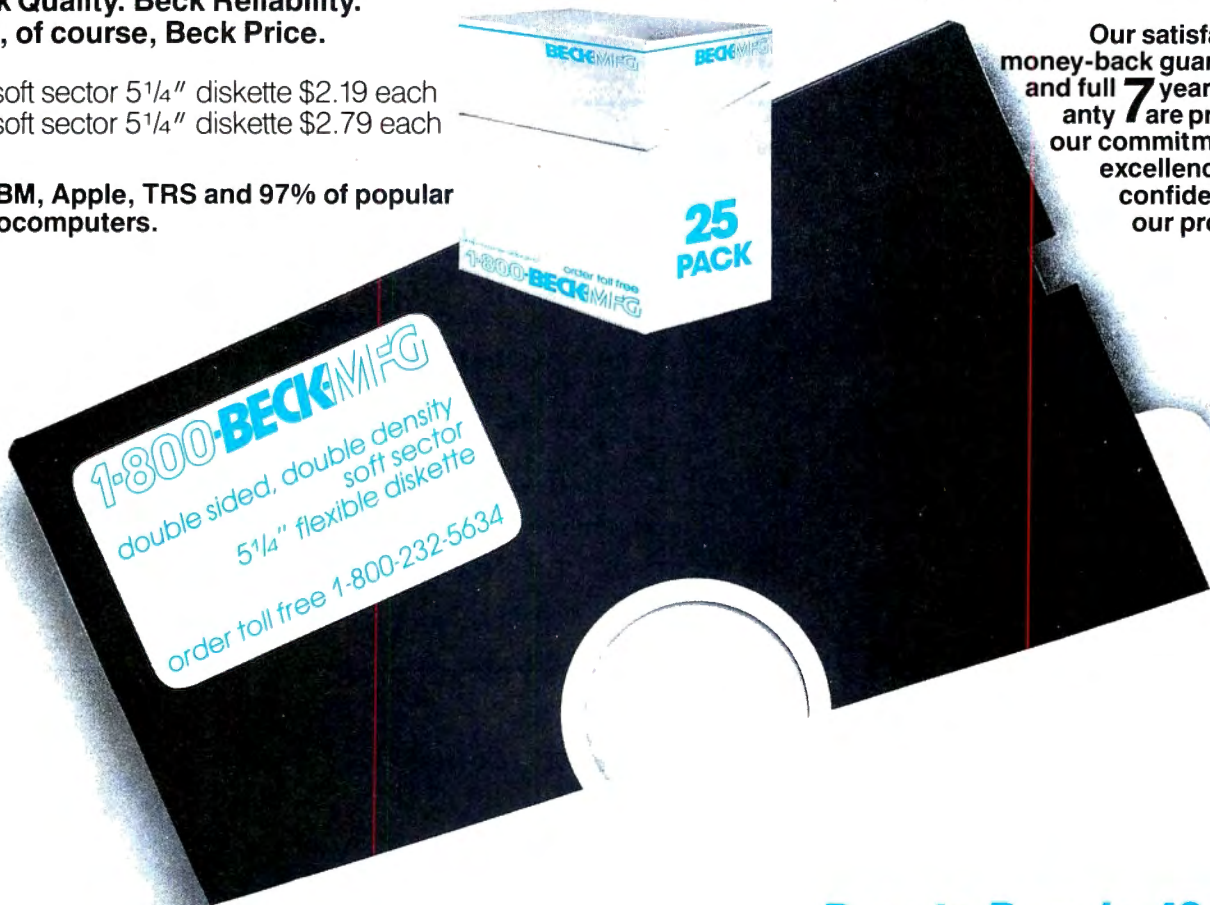
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```

-HOW MANY EQUATIONS, THE INITIAL VALUE OF X OR A, AND ITS
INCREMENT DURING PLOTTING."
800 PRINT"THEN SET UP THE DISPLAY WINDOW:
-LOCATE ITS CENTER, ITS SIZE, AND TURN ON/OFF THE DISPLAY
OF THE VARIABLES' VALUES."
810 GOSUB 870
820 PRINT"
5. NOW WATCH IT PLOT YOUR EQUATIONS."
830 PRINT"
6. YOU MAY ALSO CONTROL EQUAPLOT WHILE IT IS WORKING. PRESS
<ENTER>, THE OPTION CODE (BELOW), THEN <ENTER>:"
840 PRINT"
0 CONTINUE PLOT 5 DISPLAY VALUES (ON/OFF)
1 RELOCATE WINDOW 6 DISPLAY AXIS
2 CHANGE WINDOW SIZE 7 PRINT DISPLAY"
850 PRINT" 3 RESET INITIAL X OR A 8 CHANGE VALUES OF CON
STANTS
4 CHANGE INCREMENT SIZE 9 CLEAR SCREEN"
860 PRINT"
DURING PROGRAM EXECUTION, YOU MAY REVIEW THE OPTIONS AVAIL-
ABLE BY PRESSING <ENTER>, THEN <R>. PRESS ANY KEY TO ACCESS
THE OPTIONS."
870 IF INKEY$="" THEN 870 ELSE RETURN
880 '
*****
* TITLE PAGE *
*****
890 CLEAR 50:CLS:A$="EQUAPLOT":B$=A$+A$+A$
:FORF=0TO15
:PRINT@F*64+32+20*SIN(25*F*.017),MID$(B$,F+2,8);
:NEXT
:PRINT@268,A$;@677,"DAVID W. POWELL";@744,"AIBONITO, P.R.";
900 IF INKEY$=""THEN900
910 '
*****
* INITIALIZE *
*****
920 CLEAR 400
:DEFINT C,E,F,I,L:DEFSTR S
:DIM D(8),SD(8),K(9),S(2)
930 '
***** SET INITIAL VALUES *****
940 CX=0:CY=0:X=0:Y=0:D(4)=0:D(5)=0:L=0:S(1)="" :S(2)=""
950 D(6)=0:D(7)=0:D(8)=1:D(0)=1:D(1)=1:D(3)=1'
DISPLAY PARAMETERS
960 K=.01745329' CHANGES DEGREES TO RADIANS
965 GOSUB 69
:P=PEEK(P+1)+256*PEEK(P+2)+3' LOC. OF FIRST EQUATION
967 P=P+1:PF=PEEK(P)
:IF PF=82 OR PF=89 THEN D(1)=2+(PF=89)
ELSE IF PF<>32 THEN CLS:PRINT "ERROR IN LINE #70"
:LIST 70
ELSE 967' SET EQUATION TYPE FLAG
970 FOR F=0 TO 9:K(F)=1:NEXT:GOSUB630' CONSTANTS
980 GOSUB720'
INSTRUCTIONS
990 GOSUB590' CHANGE VALUES FOR CONSTANTS
1000 GOSUB650' CHANGE FORMAT INSTRUCTIONS
1010 GOTO 120'
TO MAIN ROUTINE
1020 STOP

```

End

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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 ✓
Number of files usable concurrently	1	2	10 ✓
Files span multiple drives	no	no	up to 8 ✓
FEATURES:			
Full-screen facility for creating custom screen layouts	yes	no	YES ✓
Full-screen facility for creating custom report layouts	no	no	YES ✓
Built-in field types (error checking)	no	3	12 ✓
User-defined field types	no	programmer required	200 ✓
Conditional math	no	programmer required	YES ✓
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2000

A SPECIAL REPORT



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Up Close ...

TANDY'S MODEL 2000

With a true 16-bit CPU, MS-DOS, and high-resolution graphics, the Tandy 2000 rivals its peers in the desktop market.

by Terry Kepner and Mark Robinson

The Model 2000 is the first Tandy/Radio Shack machine designed to take advantage of a market created by another computer manufacturer. It's competing directly with the IBM PC, although Tandy's new machine isn't just a PC clone; in fact, it's a more powerful desktop computer with color graphics and more sophisticated hardware. If you're looking for an MS-DOS compatible computer, the 2000 is the one to buy.

Like the IBM PC, the 2000 operates under MS-DOS 2.0 and uses GW-Basic. Unlike the PC, however, the 80186-based 2000 is a true 16-bit machine that computes and communicates along 16 internal and external address lines. It offers 640- by 400-pixel high-resolution graphics, two floppy disk drives that store 720K each, and a speed of 8 MHz; the PC can't match those features.

Basic Hardware

The only hardware advantage IBM has over the Tandy machine is that you can purchase the IBM as a cassette-based system for about \$1,500. However, few people buy the machine in that configuration and fewer businesses buy a computer without disk drives.

The Model 2000's main unit is white; it measures 18½ inches by 15¾ inches by 6 inches (see Photo 1). The power and reset switches and access to the two disk drives are on the unit's front, with the keyboard connector under the switches.

The standard 2000 has two thin-line, double-density disk drives that use double-sided 5¼-inch floppy disks with 96 tracks per inch (TPI). Each drive has room for 720K—a total of 1,440,000 bytes of storage on two disks. The drives also have brushless, direct-drive motors and

twice the normal track-to-track stepping speed.

The Model 2000 hard disk system has 256K RAM and an internal 10 Mbyte drive, plus a floppy disk drive that stores 720K. A port on the back of the main unit provides an interface for a second, external floppy drive.

You use the four expansion slots on the back for the external memory boards, the high-resolution monochrome graphics board, the TV/joystick board, and the Digi-Mouse/clock board (see Photo 2).

An RS-232C serial communications port and a 34-pin parallel printer port are also on the back. The monochrome monitor connector is on the back of the main unit, and the color monitor connector is on the graphics option board.

The 80186 chip allows for several

Photo 1. The Tandy Model 2000.



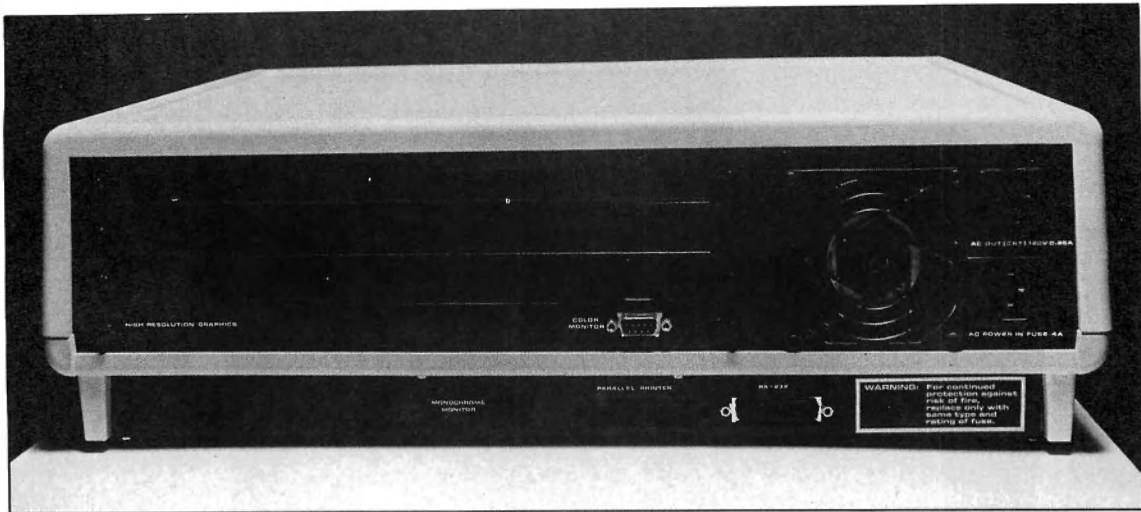


Photo 2. Rear view of the 2000's main unit.

new functions: a clock generator, three programmable timers, two high-speed direct memory access (DMA) controllers, and a multilevel interrupt controller. In addition, the Model 2000 implements an extra parity check bit to find memory errors, for all memory configurations from 128-768K.

Physical Set-up

Tandy takes pride in emphasizing the ergonomic design of the Model 2000. In many ways, its modular arrangement is an improvement over their other machines, but the 2000 isn't perfect.

When you have the main unit on its optional floor stand or on a shelf below the table top, the monochrome video monitor goes on its special stand. This stand is a small, attractive, swept-cone shaped unit; its footprint is smaller than the monitor itself.

Not only does the stand raise the monitor to a comfortable viewing height, it lets you use some of the space below the monitor that you would normally waste.

The CPU/disk drive floor stand holds the unit vertically, at the side of your desk. This is a convenient, safe position.

The only problem is that the stand covers up the bottom front portion of the CPU/disk drive unit where the video monitor jack is lo-

cated. (When you put the CPU on a table top, the unit is slightly raised so you can slide the keyboard under it. The monitor jack is at the back of this space.) Normally this doesn't cause any problems, but if you have the color as well as the monochrome monitor, you have to disassemble the floor stand unit to switch monitors.

The color monitor has a much larger footprint than the monochrome monitor, and it doesn't fit on the table stand. In fact, the color monitor is only a few inches thinner than the CPU/disk drive unit.

If you have the color monitor, you might as well forget the floor stand and put the CPU on your desk. That way the color monitor is at a comfortable viewing height and you can store your keyboard out of the way when you're not using it. You also save shelf room by storing the manuals on the CPU. Having the color monitor on your desk with the keyboard (and the CPU in its stand) takes up more space than all three units.

Keyboard

The Model 2000 keyboard is a vast improvement over the IBM PC's, which has a number of special keys in awkward places. Tandy's machine doesn't have the ALT key where the shift key should be, as does the PC, so you can't inadver-

tently lock into the numbers when you want the arrows.

Another IBM difficulty Tandy has overcome is with the Shift NUM Lock, which halts listing but doesn't restart it. Other advantages over the PC include the two additional function keys, the ability to put labels over the function keys, and a reset button.

This keyboard has 90 sculptured keys. Twelve program function keys line the top row; from DOS they have editing functions, and in Basic they have 10 functions, including Load, Save, and Run commands.

The numeric pad is flat, while the rest of the keyboard is tiered. Unless you press the number lock key, you'll get special characters from the numeric keyboard.

Some new keys include ALT, print, and home. When you press ALT with decimal numbers 1-255 on the numeric keypad, you get the ASCII characters on the screen. The print key sends output to the screen and printer, and pressing the shift/print keys sends the current screen to the printer. The home key transfers the cursor to the screen's upper left corner.

The 2000's keyboard does have its problems, however. The key beep is louder than the IBM's and the machine doesn't have a volume control.

Also, the key labels in Basic aren't perfect; GW-Basic requires spaces between keywords, but pressing the F1 key, which prints the List command on the screen, prints it without a trailing space. Pressing the enter key lists the entire program, but if you only want to see line 100 you must press the space bar before typing the number (LIST 100) or you get a syntax error.

You can redefine these keys, but Tandy should have included the correct Basic syntax as a matter of course.

The hold key can be confusing; hitting it twice appears to hang up the computer. The only solution is to press the key once more to toggle it off.

Tandy avoids two other potential problems by adding small light-emitting diodes (LEDs) in the keys to indicate when you've pressed the number lock and shift lock keys.

The Video Factor

You have three graphics resolution options for your Model 2000's monitor: medium-resolution color graphics, high-resolution monochrome graphics, and high-resolution color graphics.

To get medium resolution, you need a color television and the TV/joystick expansion board. This gives you 320- by 200-pixel graphics, with a total of 319,199 individual pixels available. You can select five colors (counting black) out of a possible 16 to use on the screen at one time.

You can use either the CM-1 color monitor or the VM-1 monochrome monitor for high-resolution monochrome graphics. You also need the monochrome graphics option board. The resolution for this mode is 640- by 400-pixel, which gives you 639,399 individually addressable pixels. You can choose from black and two shades of white. Features include invisible, highlighted, underscored, and reverse-image characters.

For high-resolution color graphics, get the CM-1 color monitor,

the monochrome graphics option board, and the color graphics option kit. This combination gives you 640- by 400-pixel resolution and up to 16 possible colors that you can use eight at a time. Contrast and brightness controls let you compensate for room lighting.

Both the color and monochrome monitors have a high-speed horizontal scan rate of 26 kHz and a video bandwidth of 25 MHz—about five times greater than that of a color television. Both hold 80 or 40

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characters per line and 25 lines on the screen.

The graphics options do have idiosyncrasies. A notable one occurs when you specify the same foreground, background, and border colors from Basic. In most cases, using the same color in the COLOR X,Y,Z command locks you out of the Model 2000.

It appears that when you use the graphics boards, the computer has to scan the screen to see what you've typed (remember that the 2000 uses on-screen editing instead of the line editing found in other Tandy machines). When you specify the same color for the foreground and background, the computer sees only solid color.

Another problem occurs during a simple benchmark test—a For...

Next loop with a print embedded in the middle. When you print anything, the enabled graphics boards turn on each pixel individually. This works fine until you reach the bottom line of the display; to move the entire display up one line, the computer must scan the whole screen.

In normal, non-graphics operation, an image of the display remains in memory and scrolling occurs by copying from memory to the display. However, in the graphics mode, the computer stores graphics in the board instead of in RAM. This slows down video functions considerably.

This leads to another difficulty: Turning on the 2000 always enables the installed graphics boards unless you press the F12 key as the computer scans the keyboard (as soon as the LEDs flash). Once you enable the boards from DOS or Basic, you can't disable them without resetting the machine, so you're stuck with slow video response.

Some CompuServe users have mentioned the 2000's inability to provide monochrome graphics for the VM-1 when the computer contains the color graphics kit. One solution is to press the F12 key during boot-up, as the computer scans the keyboard.

When you add graphics capabilities to the Model 2000, you lose speed. If you have an application where speed is irrelevant and you need graphics, you should buy the boards. For example, if you need color slides or have a large boardroom video screen for business presentations, the 2000's graphics are great.

The Model 2000 has finer graphics and more colors than the IBM PC; it's a better graphics machine. However, we feel that, unless you need unusual graphics capability as described above, you don't need the high-resolution boards.

MS-DOS

The Model 2000's operating system, MS-DOS, offers many useful

from your disk to the RS-232 port or vice versa. You can copy from any input device to any output device, branching format similar to a tree. You start at the root, and work out toward the limbs to get the directory you want.

The main directory, called the root directory, is present when you boot up the disk. You can enter one or more branch directories from the root directory, and more branch directories from any given branch directory.

The directory path is the list of branch directories you must follow to get to a specific file. You can use only the files in the current directory unless you've specified a complete path. In other words, the computer doesn't search any other directory or disk drive for a file, unless you specifically direct it to.

Multiple directories are useful because you can partition a disk into sections this way. You can have separate directories for word processing files, Basic files, data-base management files, and so on.

You can better organize your files by partitioning them and you ultimately save time. You don't have to search through 100 files to find 10 word processing files.

MS-DOS 2.0 has 43 commands: 14 are external and the rest are internal. You can access an internal command from within any directory. An external command is a small file that must be present in the current directory or have a path to use. We discuss some of the more interesting and useful commands below.

A DIR command lists only the current directory. To get a complete directory of every file on a disk and the path names to each file, you use the CHKDSK/V command.

The Print command is actually a spooler that prints up to 10 files while you process other MS-DOS commands.

The Copy command does much more than let you copy files from one disk to another; it also lets you copy from one device to another. For example, you can copy a file

MS-DOS should provide a basis for compatibility between IBM's PC and the 2000. However, many programs bypass MS-DOS and go directly to the PC's hardware.

features. Its most noticeable difference from other TRS-80 DOSes is its use of multiple directories in a as long as you have the supporting hardware. Unfortunately, the Copy command doesn't warn you when you're about to copy over existing data.

You can use several commands (such as For, If, GOTO, Exit, Echo, and Shift) to create batch files. These files have a function like job control language (JCL) files, but they're more flexible. They contain a series of DOS commands that execute automatically when you use the batch file.

These files use a .BAT extension. You run them at the DOS prompt by entering the file name and any parameters that you want. The batch-processing commands in MS-DOS allow for batch files that rival programs in power.

Other features of MS-DOS include the EDLIN, Link, and Debug functions. EDLIN is a simple line editor that uses several function keys and regular keys for commands. It's useful for entering and editing batch or small text files. Without this feature, you'd need a separate word processor to generate batch or JCL files.

Link is a utility that you use with Assembly, Fortran, and Pascal languages. It links modules together, makes sure you've defined all symbol references (including those you might have defined in different modules), and produces one relocatable load module.

Debug has many useful com-

mands for the Assembly-language programmer, including Assemble, Unassemble, and Hexadecimal arithmetic. It lets you display and modify the contents of memory and of the registers. It doesn't let you single-step through a program, but you can use up to 10 stops for testing purposes.

If you use Debug to make changes in a program, it can assemble the statements directly into memory for testing. You do still need an assembler for Assembly-language programs.

Despite their usefulness, the Tandy MS-DOS commands aren't perfect. The Sort command doesn't work correctly. The example in the manual demonstrates sorting a directory, and that's the only kind of sort that works. All other uses result in errors or incorrect results. This command should let you sort information in a file. The updated 2000 DOS (MS-DOS 3.0) will have a corrected Sort command.

The commands to change the directory or erase a file give no indication that the change has occurred other than the reappearance of the prompt. Also, the Format command doesn't warn you when the disk you're formatting contains data.

Finally, several CompuServe users have noted that the COM function doesn't appear to work.

PC Compatibility

MS-DOS should provide a basis for compatibility between the IBM PC and the Model 2000. A programmer can use MS-DOS routines to write programs that run on any machine using that operating system, regardless of hardware configuration.

However, many IBM software programmers fail to take advantage of these routines because they consider them too slow or awkward. They write programs that bypass MS-DOS and go directly to the IBM PC's hardware. The result is software that runs faster but only on computers with the PC's exact

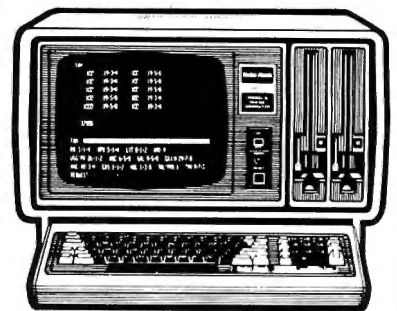
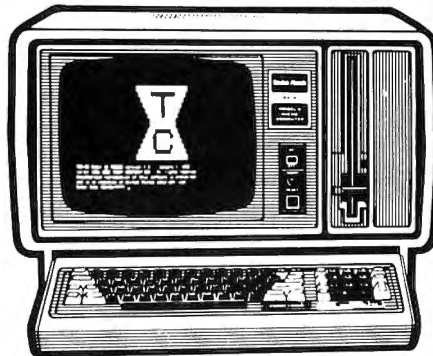
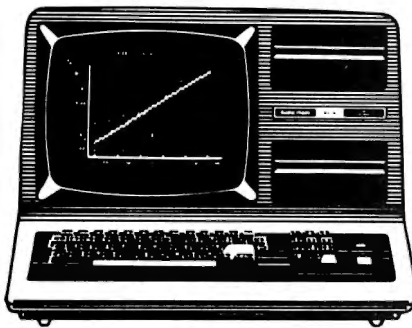
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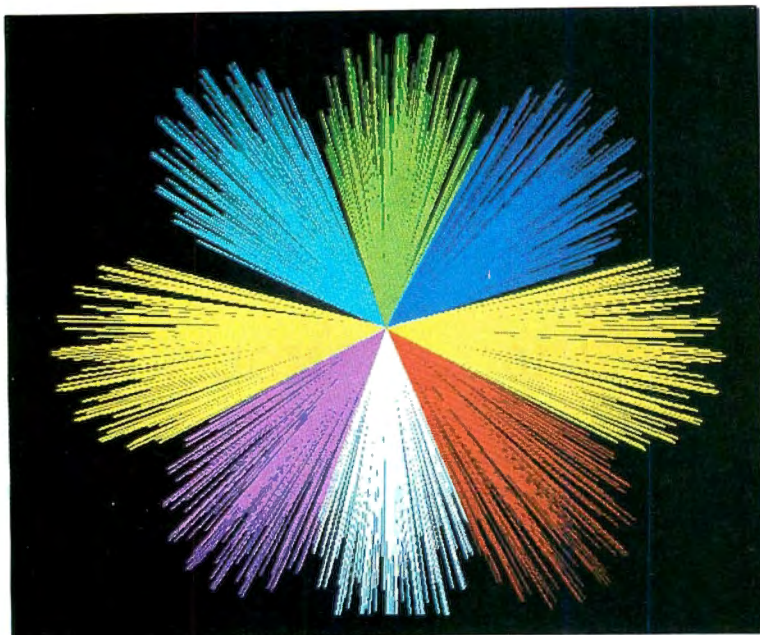


Photo 3. Program Listing's graphics demonstration.

hardware design.

Consequently, the Model 2000 only runs some of the software available for the IBM PC. If a program uses only MS-DOS calls, it will work on the Model 2000; if it makes hardware calls, it won't work.

For the time being, users are limited to Tandy's software designed specifically for the Model 2000 and the relatively few packages that address only MS-DOS calls. If this computer is to live up to its potential, software development needs more attention.

Documentation

The MS-DOS manual is well written, but it would be more helpful with more examples of commands. The commands appear in alphabetical order, so finding them is easy provided you know the command name.

The manual is subdivided into six tabbed sections for easy reference. They include Introduction, Commands, EDLIN, Link, Debug, and Appendices.

You must separate MS-DOS commands and parameters with a delimiter: a space, comma, semicolon, equals sign, or tab. The manual

uses a space as the delimiter, so it's frequently difficult to determine where an actual space should occur.

MS-DOS for the IBM PC is very similar to the 2000's DOS, but PC-DOS has two additional commands: Assign and Mode. Some other commands appear to be different, but do have PC equivalents.

If you have an IBM disk, you can read most of its files in a Model 2000 disk drive. However, since the 2000 uses higher density disks, the reverse isn't true unless you specifically format a Tandy disk for the IBM.

Naturally, IBM machine-language programs and utilities don't work in the 2000 unless the software uses only standard MS-DOS calls.

GW-Basic

The Model 2000's MS-DOS master disk contains GW-Basic 1.0, a Basic similar to the IBM PC's. The main differences between GW-Basic and the Level II or Disk Basic that the other Tandy machines use are mostly in the area of graphics commands (see Photo 3 and the Program Listing).

Circle, Paint, Line, and Color are among the 2000's possible Basic commands. GW-Basic is actually similar to the Extended Color Basic available for the Color Computer. See the Table for statements and functions new to Model I/III/4 users.

These graphics commands are an asset in business applications, where charts and graphs are necessary representations of data (see Photo 4).

An additional feature of GW-Basic is simple animation using the graphics Put and Get commands. The Put command lets you designate an area on the screen that you want to save in a dimensioned array, while the Get command lets you place the stored image anywhere on the screen.

The Sound command is new to

Program Listing. Flower graphics demonstration.

```

0 'FLOWER.BAS      Model 2000 Graphics Demo.
10 SCREEN 3
20 CLS
30 X0=528:Y0=216
40 PSET(X0+64,Y0),C4
50 FOR I=0 TO 6.28 STEP .04
60 X=X0+64*COS(8*I)*COS(I)
70 Y=Y0-64*COS(8*I)*SIN(I)
80 LINE(320,200)-(X,Y),7
90 LINE(320,200)-(X-410,Y+5),15 '@ 3 O'CLOCK
100 LINE(320,200)-(X-70,Y-120),6 '@ 9 O'CLOCK
110 LINE(320,200)-(X-70,Y+113),4 '@ 1 O'CLOCK
120 LINE(320,200)-(X-200,Y+138),3 '@ 5 O'CLOCK
130 LINE(320,200)-(X-320,Y+107),2 '@ 6 O'CLOCK
140 LINE(320,200)-(X-330,Y-130),1 '@ 7 O'CLOCK
150 LINE(320,200)-(X-196,Y-160),5 '@ 11 O'CLOCK
160 NEXT I
170 GOTO 170

```

End

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Table. Basic keywords and functions for the Model 2000.

Basic Keywords

Statements for assigning values to variables and defining memory space:

Common	passes variables to a chained program
Erase	erases an array
Option Base	declares minimum value for array subscripts
Randomize	reseeds the random number generator
Swap	exchanges the values of variables

Statements for altering program sequence:

Chain	loads another program and passes variables to the current program
COM(1) On	enables communication trapping
Key(n) On	enables key trapping
On COM(1) GOSUB	branches to a subroutine when activity occurs on the communication channel
On Key...GOSUB	branches to a subroutine when you press a specific key
On STRIG...GOSUB	branches to a subroutine when you press the mouse button
STRIG On	enables mouse trapping
While...Wend	executes statements in a loop as long as a given condition is true
Wait	suspends program execution while monitoring the status of a machine input port

Statements for storing and accessing data on disk:

LSET	moves data (and left justifies it) to a field in a direct access file buffer
Open "COM"	opens a communication file
Reset	closes all open files on disks
RSET	moves data (and right justifies it) to a field in a direct access file buffer

Statements for inputting or outputting data to the video display or the line printer:

Circle	draws an ellipse with a center and radius on the display
Color	to select foreground, background, and border display colors
Draw	draws images on the display
Get	transfers graphic images from memory to the display
Line	draws a line on the display
Locate	positions the cursor on the screen
Paint	fills an area on the screen with a selected color
Palette	colors in the current palette
Palette Using	to change more than one of the color numbers in the current palette
Screen	sets the screen attributes (text, medium or high resolution) to be used by subsequent statements
Write	prints data on the display

Statements for performing system functions or entering other modes of operation:

Beep	produces a sound from the speaker
BLOAD	loads a memory image file from disk
BSAVE	saves a memory image file to disk
Kill	deletes a disk file
Name	renames a disk file
Play	produces musical tones
Sound	generates a specific tone for a specified length of time
System	returns to MS-DOS

Functions

Numeric functions (return a number):

CDBL	converts to double precision
CINT	returns the largest integer not greater than the parameter
CSNG	converts to single precision
EXP	computes the natural exponential
Fix	truncates to whole number
FRE	returns the number of bytes in memory not being used
INSTR	searches for a specified string
INP	returns the byte read from a port
SGN	returns the sign

String functions (returns a string value):

ERR\$	returns the latest error number and message
HEX\$	converts a decimal value to a hexadecimal string
OCT\$	converts a decimal value to an octal string

Input/output functions:

CVD	restores data from a direct disk file to double precision
CVI	restores data from a direct disk file to integer
CVS	restores data from a direct disk file to single precision
CRSLIN	returns the current row position of the cursor
Files	displays the names of the files on a disk
Key	assigns or displays the current function key soft values
MKI\$	converts an integer value to a string for writing it to a direct access file
MKS\$	converts a single precision number to a string for writing it to a direct access file
MKD\$	converts a double precision value to a string for writing it to a direct access file
Screen	returns the ASCII code for the character stored at a specific position on the screen
SPC	prints spaces to the display
Stick	returns the number of points moved along the coordinates
STRIG	returns the status of the mouse button

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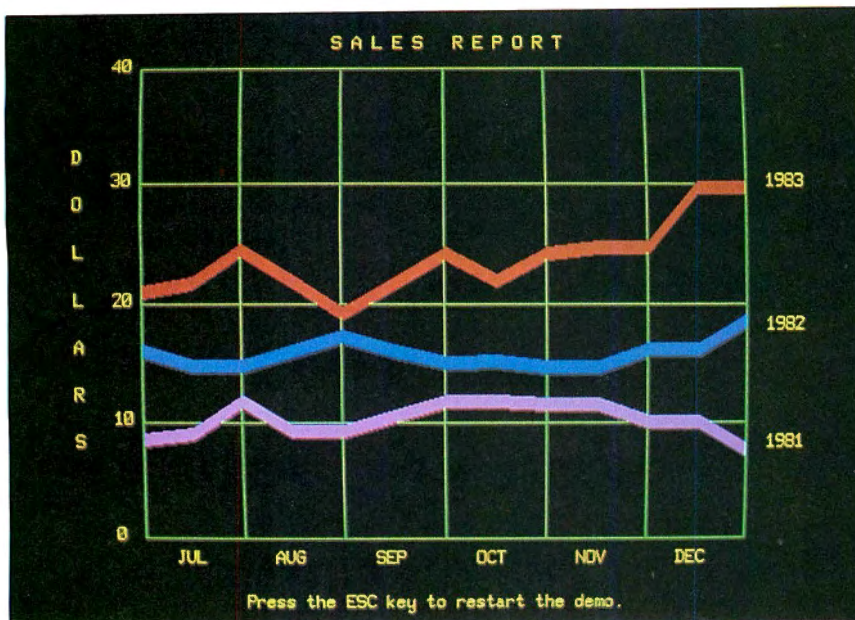


Photo 4. Sample color graph.

Model I/III users, although Model 4 users have some experience with it. The syntax for this command is SOUND tone, duration. The tone indicates the frequency of the sound measured in Hertz in a range of 37-32767. Duration can be an integer from zero to 65535 that specifies the duration in clock ticks of 18.2 ticks per second.

Problems exist in the actual execution of GW-Basic. This 16-bit Microsoft Basic can't address any memory locations with addresses over 64K. Since the Model 2000 user has 128-256K readily available, this wastes much of the machine's capabilities.

In fact, the Basic Microsoft uses on both the 2000 and the PC appears to be the standard graphics GW-Basic on the 8-bit computers with CP/M. It looks as if all Microsoft did was transfer their GW-Basic from an 8-bit 8080A computer to the new 8086 and 80186 computers, with alterations to take advantage of a few features such as the improved color graphics ability.

The 64K Basic limits programming ability. The largest Basic program you can run on the 2000 is roughly 40K. Microsoft could have adapted GW-Basic to access the other 64K banks.

Also, Tandy has perpetuated an inconvenience of the Model 4's; GW-Basic requires spaces between the keywords. I am not impressed by this Basic.

The manual for the 2000's GW-Basic is like the one for the IBM PC except for the display numbers that accommodate the 2000's increased capabilities.

Neither computer's Basic manual is instructional; they won't teach you Basic. The 2000 manual also is short on examples for the new commands that might be unfamiliar to you.

One syntax problem occurs in the description of the Paint command. You should use a comma between the right parenthesis that contains the x and y coordinates and the color parameter.

A final criticism of the GW-Basic manual is that it's poorly designed. The index frequently refers you to the wrong pages, a problem exacerbated by the arrival of 47 replacement pages that don't necessarily contain the same material as the originals.

Docs Overview

For those interested in more technical information about their 2000, the *Programmer's Reference Manu-*

al is already available (\$19.95, Radio Shack #26-5403). This book provides details on interfacing the 2000 in MS-DOS, GW-Basic, and directly. It also supplies information on the Basic input/output system (BIOS), Basic disk operating system (BDOS), and CP/M in the MS-DOS environment.

Unfortunately, this reference manual is plagued by the typographical and organizational problems evident in the other Model 2000 manuals. As a class, the 2000 documentation is the worst of any Tandy computer. It's obvious that speed was more important than layout accuracy.

Also, a lack of sufficient examples in the MS-DOS and GW-Basic manuals is an important oversight.

Conclusions

The Model 2000 benefits from its divergence from the IBM PC path. MS-DOS compatibility will eventually give it a large software base.

Documentation problems are minor concerns compared to the outstanding speed of the 80186 microprocessor and the 2000's incredible graphics capabilities.

Finally, although the IBM PC has more software right now, the Model 2000 will catch up soon. From a hardware perspective, the 2000 is clearly the superior machine. All things considered, Tandy has come up with another winner. ■

Contributing editors: Bradford N. Dixon, Mare-Anne Jarvela, and Beverly Woodbury.

Contact Terry Kepner and Mark Robinson c/o 80 Micro, 80 Pine St., Peterborough, NH 03458.

(For an overview of the Model 2000 and its operating system, see Eric Maloney's "Tandy Makes Its Move," January 1984, p. 70; Jim Heid's "MS-DOS Overview," January 1984, p. 84; and Jim Heid's "MS-DCS: Tandy's Powerhouse Operating System," March 1984, p. 74.)

... and Personal

AN INTERVIEW WITH **ED JUGE**

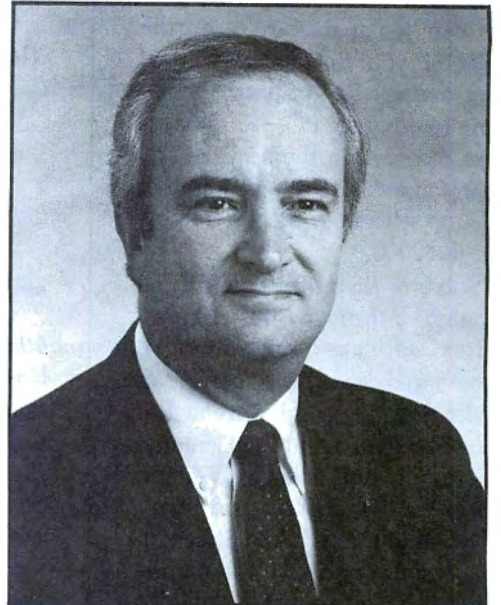


Photo courtesy of Radio Shack, a division of Tandy Corp.

by Terry Kepner and Mark Robinson

Since the Model 2000 is such a significant departure for Tandy, we thought it would be interesting to talk to Ed Juge, Tandy's Director of Computer Merchandising for Business Computers, about the genesis of the machine. With that in mind, we solicited questions from CompuServe subscribers, added some queries of our own, and conducted the interview transcribed below.

80: When you asked your engineers to design a computer, what was their assignment?

Juge: The assignment was to produce an MS-DOS machine that would give us the greatest possible capabilities. We had a decision to make before it ever got to the engineers as to whether we wanted to go for IBM compati-

bility or whether we wanted to go for the best MS-DOS machine that technology and our engineering staff could put together. That was the route we chose to go.

IBM PC technology wasn't particularly up-to-date when the PC came out two years ago. We felt that by the time we got our machine out the technology would be even older, and there were a lot of things that could be done today that couldn't be done then. Besides, if you can't get a PC, there are plenty of look-alikes around; you don't need another one.

80: Some of the great features, like the keyboard, are improvements over the PC...

Juge: We get lots of nice comments.

80: There are a lot of benefits to the 2000 that aren't as readily apparent, such as the 16-bit data

path. How would you describe that benefit to a customer?

Juge: I think the 16-bit data path obviously adds to the overall speed of the machine. We've done some real quick benchmarks on it, various little programs that have been published, and we find that it's about 2.7 times faster than the IBM.

I believe *Creative Computing* ran a test a couple of months ago where the IBM PC took 24 seconds to run a program and we took six. We have heard from a couple of other software vendors; one in particular says ours runs up to six times as fast.

80: I've noticed quite a bit of software is either available or going to be available soon. Are you planning any new releases of things like CP/M, so you can take some of the public domain software and run it?

Juge: There isn't much running under CP/M right now. CP/M is a possibility, but we don't know. At this stage there is no contract, nothing is signed, and Digital Research hasn't even made a concrete proposal to us.

80: Is there any software in the works or being released that you would like to mention?

Juge: Out of the 50 or so top sellers that we are aware of on the IBM, if you throw away those that are strictly training you on how to use your PC, we fully expect that within the next not too many months we'll have all 50 of the top sellers out there available for the 2000.

Some of them are going to be available through this Express Order software program we've announced (whereby users can order third-party software at Radio Shack Computer Centers). WordStar, for example, should be in the warehouses and available without any Radio Shack logo on it. Probably by the middle of March you should be able to walk into your local center and place an order for it, and have it shipped within 24 hours.

I think Wordperfect is the other one that's been accepted into that program. There are a number of them.

80: We found a lot of cuts and patches in the 2000 manual and a lot of areas where last-minute changes were made. It seemed to us that probably the reason for it was so you could get the machine out.

Juge: Absolutely true. We had to release the machine, we had to release the manual, and we're doing that on most of the software too, before the final version of the hardware or software is even ready. And the only way to handle that is with addenda.

Hewlett-Packard has been doing that for years, but you probably never have bought an HP. That's a way of getting the stuff out quicker.

80: Will you be sending updated manuals to all registered users?

Juge: I doubt it—we'll probably send replacement pages. I think replacement pages will cover it. I don't know that we're going to have any reason to totally update any manual.

*"Within the next
not too many months
we'll have all 50
of the top sellers
available for
the 2000."*

80: I guess this Basic manual has been written more by Microsoft than by Tandy, and isn't so much of a training guide.

Juge: That's true.

80: Are you going to come out with some kind of training guide for it?

Juge: I don't know whether we are or not. I don't think we've talked too much about it simply because what we perceive in the market, rightly or wrongly, is that the majority of today's customers for MS-DOS products basically want to buy a piece of software and use it. They're not interested in doing much programming, although there are a lot of fellows around who are.

I have to learn something about it; I don't know anything about it. I have a 2000 at home, but I haven't really had time to play with it. And I doubt that I've gotten past p. 10 in the manual.

But you talk to General Electric, who's bought something like 6,000 IBM PCs over the past year, and they don't even want their people to have access to that kind of information. They want to buy them a copy of Lotus 1-2-3 and have them plug it in and run it. By the same token,

they're buying some of their folks Lisas, and told them they're fired if they run anything other than projects scheduling on it.

80: Is that right?

Juge: Yes, they are absolutely serious about controlling who does what on what machine. If they had a way of locking employees out of things they don't want them doing, they'd probably do it.

Not to say there's certainly not a worthwhile market for users interested in programming; we just haven't had the time to back off and take a look at it yet. We really haven't got much feedback from the field either.

80: Do you know if anything is in the works, as far as a Basic, that'll handle more than 64K?

Juge: Not to my knowledge. I don't think Microsoft is working on anything like that. I know I've been in the discussion with Bill [Gates, president of Microsoft] a couple of times on it. I don't think he's particularly interested in doing that.

You're talking about handling more than 64K... well, on the IBM and Tandy 2000 I would assume that it can. But on the 4, or the 12, or one of those 8-bit machines where you have to do bank switching, I don't think Bill is too interested in doing it. He says he hasn't found a way that makes sense; he says it makes the machine excruciatingly slow.

80: How are you handling service from your Radio Shack Computer Centers? Are you giving your people special training for the 2000?

Juge: Yes, the people get training. Of course, it's new to them and they don't know everything about it. They don't know the machine as well as something they've been working on for two or three years, obviously, but it's being handled through the service centers.

80: Do you expect that service won't be a problem?

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Juge: I don't think service is going to be a problem. I think initially service may be a little bit slower, just like on any other machine.

Initially on the IBM, you had a choice: If you lived within 40 miles of one of their seven service centers in the U.S., or if you wanted to drive to one of them, you could get service. Otherwise, you mailed your PC back to a center in Kansas or somewhere and waited two weeks for it to come back. My understanding is that if you're dependent on IBM for service, that's still true today.

You can go to one of their dealers who has service capability. We've called IBM's hot line just to see what kind of response we got.

They said, "Well what's your problem?" We told them, and they said, "Where'd you buy your machine?" We told them Sears Business Center, and they said, "Well sir, if you'll take it back to Sears Business Center I think they'll be able to answer your question."

Our service may not be perfect. Heavens, I know that—I spent the last 25 years in servicing electronic equipment and I can guarantee you that nobody has all the answers. Sometimes things take a while to run down, and certainly with software entering the picture, you've got a situation that's orders of magnitude greater than when I was servicing electronics goods.

But I think our service is probably about as good as anybody's. We were beat around the head and shoulders by the Tandy Business User's Group when they met here in Fort Worth a year ago—they wanted better service, faster service, more competent service, whatever.

But interestingly the guys would admit that what they were getting from us was already orders of magnitude ahead of what they were getting from

IBM on their PC. This is coming from large users, people that are buying 200 pieces.

We certainly are trying to improve our service. We know it's not perfect, but I really don't think it's a major, major problem.

80: I don't think it'll be a drawback at all as people are making their decisions.

Juge: We hope we can convince them that it's probably really an advantage.

80: Is there anything else you would like us to tell the readers about the machine or about what you're doing?

Juge: I think the thing we want to get across the most is the question you asked me when we started this interview, and that is what our philosophy was in coming out with a machine that was not quite IBM compatible. We did attempt to maintain addresses and all that sort of stuff to the greatest degree we could, but we knew up front that it wasn't going to be possible to achieve perfect IBM compatibility using different chip sets and clock speed and everything.

I think we probably did it the right way, and we didn't have to brownnose the software folks to get them to put their stuff on our machine. Most of them have been quite anxious to do it. We've had a lot of major players come to us.

In fact, we had one of the probably top three software companies in the country come to us here recently. They had tried to sell us a particular product that I was a little bit squeamish on, and then he said, "We're going to do it on our own, and if nothing else we'd like to put it in the Express Software plan.

What I'm trying to say is that this product has excited some of the major players in the industry, and most of them are very willing, if not anxious, to get their products up on the 2000. ■

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MARKING TIME

by Beve Woodbury

Being the biggest doesn't necessarily mean being the best. In these benchmark tests on 10 micros, the Model 2000 shows its stuff with the shortest time around.

One of the most touted characteristics of the Tandy Model 2000 is its speed. I measured its performance in benchmark tests against nine other computers, including the Apple Macintosh and the IBM PC (see Table 1).

In all the tests, the 80186-based Model 2000 far outdistanced its competitors (see Table 2). Second in line for all tests (except for a string manipulation test, where the Models II and 4 tied for second place) was Apple's 32-/16-bit Macintosh, followed by the 16-bit IBM PC,

which came in third in all tests, again except for the string manipulation test.

The Tests

These benchmark tests were designed to test each computer's speed of operation in standard execution and computation exercises, like loops, arithmetic operations, and string manipulation. In addition to the Model 2000, the Mac, and the PC, I tested Tandy's Models I, II, III, 4, 16B, and 100, and Apple's IIe (see Table 1).

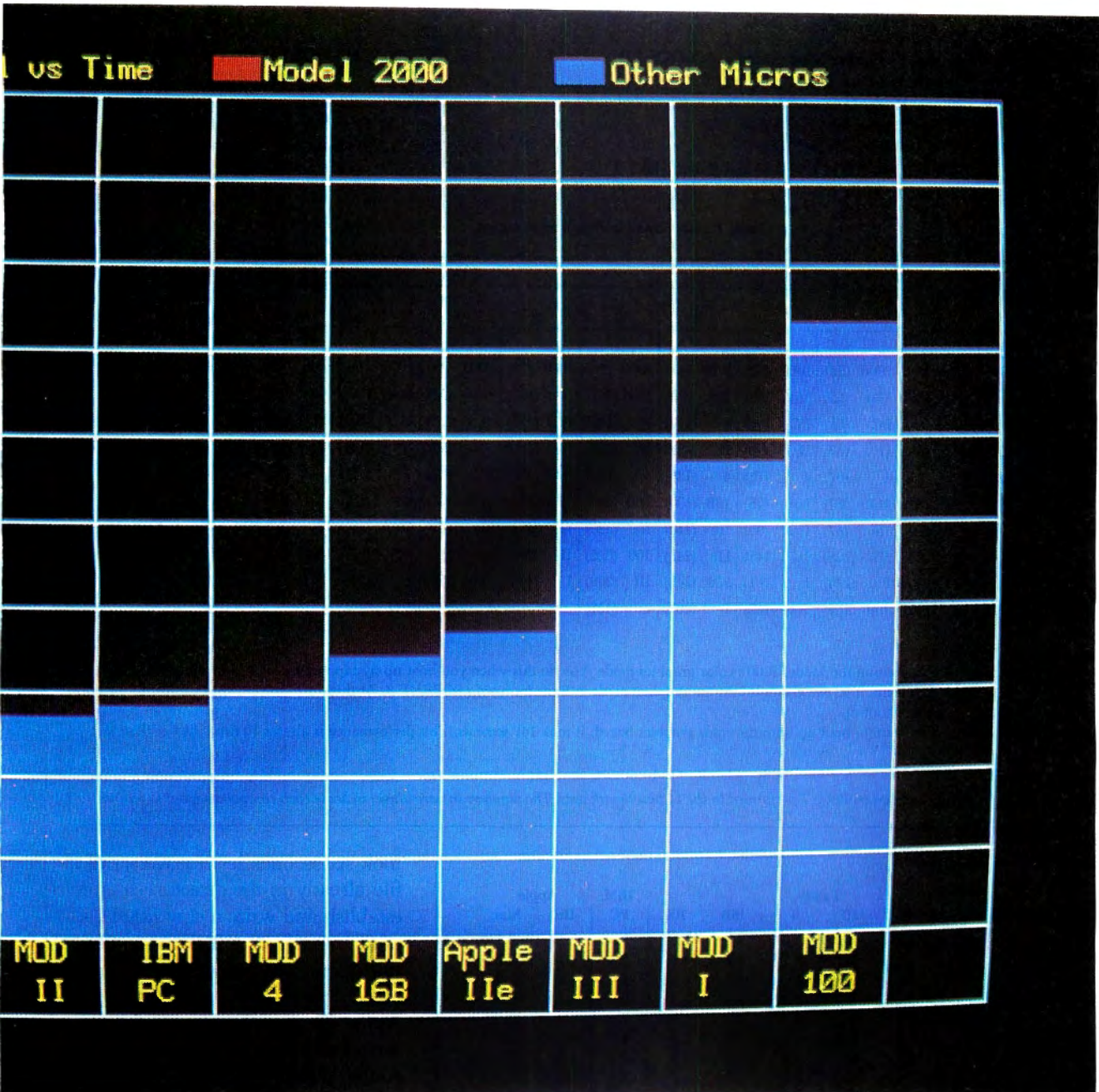
Benchmark Test: Model

	9		
	8		
	7		
T	6		
I	5		
M	4		
E	3		
	2		
	1		
	0		
		Tandy 2000	Apple MAC

The benchmark programs are short and simple, and test the most commonly used Basic coding. I timed the Apple IIe with a stopwatch; I timed all the other computers using their internal real-time clock.

Program Listing 1 executes a simple For...Next loop 5,000 times. I ran the loop 5,000 times to get significant time indications on the Model 2000.

Program Listing 2 executes the same loop using a counter instead of a For...Next loop to repeat the



loop 5,000 times. This method increases the required execution time considerably.

Program Listing 3 adds an arithmetic statement using all variables.

Program Listing 4 uses the same arithmetic statement replacing most variables with constants. Note that the use of constants slightly increases the required execution time.

Program Listing 5 adds a simple GOSUB loop.

Program Listing 6 adds a For... Next loop within the GOSUB loop and sets up an array.

Program Listing 7 adds simple array handling within the For... Next loop.

Program Listing 8 generates prime numbers using the sieve of Eratosthenes algorithm.

Program Listing 9 manipulates strings by extracting a substring using the MID\$ function.

Program Listing 10 manipulates strings using a simple bubble sort.

Program Listing 11 times disk write, disk read, and screen print functions.

I adapted Listings 1-7 from "BA-

SIC Timing Comparisons" by Tom Rugg and Phil Feldman (*Kilobaud*, June 1977, p. 66). I adapted Listings 8 and 9 from "A Closer Look at the IBM Personal Computer" by Gregg Williams (*BYTE*, January 1982, p. 36).

The Results

In addition to the standings of the top three computers, I got some interesting results. I found that the Models II and 4 ran most tests at exactly the same speed, while the Model 16B ran surprisingly slowly.

Tandy:
 Model 2000, 128K, high resolution color graphics, MS-DOS 2.0
 Model I, 48K, TRSDOS 2.3 Disk Basic
 Model II, 64K, TRS-80 Model II Basic-80
 Model III, 48K, TRS-80 Model III Basic 1.3
 Model I, 128K, TRSDOS 6 Disk Basic 1.0
 Model 16B, 64K, TRSDOS 4.2.0, TRS-80 Model II Basic-80 1.2
 Model 100, 24K, Model 100 Basic

IBM:
 PC, 128K, MS-DOS 2.0, Basic 2.1

Apple:
 IIe, 64K, DOS 3.3, Applesoft Basic
 Macintosh, prereleased Microsoft Basic

Table 1. System specifications used in testing.

1	2	3	4	5	6	7	8	9	10	Write	Read	Print
2000 (2)	2000 (10)	2000 (20)	2000 (21)	2000 (23)	2000 (43)	2000 (66)	2000 (58)	2000 (9)	2000 (4)	2000 (6)	2000 (3)	2000 (7*)
Mac (5)	Mac (17)	Mac (46)	Mac (55)	Mac (58)	Mac (99)	Mac (142)	Mac (109)	II (15)	Mac (11)	100 (7)	PC (7)	I (13)
IIe (5)	PC (24)	PC (59)	PC (61)	PC (66)	PC (117)	PC (186)	PC (177)	4 (15)	PC (13)	III (8)	100 (7)	II (13)
PC (7)	II (27)	II (64)	II (67)	II (76)	II (126)	II (189)	II (183)	Mac (22)	II (14)	PC (10)	III (10)	III (15)
II (7)	4 (27)	4 (64)	4 (67)	4 (76)	4 (126)	4 (189)	4 (183)	PC (23)	4 (15)	I (12)	II (11)	4 (15)
4 (7)	16B (28)	16B (65)	16B (67)	16B (78)	16B (130)	16B (195)	16B (191)	16B (25)	IIe (19)	4 (12)	I (12)	16B (17)
16B (8)	IIe (41)	IIe (79)	IIe (87)	IIe (95)	IIe (140)	IIe (220)	IIe (211)	IIe (31)	16B (26)	II (17)	4 (12)	PC (25)
III (13)	100 (46)	III (122)	III (125)	III (143)	III (241)	100 (322)	III (369)	III (32)	III (27)	16B (20)	16B (12)	100 (182)
I (14)	III (52)	100 (126)	I (144)	I (161)	100 (242)	III (369)	I (410)	100 (39)	I (29)			
100 (15)	I (58)	I (140)	100 (152)	100 (162)	I (267)	I (410)		I (53)	100 (45)			

*I ran this printing test after bypassing the Model 2000's color graphics mode. You do this when you boot up by tapping the F12 key immediately after the capitals and number lock keys flash. You can then get into the graphics mode in Basic by typing SCREEN 3. At this time, you cannot get back into the fast printing mode without another boot-up.

When I did the printing test on normal boot-up with the color graphics board, it took 142 seconds. This performance is almost 10 times slower than the Model I's.

Table 2. Here's how the 10 micros listed in Table 1 performed in the 11 benchmark tests. The numbers in parentheses indicate each computer's speed in seconds.

Test	Tandy						IBM		Apple	
	I	II	III	4	16B	100	PC	IIe	Mac	
1	7.0	3.5	6.5	3.5	4.0	7.5	3.5	2.5	2.5	
2	5.8	2.7	5.2	2.7	2.8	4.6	2.4	4.1	1.7	
3	7.0	3.2	6.1	3.2	3.3	6.2	3.0	4.0	2.3	
4	6.7	3.2	6.0	3.2	3.2	7.2	2.9	4.1	2.6	
5	7.0	3.3	6.2	3.3	3.4	7.0	2.9	4.1	2.5	
6	6.2	2.9	5.6	2.9	3.0	5.6	2.7	3.2	2.3	
7	6.2	2.9	5.6	2.9	3.0	4.9	2.8	3.3	2.1	
8	7.0	3.2	6.4	3.2	3.3	—	3.1	3.6	1.9	
9	5.9	1.7	3.6	1.7	2.8	4.3	2.6	3.4	2.4	
10	7.3	3.5	6.8	3.8	6.5	11.2	3.3	4.7	2.8	
11										
Write	2.0	2.8	1.3	2.0	3.3	1.2	1.7			
Read	4.0	3.7	3.3	4.0	4.0	2.3	2.3			
Print	1.9	2.1	2.1	2.4	1.9	26.0	3.6			
Overall										
Ratio	5.7	2.7	5.0	3.0	3.4	7.3	2.8	3.7	2.3	

Table 3. Absolute comparison of Model 2000 performance against other micros. For instance, in Test 1, the Model 2000 ran 3.5 times faster than the IBM PC.

In addition, there were some unexpected results. For instance, the Apple IIe beat the PC in the For...Next loop test. And the Model 100 beat the Models I and III in the loop test using a counter, and beat the Model I in a test with arith-

metic statements using variables, the For...Next test with GOSUB loop and array, and the string manipulation test using the MID\$ function.

When I tested the disk write function, the Models II, 4, and 16B

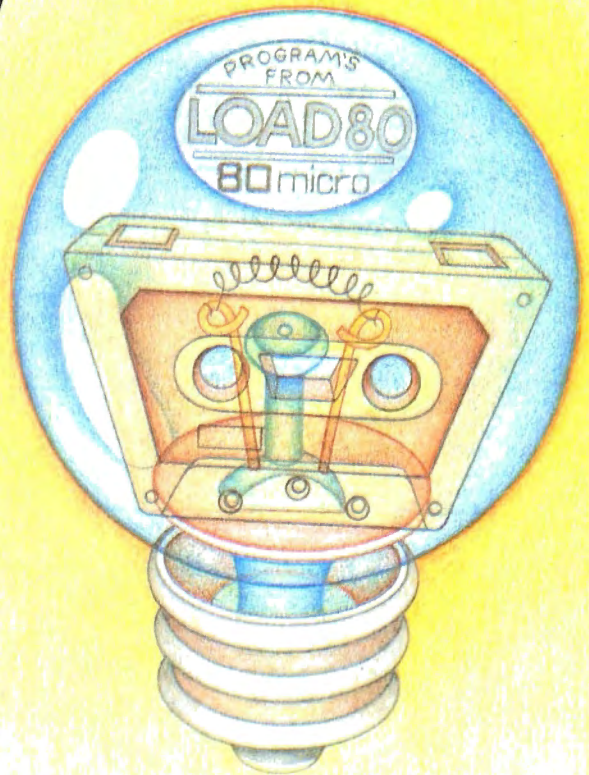
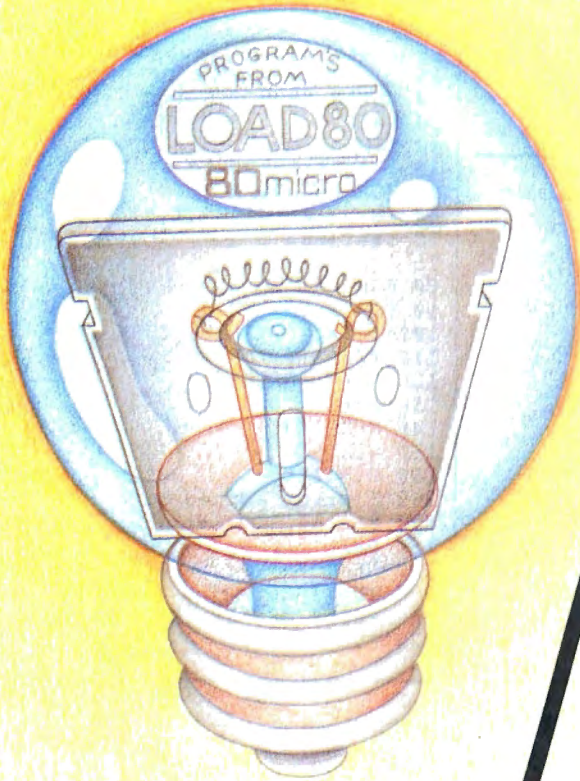
took six seconds less to overwrite a file already in the directory than to establish and write a new file. In all other models, the file's presence in the directory made no apparent time difference. (I didn't test the Apple IIe and Macintosh for disk write/read because of the required coding differences.)

Also, note the results of the Basic program coding. Significantly less time is required when you use a For...Next loop instead of a counting loop, and when you use variables rather than constants in arithmetic statements.

The Model 2000 surpasses all previous Tandy products in speed, and simultaneously expands the line's computational capabilities. And, as the Tandy advertisements claim, it does run 2½ to 3 times faster than the IBM PC; it's even farther ahead of the Apple IIe and Macintosh. ■

See p. 100 for Program Listings

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Program Listing 1. For...Next loop.

```

10 ' simple For...Next loop
20 '
30 PRINT TIMES$
40 FOR K=1 TO 5000
50 NEXT K
80 PRINT TIMES$
90 END

```

Program Listing 2. Loop using a counter.

```

10 'simple counting loop
20 '
30 PRINT TIMES$
40 K=0
50 K=K+1
70 IF K<5000 THEN 50
80 PRINT TIMES$
90 END

```

Program Listing 3. Arithmetic statement using variables.

```

10 ' simple loop with
15 ' arithmetic functions
18 ' using variables
20 '
30 PRINT TIMES$
40 K=0
50 K=K+1
60 A=K/K*K+K-K
70 IF K<5000 THEN 50
80 PRINT TIMES$
90 END

```

Program Listing 4. Arithmetic statement using variables and constants.

```

10 ' simple counting loop
15 ' with arithmetic functions
18 ' using constants
20 '
30 PRINT TIMES$
40 K=0
50 K=K+1
60 A=K/2*3+4-5
70 IF K<5000 THEN 50
80 PRINT TIMES$
90 END

```

Program Listing 5. GOSUB loop.

```

10 ' add a simple
15 ' GOSUB loop
20 '
30 PRINT TIMES$
40 K=0
50 K=K+1
60 A=K/2*3+4-5
65 GOSUB 100
70 IF K<5000 THEN 50
80 PRINT TIMES$
90 END
100 RETURN

```

Program Listing 6. For...Next loop within GOSUB loop, and array set-up.

```

10 ' add an array
15 ' and simple
18 ' For...Next loop
20 '
30 PRINT TIMES$
40 K=0
45 DIM M(5)
50 K=K+1
60 A=K/2*3+4-5
65 GOSUB 100
66 FOR L=1 TO 5
68 NEXT L
70 IF K<5000 THEN 50
80 PRINT TIMES$
90 END
100 RETURN

```

Program Listing 7. Array handling within the For...Next loop.

```

10 ' add filling array
15 ' in simple
18 ' For...Next loop
20 '
30 PRINT TIMES$
40 K=0
45 DIM M(5)
50 K=K+1
60 A=K/2*3+4-5
65 GOSUB 100
66 FOR L=1 TO 5
67 M(L)=A
68 NEXT L
70 IF K<5000 THEN 50
80 PRINT TIMES$
90 END
100 RETURN

```

Program Listing 8. Sieve of Eratosthenes algorithm.

```

10 ' generate prime numbers
20 '
30 DEFINT A-Z
40 PRINT TIMES$
50 S=7000
60 DIM F(7001)
70 C=0
80 FOR I=1 TO S
90 F(I)=1
100 NEXT I
110 FOR I=0 TO S
120 IF F(I)=0 THEN 200
130 P=I+I+3
140 K=I+P
150 IF K>S THEN 190
160 F(K)=0
170 K=K+P
180 GOTO 150
190 C=C+1
200 NEXT I
210 PRINT C, "primes"
220 PRINT TIMES$
230 END

```

Program Listing 9. String manipulation using the MID\$ function.

```

10 ' manipulate strings
15 ' using MID$ function

```

```

20 PRINT TIMES$
30 FOR I=1 TO 5000
40 A$="abcdefghijklmnop"
50 B$=MID$(A$,6,6)
60 NEXT I
70 PRINT TIMES$
80 END

```

Program listing 9

Program Listing 10. String manipulation using a bubble sort.

```

10 ' string manipulation
15 ' simple bubble sort
20 CLEAR 5000
30 N=50
40 DIM A$(N+1)
45 ' enter list to sort
50 FOR K=1 TO N
60 INPUT A$(K):NEXT
70 S$=TIMES$
75 ' bubble sort
80 FOR C=1 TO N
90 FOR K=C+1 TO N
100 IF A$(C)<A$(K) THEN 140
110 T$=A$(K)
120 A$(K)=A$(C)
130 A$(C)=T$
140 NEXT K
150 NEXT C
160 E$=TIMES$
165 ' print sorted list
170 FOR K=1 TO N+1
180 PRINT A$(K)
190 NEXT K
200 Y$=TIMES$
210 PRINT S$, E$, Y$
220 END

```

Program Listing 11. Disk write, disk read, and screen print timing.

```

10 ' test disk I/O
15 ' and screen print
20 CLEAR 5000
30 S$=TIMES$
40 A$="testing"
50 DIM T$(500)
55 ' time disk write
60 OPEN "O", 1, "DATA/TXT"
65 ' use "DATA.TXT" with MS DOS
70 FOR K=1 TO 500
80 PRINT#1, A$
85 ' use WRITE#1 for MS DOS
90 NEXT K
100 CLOSE
110 R$=TIMES$
115 ' time disk read
120 OPEN "I", 1, "DATA/TXT"
125 ' use "DATA.TXT" with MS DOS
130 FOR K=1 TO 500
140 INPUT#1, T$(K)
150 NEXT K
160 CLOSE
170 X$=TIMES$
175 'time screen print
180 FOR K=1 TO 500
190 PRINT T$(K)
200 NEXT K
210 Y$=TIMES$
220 PRINT S$, R$, X$, Y$
230 END

```

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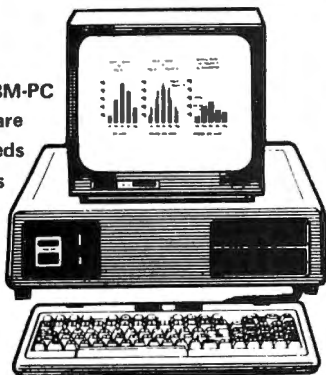
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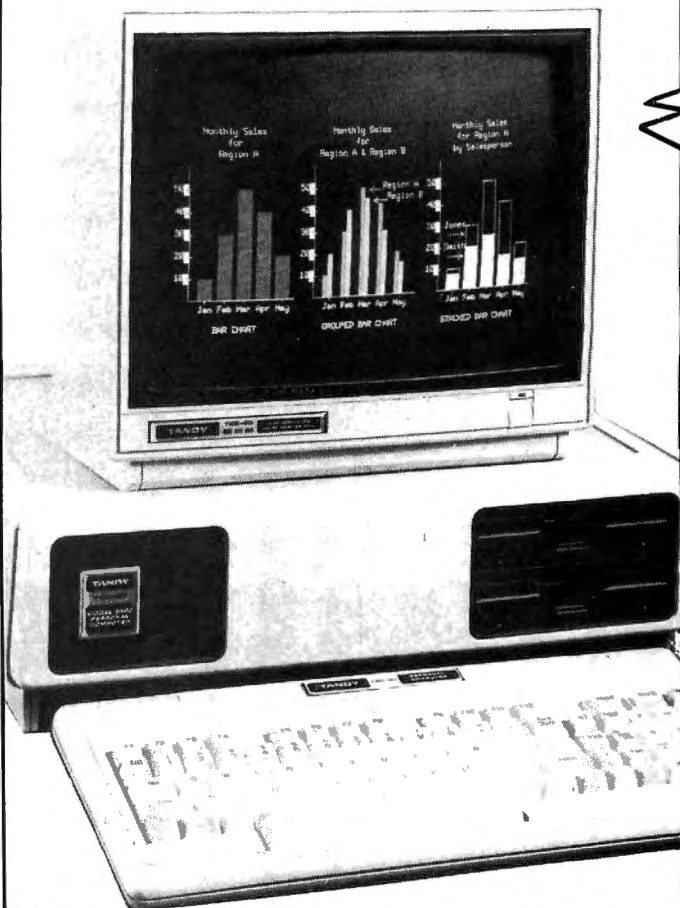
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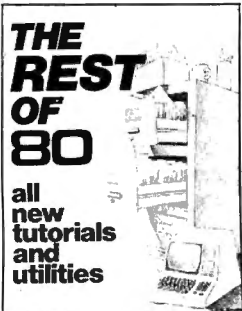
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Basically Better Graphics

Basic graphics programs can run up to eight times faster than normal by using the LSET and RSET commands.

As computer languages go, Basic is great for its ease of use and understandability. But its sometimes slow execution speed can be a drawback, especially in terms of graphics generation. I've discovered a way to manipulate strings that makes Model I/III Basic graphics run up to eight times faster than normal using the LSET and RSET commands.

Think of strings as buffers: areas in memory with defined starting addresses and lengths. LSET creates stable buffers, freezing a string's starting address and length.

Basic usually changes string addresses during string manipulation. For example, if you define G\$, then execute G\$=P\$, Basic changes G\$'s starting address and length to match P\$'s. But if you use LSETG\$=P\$, Basic can't change G\$'s starting address or length.

If the program establishes the "buff-

er" G\$ in video memory, LSETG\$=P\$ results in the same display as PRINTP\$. Since PRINTP\$'s execution generally requires more operations, LSETG\$=P\$ is much faster.

The Test

I've written a short program called Demo (see the Program Listing) to illustrate how effectively this method produces graphics.

An INKEY\$ routine provides access to Demo's subroutines. The program displays a single prompt with five options: B is a Basic screen white-out routine, C fills the screen with a single character, R resets the screen, S saves the screen contents, and W is a screen white-out routine that uses LSET.

After you pick an option, Demo displays two sets of numbers in the upper left corner of the screen. The top set, one or two digits on the left and two

digits on the right, is the subroutine's starting time. The left number indicates seconds, and the right number denotes thirtieths of a second. The bottom set of numbers is the subroutine's ending time, expressed in the same format.

This clock shows just how much faster Basic graphics run using LSET. The Basic white-out routine, B, normally takes 16/30 of a second to run, while the LSET white-out routine, W, runs in only 2/30 of a second.

Inside Demo

Demo establishes five strings, Q\$(X), in lines 130 and 135. Lines 150-190 change the strings' addresses to screen locations 255 bytes apart.

When you first run the program, Demo displays two numbers in the screen's top left corner. The upper number is the string space remaining after Demo defined its five strings. The lower number is the string space remaining after DEMO changed the strings' addresses.

Lines 140 and 200 demonstrate that DEMO's strings, like field variables, take up no string space. Line 220 creates a string buffer to time Demo's subroutines in thirtieths of a second.

LSET Tips

Q\$s will remain as stable buffers if

Program Listing. Basic graphics demonstration program.

```

10 REM This demonstration program illustrates some of the
20 REM features of LSET(or RSET).
30 REM
40 REM
50 REM Peter R. Heisen
60 REM 2109 Stackhouse Dr.
70 REM Yardley, Pa. 19067
80 REM
90 REM
100 CLEAR3000
110 DEFINTA-Z
115 CLS
120 REM Initialization of strings
130 FORX=1TO4:Q$(X)=STRING$(255,32):P$(X)=STRING$(255,32):NEXT
135 Q$(5)=STRING$(4,32)
140 PRINT FRE(D$)
150 V=15360:M=INT(V/256):L=V-M*256
160 FORX=1TO5
170 M=INT(V/256):L=V-M*256
180 Y=VARPTR(Q$(X)):POKEY+1,L:POKEY+2,M:V=V+255
190 NEXT
    
```

Listing continued

The Key Box



Models I and III
32K RAM
Disk Basic

Listing continued

```

200 PRINT FRE(D$)
210 PW$=STRING$(255,191)
215 INPUT"Press <ENTER> to continue";D$
220 Z$="":Y=VARPTR(Z$):POKEY+1,22:POKEY+2,66 'ADD. HEARTBEAT
225 T1$=Z$:T2$=Z$
227 PRINT"Choose B,C,R,S,or,W":GOTO260
230 REM This ends the initialization.
240 PRINT@0, ASC(RIGHT$(T1$,1));30-ASC(LEFT$(T1$,1));
250 PRINT@64, ASC(RIGHT$(T2$,1));30-ASC(LEFT$(T2$,1));CHR$(24);CHR
$(28);
260 I$=INKEY$:IFI$=""THEN260
270 IFI$="W" GOSUB1000:GOTO240
280 IFI$="S" GOSUB1100:GOTO240
290 IFI$="R" GOSUB1200:GOTO240
300 IFI$="B" GOSUB900:GOTO240
305 IFI$="C" GOSUB1300:GOTO240
310 GOTO260
320 REM
890 REM Subroutines
895 REM
899 REM Usual Basic White-out
900 T1$=Z$:FORX=1TO4:PRINTPW$;:NEXT:PRINTSTRING$(3,191);:POKE16383
,191:T2$=Z$:RETURN
995 REM
999 REM LSET White-out
1000 T1$=Z$:FORX=1TO5:LSETQ$(X)=PW$:NEXT:T2$=Z$:RETURN
1095 REM
1099 REM Save screen
1100 T1$=Z$:FORX=1TO5:P$(X)=Q$(X):NEXT:T2$=Z$:RETURN
1190 REM
1199 REM LSET Restore screen
1200 T1$=Z$:FORX=1TO5:LSETQ$(X)=P$(X):NEXT:T2$=Z$:RETURN
1290 REM
1299 REM Fill screen with a character
1300 PRINT"Press a character key:
";CHR$(24);
1305 D$=INKEY$:IFD$=""THEN1305
1310 PO$=STRING$(255,ASC(D$))
1320 T1$=Z$:FOR X=1TO5:LSETQ$(X)=PO$:NEXT:T2$=Z$:RETURN

```

End

they appear on the left side of equations with LSET or RSET. You can use them alone on the right side. For example, P\$=MID\$(Q\$(X),2,!) will not change Q\$'s length or address.

If a string's starting address is above the Basic program's beginning address, the program ignores LSET and RSET. Solve this by changing the program's beginning address, located at 40A4 hexadecimal (hex).

I also read from and write to the stable buffers created with LSET. You can begin by experimenting with the cursor position. Create a 2-byte string C\$ with the cursor address 4020 hex (16416 decimal). Use Y=CVI(C\$):PRINT Y to read from it, and use INPUT Y%:LSETC\$=MKI\$(Y%) to write to it.

Finally, like field variables, LSET pads with trailing blanks when necessary, and RSET pads with leading blanks. You might find this useful for graphics applications. ■

Contact Peter R. Heisen at 2109 Stackhouse Drive, Yardley, PA 19067.

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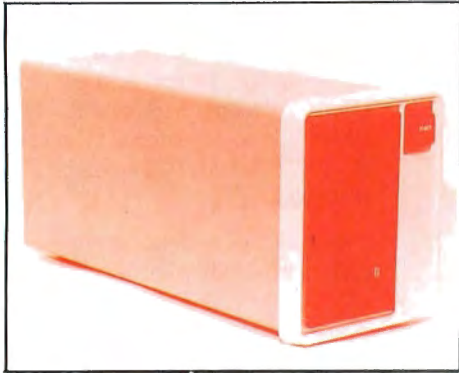
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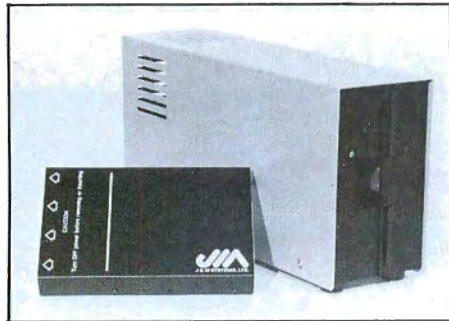


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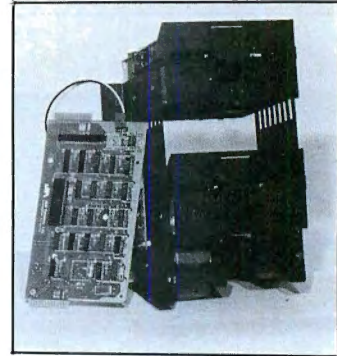
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BUGS From Outer Space

BY ROGER SMITH

PRESS <CLEAR> TO PLAY

This month, the bugs move in for the attack.

The bugs are here! Fortunately, while others ignored warnings until it was too late, you've built and armed your laser base. Now's the time to keep cool and start shooting—but first, add three more modules to the machine-language arcade game we started in March.

The bugs live in the first subroutines in Program Listing 1 (TEXT3A). The three bug tables, BUG1-BUG3, are each 48 bytes long, with each bug occupying 3 bytes. The first 2 bytes are its screen location in the standard least-significant byte/most-significant byte (LSB/MSB) format; if the MSB is zero, the bug isn't on the screen.

The third byte is a code for the bug's direction. If it's zero, the bug is moving right and will move up at the end of the line; if it's 2, the bug is moving left and will move up. Bytes of 1 and 3 indicate, respectively, that the bug will move left or right after moving up one line.

Direction codes 4-7 are equivalent to 0-3, except that the bug moves down the screen at the end of each line. Bytes of 8 and 9 mean that the bug is moving right and left, respectively, and will wrap around at the end of the line; the most dangerous bytes, 10 and 11, direct the bug to attack to the right or left.

The three Add Bug routines (one for each type of bug) add bugs to the tables

at the proper times. Except for different entry points and initial directions, the routines are similar.

The random number generator starts at the label RND, returning a pseudo-random number in A. Most of this subroutine is based on a standard random number algorithm; the keyboard and refresh register make the numbers returned less predictable.

DBUG1-DBUG3 are tables that store the graphics characters representing each bug type (star, spider, or saucer). TEST3A scans the bug tables; it returns with the Z flag set (no bugs on screen) or reset (bugs in sight).

Should the bugs get the best of you, the Killed subroutine adds your base location to the explosion list, decrements the number of bases left, and sets the base hit flag.

Bugs on the Run

Program Listing 2 (TEXT3B) contains subroutines to move the bugs. The address of each subroutine is stored in ADRTAB, a table that the actual Move routines check.

Each Move subroutine is called with the bug's location in DE; IY points to its location in the bug table. All the Move subroutines update the bug's location and change its direction if necessary.

MOVE10 and MOVE11 also check

to see if the bug has hit the base, calling the Killed subroutine if it has.

After bugs have been added, TEXT-3C (Program Listing 3) draws them. MOVEB1-MOVEB3 move each of the three bug types. Each of the move bug routines calls on the Move subroutine to do most of the work.

When Move, going through the bug list, finds a displayed bug (one with an MSB location other than zero), it erases it, then tests to see whether the bug has run into a shot. If so, a flag is set (score one for your side).

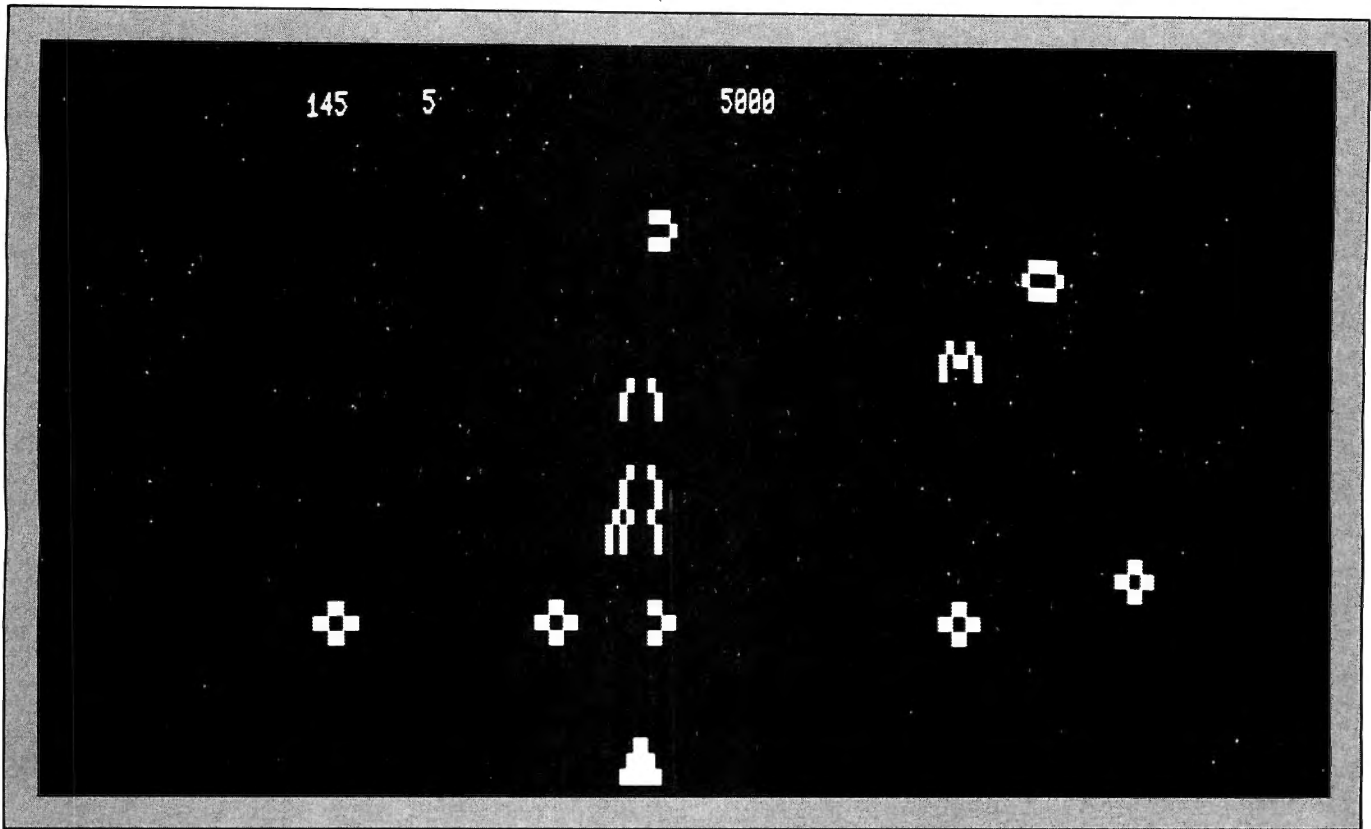
Move then multiplies the direction code by two to get an offset, which the program adds to the location of the address table (ADRTAB). The program loads BC with the address of the proper Move subroutine, and HL with that of the label Return (where the Move subroutines go at a RET).

Next, the program pushes BC onto the stack and executes a RET command, making the program jump to

The Key Box

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





The title screen (left) appeared in March; above, bugs swoop down on the laser base built in April.

the subroutine whose address is in BC. After the Move subroutine updates the location and returns to Return, the bug appears at its new position.

Here Come the Bugs

MAIN3 (Program Listing 4) is the third version of the main program. As before, you don't have to type it in; simply change last month's main source code to match by removing some semicolons and changing the value loaded into B at the LOOPMN label.

Assemble all the listings, then load all the new and old modules' object code files. Finally, execute the newest main program.

After the introduction and title screens, press the clear key to see your base. This time, you've got company—the bugs will rush to join you. Use the left and right arrows to move the base and the space bar to shoot them down.

You don't have an Explosion routine yet, so the pieces of destroyed bugs will remain on the screen. Next month, we'll clean up our act. ■

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

Program Listing 1. TEXT3A/SRC.

```

00100 ;**** PART 3A
65C0 00110 ORG 65C0H
6257 00120 BASE EQU 6257H
6359 00130 BUG1 EQU 6359H
6389 00140 BUG2 EQU 6389H
63B9 00150 BUG3 EQU 63B9H
6203 00160 DISSCR EQU 6203H
6570 00170 EXPLOD EQU 6570H
6235 00180 INCSR EQU 6235H
656C 00190 MINUS1 EQU 656CH
6568 00200 SHIPS EQU 6568H
00210 ;**** ADD BUG #1 ROUTINE
65C0 DD350B 00220 ADD1 DEC (IX+11) ;DECREMENT COUNTER
65C3 C0 00230 RET NZ ;RETURN IF NOT Z
65C4 DD7E0C 00240 SKIP10 LD A,(IX+12) ;RESTORE COUNTER
65C7 DD770B 00250 LD (IX+11),A
65CA DD7E26 00260 LD A,(IX+30) ;TIME TO ADD NEXT SET
65CD B7 00270 OR A ;=0?
65CE 2804 00280 JR Z,SKIP11 ;SKIP IF SO
65D0 DD3526 00290 DEC (IX+38) ;ELSE COUNT=COUNT-1
65D3 C9 00300 RET
65D4 DD7E1F 00310 SKIP11 LD A,(IX+31) ;ADD BUG 1 FLAG
65D7 B7 00320 OR A ;?
65D8 C8 00330 RET Z ;RETURN IF SO
65D9 DD351F 00340 DEC (IX+31) ;DECREMENT IT
65DC 201D 00350 JR NZ,SKIPD1 ;SKIP IF NOT Z
65DE DD7E21 00360 LD A,(IX+33) ;RESET BUG 1 SPEED
65E1 DD7706 00370 LD (IX+6),A
65E4 DD360000 00380 LD (IX),0 ;RESET NUM OF BUGS
65E8 DD7E24 00390 LD A,(IX+36) ;BUG 2 ALREADY ADDED?
65EB B7 00400 OR A
65EC C0 00410 RET NZ ;RETURN IF SO
65ED DD362606 00420 LD (IX+38),6 ;TIME TO ADD NEXT=6
65F1 DD7E01 00430 LD A,(IX+1) ;SET ADD BUG 2 FLAG
65F4 07 00440 RLCA
65F5 07 00450 RLCA
65F6 07 00460 RLCA ;A=A*8
65F7 DD7720 00470 LD (IX+32),A ;STORE FLAG
65FA C9 00480 RET ;RETURN
65FB DD7E00 00490 SKIPD1 LD A,(IX) ;A=NUMBER OF BUG 1
65FE B7 00500 OR A ;ZERO?
65FF C8 00510 RET Z ;RETURN IF 0
6600 3D 00520 DEC A ;A=A-1
6601 47 00530 LD B,A ;B=A
6602 07 00540 RLCA
6603 80 00550 ADD A,B ;A=A*3
6604 4F 00560 LD C,A
6605 0600 00570 LD B,0 ;BC=A
6607 FD215963 00580 LD IY,BUG1 ;IY=>TABLE
660B FD09 00590 ADD IY,BC ;ADD OFFSET
660D 21403F 00600 LD HL,3F40H ;NORMAL ENTRY
6610 DD7E25 00610 LD A,(IX+37) ;RND ENTRY POINTS?
6613 B7 00620 OR A
6614 2812 00630 JR Z,ADD11 ;SKIP IF NOT

```

Listing 1 continued

Listing 1 continued

```

6616 CD1967 00640 CALL RND ;A=RND
6619 E603 00650 AND 3 ;MASK LAST 2 BITS
661B 07 00660 RLCA
661C 07 00670 RLCA
661D 07 00680 RLCA
661E 07 00690 RLCA
661F 07 00700 RLCA
6620 07 00710 RLCA ;A=A*64
6621 4F 00720 LD C,A
6622 0600 00730 LD B,0 ;BC=A
6624 21C03E 00740 LD HL,3EC0H ;UPPERMOST ENTRY
6627 09 00750 ADD HL,BC ;ADD OFFSET
6628 FD7500 00760 ADD1 LD (Y),L ;STORE HL
662B FD7401 00770 LD (Y+1),H
662E FD360200 00780 LD (Y+2),0 ;STORE DIRECTION
6632 DD3500 00790 DEC (IX) ;DEC # OF BUGS
6635 DD361701 00800 LD (IX+23),1 ;SET REDRAW FLAG
6639 C9 00810 RET
;**** ADD BUG #2 ROUTINE
663A DD350D 00830 ADD2 DEC (IX+13) ;DEC COUNTER
663D C0 00840 RET NZ ;RETURN IF NOT 0
663E DD7E0E 00850 LD A,(IX+14) ;RESTORE COUNTER
6641 DD770D 00860 LD (IX+13),A
6644 DD7E26 00870 LD A,(IX+38) ;TIME TO ADD NEXT SET
6647 B7 00880 OR A
6648 2804 00890 JR Z,SKIPH2 ;SKIP IF 0
664A DD3526 00900 DEC (IX+38) ;ELSE DEC COUNT
664D C9 00910 RET
664E DD7E20 00920 SKIPH2 LD A,(IX+32) ;ADD BUG 2 FLAG
6651 B7 00930 OR A ;=0?
6652 C8 00940 RET Z
6653 DD3520 00950 DEC (IX+32) ;DEC FLAG
6656 201D 00960 JR NZ,SKIPD2 ;SKIP IF NOT Z
6658 DD7E22 00970 LD A,(IX+34) ;RESET BUG 2 SPEED
665B DD7708 00980 LD (IX+8),A
665E DD360100 00990 LD (IX+1),0 ;SET NUM OF BUGS=0
6662 DD7E24 01000 LD A,(IX+36) ;BUG 1 ALREADY ADDED?
6665 B7 01010 OR A
6666 C8 01020 RET Z
6667 DD362606 01030 LD (IX+38),6 ;RETURN IF SO
666B DD7E00 01040 LD A,(IX) ;SET TIME TO NEXT SET
666E 07 01050 RLCA ;SET FLAG
666F 07 01060 RLCA
6670 07 01070 RLCA ;A=A*16
6671 DD771F 01080 LD (IX+31),A
6674 C9 01090 RET
6675 DD7E01 01100 SKIPD2 LD A,(IX+1) ;A=NUMBER OF BUG
6678 B7 01110 OR A ;0?
6679 C8 01120 RET Z
667A 3D 01130 DEC A ;A=A-1
667B 47 01140 LD B,A ;B=A
667C 07 01150 RLCA
667D 80 01160 ADD A,B ;A=A*3
667E 4F 01170 LD C,A
667F 0600 01180 LD B,0 ;BC=A
6681 FD218963 01190 LD IY,BUG2 ;IY=>BUG TABLE
6685 FD09 01200 ADD IY,BC ;ADD OFFSET
6687 217D3F 01210 LD HL,3F7DH ;NORMAL ENTRY
668A DD7E25 01220 LD A,(IX+37) ;RND ENTRY POINTS?
668D B7 01230 OR A
668E 2812 01240 JR Z,ADD22 ;SKIP IF NOT
6690 CD1967 01250 CALL RND ;A=RND
6693 E603 01260 AND 3 ;0<=A<=3
6695 07 01270 RLCA
6696 07 01280 RLCA
6697 07 01290 RLCA
6698 07 01300 RLCA
6699 07 01310 RLCA
669A 07 01320 RLCA
669B 4F 01330 LD C,A ;A=A*64
669C 0600 01340 LD B,0 ;BC=A
669E 21FD3E 01350 LD HL,3EFDH ;LOWEST ENTRY ADDRESS
66A1 09 01360 ADD HL,BC ;ADD OFFSET
66A2 FD7500 01370 ADD2 LD (Y),L ;STORE HL

```

```

66A5 FD7401 01380 LD (Y+1),H
66A8 FD360202 01390 LD (Y+2),2 ;STORE DIRECTION
66AC DD3501 01400 DEC (IX+1) ;# OF BUGS= # - 1
66AF DD361701 01410 LD (IX+23),1 ;SET REDRAW FLAG
66B3 C9 01420 RET
;**** ADD BUG #3 ROUTINE
66B4 DD350F 01430 ADD3 DEC (IX+15) ;DEC COUNTER
66B7 C0 01450 RET NZ ;RETURN IF NOT 0
66B8 DD7E10 01460 LD A,(IX+16) ;RESET COUNTER
66BB DD770F 01470 LD (IX+15),A
66BE DD7E1F 01480 LD A,(IX+31) ;IF NOT ADDING BUG 1
66C1 DDB620 01490 OR (IX+32) ;OR BUG 2
66C4 C8 01500 RET Z ; THEN RETURN
66C5 DD7E27 01510 LD A,(IX+39) ;LEVEL DONE?
66C8 B7 01520 OR A
66C9 C0 01530 RET NZ ;RETURN IF SO
66CA CD3D67 01540 CALL TEST3A ;ANYTHING ON SCREEN?
66CD 2807 01550 JR Z,ADD3X ;SKIP IF NOT
66CF CD1967 01560 CALL RND ;A=RND
66D2 DDBE1D 01570 CP (IX+29) ;COMPARE TO BOMB PARAM
66D5 D0 01580 RET NC ;RETURN ON NC
66D6 DD21B963 01590 ADD3X LD IY,BUG3 ;IY=>BUG 3 TABLE
66DA DB4602 01600 LD B,(IX+2) ;B=NUMBER OF BUGS
66DD FD7E01 01610 LOOP33 LD A,(Y+1) ;TEST MSB
66E0 B7 01620 OR A ;0?
66E1 202B 01630 JR NZ,SKIP33 ;SKIP IF NOT
66E3 CD1967 01640 CALL RND ;A=RND
66E6 E603 01650 AND 3 ;MASK 2 BITS
66E8 07 01660 RLCA
66E9 07 01670 RLCA
66EA 07 01680 RLCA
66EB 07 01690 RLCA
66EC 07 01700 RLCA
66ED 07 01710 RLCA ;A=A*64
66EE 5F 01720 LD E,A
66EF 1600 01730 LD D,0 ;DE=A
66F1 215F3C 01740 LD HL,3C5FH ;HL=CENTER OF TOP LINE
66F4 19 01750 ADD HL,DE ;ADD OFFSET
66F5 DD361701 01760 LD (IX+23),1 ;SET REDRAW FLAG
66F9 FD7500 01770 LD (Y),L ;SET LSB
66FC FD7401 01780 LD (Y+1),H ;SET MSB
66FF FD360208 01790 LD (Y+2),8 ;SET DIRECTION
6703 CD1967 01800 CALL RND ;A=RND
6706 E601 01810 AND 1 ;MASK BIT 0
6708 C8 01820 RET Z ;RETURN IF ZERO
6709 FD360209 01830 LD (Y+2),9 ;SET DIRECTION=9
670D C9 01840 RET
670E FD23 01850 SKIP33 INC IY ;IY=IY+3
6710 FD23 01860 INC IY
6712 FD23 01870 INC IY
6714 10C7 01880 DJNZ LOOP33
6716 C9 01890 RET
;**** RANDOM NUMBER SUBROUTINE
6717 5352 01910 SEED DEFW 5253H ;RND SEED
6719 D9 01920 RND EXX ;GENERATE RND NUMBER
671A 211767 01930 LD HL,SEED ;HL=>SEED
671D 7E 01940 LD A,(HL) ;GET SEED
671E 07 01950 RLCA ;PLAY WITH IT
671F AE 01960 XOR (HL)
6720 0F 01970 RRCA
6721 23 01980 INC HL ;POINT TO MSB OF SEED
6722 34 01990 INC (HL)
6723 86 02000 ADD A,(HL)
6724 47 02010 LD B,A ;STORE RND NUMBER
6725 ED5F 02020 LD A,R ;A=REFRESH
6727 4F 02030 LD C,A ;C=A
6728 3AFF38 02040 LD A,(38FFH) ;A=KEYBOARD
672B A1 02050 AND C ;AND REFRESH
672C 2801 02060 JR Z,SKIP25 ;MIX THINGS UP
672E 34 02070 INC (HL) ; A LITTLE MORE
672F 78 02080 SKIP25 LD A,B ;GET NUMBER
6730 2B 02090 HL
6731 77 02100 LD (HL),A ;STORE IT
6732 D9 02110 EXX ;GET REGULAR REGISTERS

```

Listing 1 continued

Listing 1 continued

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6733 C9      02120      RET          ;AND RETURN
              02130      ;**** BUG DESIGNS
6734 96      02140      DBUG1      DEFB      150      ;BUG 1
6735 8C      02150      DEFB      140
6736 A9      02160      DEFB      169
6737 8C      02170      DBUG2      DEFB      140      ;BUG 2
6738 B3      02180      DEFB      179
6739 8C      02190      DEFB      140
673A A6      02200      DBUG3      DEFB      166      ;OK, BUG 3 ISN'T
673B B3      02210      DEFB      179      ; REALLY A BUG
673C 99      02220      DEFB      153
              02230      ;**** TEST IF ANY BUGS ON SCREEN SUBROUTINE
673D 0630    02240      TEST3A     LD          B,48      ;MAX # OF BUGS
673F FD215963 02250      LD          IY,BUG1    ;IY=>BUG TABLE
6743 FD7E01  02260      TEST33    LD          A,(IY+1)   ;TEST MSB
6746 B7      02270      OR          A
6747 C0      02280      RET        NZ          ;RETURN IF NOT ZERO
6748 FD23    02290      INC        IY          ;ELSE IY=IY+3
674A FD23    02300      INC        IY
674C FD23    02310      INC        IY
674E 10F3    02320      DJNZ      TEST33      ;CONTINUE
6750 AF      02330      XOR        A           ;SET Z FLAG
6751 C9      02340      RET
6752 DD7ELE  02350      KILLED    LD          A,(IX+30)   ;FLAG ALREADY SET?
6755 B7      02360      OR          A
6756 C0      02370      RET        NZ          ;RETURN IF SO
6757 C5      02380      PUSH      BC          ;SAVE REGISTERS
6758 D5      02390      PUSH      DE
6759 E5      02400      PUSH      HL
675A FDE5    02410      PUSH      IY
675C ED5B5762 02420      LD          DE,(BASE)  ;GET BASE LOC
6760 CD7065  02430      CALL      EXPLOD      ;AND PUT IN EXP TABLE
6763 DD361EC0 02440      LD          (IX+30),0C0H ;SET FLAG
6767 116C65  02450      LD          DE,MINUS1  ;DEC # BASES
676A 216865  02460      LD          HL,SHIPS
676D CD3562  02470      CALL      INCSCR
6770 11063C  02480      LD          DE,3C06H   ;DE=>VIDEO
6773 D5      02490      PUSH      DE          ;SAVE DE
6774 0606    02500      LD          B,6        ;CLEAR AREA
6776 3E80    02510      LD          A,128
6778 12      02520      KILL10    LD          (DE),A
6779 13      02530      INC        DE
677A 10FC    02540      DJNZ      KILL10
677C D1      02550      POP        DE
677D 216865  02560      LD          HL,SHIPS   ;DISPLAY BASES LEFT
6780 CD0362  02570      CALL      DISSCR
6783 FDE1    02580      POP        IY          ;RESTORE REGISTERS
6785 E1      02590      POP        HL
6786 D1      02600      POP        DE
6787 C1      02610      POP        BC
6788 C9      02620      RET
6789      02630      NEXT1     EQU        $
678A      02640      END
00000 TOTAL ERRORS
28784 TEXT AREA BYTES LEFT

ADD1  65C0 00220
ADD11 6628 00760 00630
ADD2  663A 00830
ADD22 66A2 01370 01240
ADD3  66B4 01440
ADD3X 66D6 01590 01550
BASE  6257 00120 02420
BUG1  6359 00130 00580 02250
BUG2  6389 00140 01190
BUG3  63B9 00150 01590
DEBUG1 6734 02140
DEBUG2 6737 02170
DEBUG3 673A 02200
DISSCR 6203 00160 02570
EXPLOD 6570 00170 02430
INCSCR 6235 00180 02470
KILL10 6778 02520 02540
KILLED 6752 02350

```

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LOOP33 66DD 01610 01880
MINUS1 656C 00190 02450
NEXT1  6789 02630
RND    6719 01920 00640 01250 01560 01640 01800
SEED   6717 01910 01930
SHIPS  6568 00200 02460 02560
SKIP10 65C4 00240
SKIP25 672F 02080 02060
SKIP33 670E 01850 01630
SKIPD1 65FB 00490 00350
SKIPD2 6675 01100 00960
SKIPH1 65D4 00310 00280
SKIPH2 664E 00920 00890
TEST33 6743 02260 02320
TEST3A 673D 02240 01540

```

End

Program Listing 2. TEXT3B/SRC.

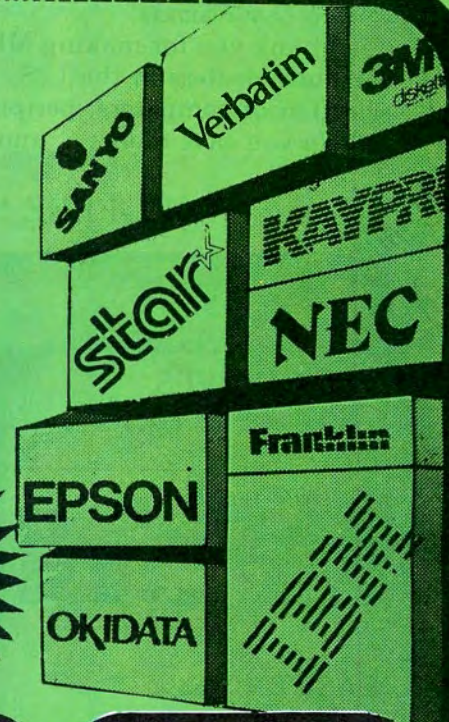
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6789      00100 ;**** PART 3B
6789H      00110      ORG          6789H
640B      00120      TEMPW     EQU          640BH
6257      00130      BASE      EQU          6257H
6463      00140      BASEM     EQU          6463H
6752      00150      KILLED    EQU          6752H
6789 A167    00160      ADRTAB    DEFW          MOVE0      ;TABLE OF MOVE
678B BB67    00170      DEFW          MOVE1      ; SUBROUTINES
678D E667    00180      DEFW          MOVE2
678F FE67    00190      DEFW          MOVE3
6791 0B68    00200      DEFW          MOVE4
6793 1468    00210      DEFW          MOVE5
6795 3A68    00220      DEFW          MOVE6
6797 4368    00230      DEFW          MOVE7
6799 5068    00240      DEFW          MOVE8
679B 6968    00250      DEFW          MOVE9
679D 8268    00260      DEFW          MOVE10
679F C968    00270      DEFW          MOVE11
              00280 ;**** MOVE SUB'S FOLLOW
67A1 CDAA67  00290      MOVE0     CALL          MOVER      ;MOVE RIGHT
67A4 C0      00300      RET        NZ          ;IF NOT AT END OF LINE
              00310      ; THEN RETURN
              00320      LD          (IY+2),1    ;NEW DIRECTION=1
67A5 FD360201 00320      LD          RET        NZ          ;MOVE RIGHT SUBROUTINE
67A9 C9      00330      MOVER     LD          A,E      ;GET POSITION
67AA 7B      00340      AND        3FH         ;END OF LINE?
67AB E63F    00350      CP         Z            ;RETURN IF SO
67AD FE3D    00360      RET        DE=DE+1
67AF C8      00370      INC        DE          ;STORE DE
67B0 13      00380      LD          (IY),E
67B1 FD7300  00390      LD          (IY+1),D
67B4 FD7201  00400      LD          A,1        ;RESET Z FLAG
67B7 3E01    00410      OR          A
67B9 B7      00420      RET
67BA C9      00430      RET        ;RETURN
67BB CDC867  00440      MOVE1     CALL          MOVEU    ;MOVE UP
67BE FD360202 00450      LD          (IY+2),2    ;DIRECTION = 2
67C2 C0      00460      RET        NZ          ;RETURN IF NOT TOP LINE
67C3 FD360206 00470      LD          (IY+2),6    ;CHANGE DIRECTION TO 2
67C7 C9      00480      RET
67C8 7A      00490      MOVEU     LD          A,D      ;TEST LOCATION
67C9 FE3C    00500      CP         3CH         ;IF > 3C00H
67CB 2007    00510      JR         NZ,SKIP50    ; THEN SKIP
67CD 7B      00520      LD          A,E        ;IF > 3C7DH
67CE FE7E    00530      CP         7EH         ; THEN SKIP
67D0 3002    00540      JR         NC,SKIP50
67D2 AF      00550      XOR        A           ;SET Z FLAG
67D3 C9      00560      RET
67D4 E5      00570      SKIP50    PUSH      HL          ;STORE HL
67D5 EB      00580      EX        DE,HL        ;HL=DE
67D6 11C0FF  00590      LD          DE,-64     ;DE=-64
67D9 19      00600      ADD        HL,DE       ;HL=HL-64
67DA EB      00610      EX        DE,HL        ;DE=HL
67DB E1      00620      POP        HL

```

Listing 2 continued on p. 117

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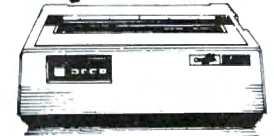
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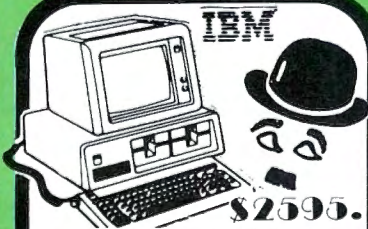
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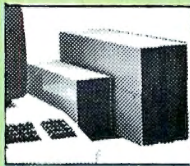
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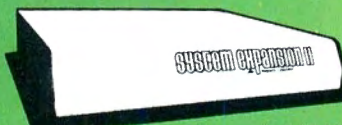
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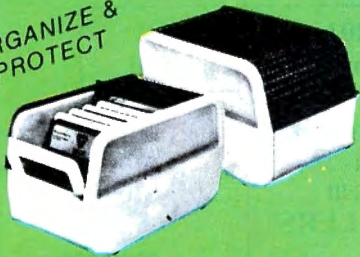
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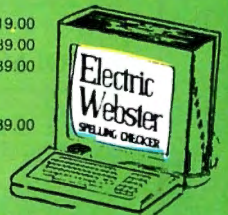
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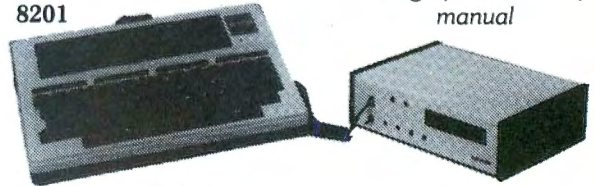
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67DC FD7300 00630 LD (IY),E ;STORE DE
67DF FD7201 00640 LD (IY+1),D
67E2 3E01 00650 LD A,1 ;RESET Z FLAG
67E4 B7 00660 OR A
67E5 C9 00670 RET
67E6 CDEF67 00680 MOVE2 CALL MOVE ;MOVE LEFT
67E9 C0 00690 RET NZ ;RETURN IF NOT AT END
67EA FD360203 00700 LD (IY+2),3 ;NEW DIRECTION=3
67EE C9 00710 RET
67EF 7B 00720 MOVE1 LD A,E ;GET LSB
67F0 E63F 00730 AND 3FH ;TEST POS
67F2 C8 00740 RET Z ;RETURN ON 0
67F3 1B 00750 DEC DE ;ELSE DE=DE-1
67F4 FD7300 00760 LD (IY),E ;STORE DE
67F7 FD7201 00770 LD (IY+1),D
67FA 3E01 00780 LD A,1 ;RESET Z FLAG
67FC B7 00790 OR A
67FD C9 00800 RET
67FE CDC867 00810 MOVE3 CALL MOVEU ;MOVE UP
6801 FD360200 00820 LD (IY+2),0 ;CHANGE DIRECTION TO 0
6805 C0 00830 RET NZ ;RETURN IF NOT TOP
6806 FD360204 00840 LD (IY+2),4 ;DIRECTION = 4
680A C9 00850 RET
680B CDAA67 00860 MOVE4 CALL MOVER ;MOVE RIGHT
680E C0 00870 RET NZ
680F FD360205 00880 LD (IY+2),5 ;IF EOL THEN DIR=5
6813 C9 00890 RET
6814 CD2168 00900 MOVE5 CALL MOVED ;MOVE DOWN
6817 FD360206 00910 LD (IY+2),6
681B C0 00920 RET NZ
681C FD360202 00930 LD (IY+2),2 ;IF BOTTOM THEN DIR=2
6820 C9 00940 RET
6821 7A 00950 MOVED LD A,D ;TEST IF < 3E00H
6822 FE3E 00960 CP 3EH
6824 2002 00970 JR NZ,SKIP60 ;SKIP IF SO
6826 AF 00980 XOR A ;SET Z FLAG
6827 C9 00990 RET
6828 E5 01000 SKIP60 PUSH HL ;STORE HL
6829 EB 01010 EX DE,HL ;HL=DE
682A 114000 01020 LD DE,64
682D 19 01030 ADD HL,DE ;HL=HL+64
682E EB 01040 EX DE,HL ;DE=HL
682F E1 01050 POP HL
6830 FD7300 01060 LD (IY),E ;STORE DE
6833 FD7201 01070 LD (IY+1),D
6836 3E01 01080 LD A,1 ;RESET Z FLAG
6838 B7 01090 OR A
6839 C9 01100 RET
683A CDEF67 01110 MOVE6 CALL MOVE ;MOVE LEFT
683D C0 01120 RET NZ
683E FD360207 01130 LD (IY+2),7
6842 C9 01140 RET
6843 CD2168 01150 MOVE7 CALL MOVED ;MOVE DOWN
6846 FD360204 01160 LD (IY+2),4
684A C0 01170 RET NZ
684B FD360200 01180 LD (IY+2),0
684F C9 01190 RET
6850 7B 01200 MOVE8 LD A,E ;TEST POSITION
6851 E63F 01210 AND 3FH
6853 FE3D 01220 CP 3DH ;END OF LINE?
6855 2808 01230 JR Z,MOVE8A ;JUMP IF SO
6857 13 01240 INC DE
6858 FD7300 01250 LD (IY),E ;STORE DE
685B FD7201 01260 LD (IY+1),D
685E C9 01270 RET
685F 7B 01280 MOVE8A LD A,E ;GET LSB
6860 E6C0 01290 AND 0C0H ;ERASE LAST 6 BITS
6862 FD7700 01300 LD (IY),A ;STORE LSB
6865 FD7201 01310 LD (IY+1),D ;STORE MSB
6868 C9 01320 RET
6869 7B 01330 MOVE9 LD A,E ;TEST POSITION
686A E63F 01340 AND 3FH
686C 2808 01350 JR Z,MOVE9A ;JUMP IF START OF LINE
686E 1B 01360 DEC DE
686F FD7300 01370 LD (IY),E ;STORE DE

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6872 FD7201 01380 LD (IY+1),D
6875 C9 01390 RET
6876 7B 01400 MOVE9A LD A,E ;GET LSB
6877 F63F 01410 OR 3FH ;SET LAST 6 BITS
6879 D602 01420 SUB 2 ;SUBTRACT 2
687B FD7700 01430 LD (IY),A ;STORE LSB
687E FD7201 01440 LD (IY+1),D ;STORE MSB
6881 C9 01450 RET
6882 7A 01460 MOVE10 LD A,D ;TEST IF BOTTOM LINE
6883 FE3F 01470 CP 3FH
6885 2005 01480 JR NZ,NOPE10 ;SKIP IF NOT
6887 7B 01490 LD A,E
6888 FEBF 01500 CP 0BFH
688A 300F 01510 JR NC,YES10 ;SKIP IF SO
688C E5 01520 NOPE10 PUSH HL
688D EB 01530 EX DE,HL ;HL=DE
688E 114100 01540 LD DE,65 ;DE=65
6891 19 01550 ADD HL,DE ;HL=HL+65
6892 EB 01560 EX DE,HL ;DE=HL
6893 E1 01570 POP HL
6894 FD7300 01580 LD (IY),E ;STORE DE
6897 FD7201 01590 LD (IY+1),D
689A C9 01600 RET
689B CDF768 01610 YES10 CALL TEST4 ;TEST IF BASE HIT
689E 7B 01620 LD A,E ;GET MSB
689F E63F 01630 AND 3FH ;MASK IT
68A1 FE3D 01640 CP 3DH ;END OF LINE?
68A3 3801 01650 JR C,OK10 ;SKIP IF OK
68A5 AF 01660 XOR A ;A=0
68A6 C680 01670 OK10 ADD A,80H ;ADD 128
68A8 FD7700 01680 LD (IY),A ;STORE LSB
68AB FD36013C 01690 LD (IY+1),3CH ;STORE MSB
68AF FD360208 01700 LD (IY+2),8 ;STORE DIRECTION
68B3 D9 01710 ERASE EXX
68B4 21C03F 01720 LD HL,3FC0H ;ERASE LAST LINE
68B7 11C13F 01730 LD DE,3FC1H
68BA 3680 01740 LD (HL),80H
68BC 013F00 01750 LD BC,63
68BF EDB0 01760 LDIR
68C1 110000 01770 LD DE,0 ;DRAW BASE
68C4 CD6364 01780 CALL BASEM
68C7 D9 01790 EXX
68C8 C9 01800 RET
68C9 7A 01810 MOVE11 LD A,D ;TEST FOR LAST LINE
68CA FE3F 01820 CP 3FH
68CC 2005 01830 JR NZ,NOPE11
68CE 7B 01840 LD A,E
68CF FEC0 01850 CP 0C0H
68D1 300F 01860 JR NC,YES11
68D3 E5 01870 NOPE11 PUSH HL
68D4 EB 01880 EX DE,HL ;HL=DE
68D5 113F00 01890 LD DE,63 ;DE=63
68D8 19 01900 ADD HL,DE ;HL=HL+63
68D9 EB 01910 EX DE,HL ;DE=HL
68DA E1 01920 POP HL
68DB FD7300 01930 LD (IY),E ;STORE DE
68DE FD7201 01940 LD (IY+1),D
68E1 C9 01950 RET
68E2 CDF768 01960 YES11 CALL TEST4 ;BASE HIT?
68E5 7B 01970 LD A,E
68E6 E63F 01980 AND 3FH
68E8 C680 01990 ADD A,80H ;ADD 128
68EA FD7700 02000 LD (IY),A ;STORE LSB
68ED FD36013C 02010 LD (IY+1),3CH ;STORE MSB
68F1 FD360209 02020 LD (IY+2),9 ;STORE DIRECTION
68F5 18BC 02030 JR ERASE
68F7 E5 02040 TEST4 PUSH HL ;SAVE HL
68F8 2A5762 02050 LD HL,(BASE) ;GET BASE LOC
68FB 7B 02060 LD A,E
68FC 95 02070 SUB L
68FD C602 02080 ADD A,2
68FF FE05 02090 CP 5 ;HIT?
6901 3008 02100 JR NC,NOHIT ;SKIP IF NOT
6903 7A 02110 LD A,D
6904 FE3F 02120 CP 3FH

```

Listing 2 continued

```

6906 2003 02130 JR NZ,NOHIT ;SKIP IF NOT
6908 CD5267 02140 CALL KILLED ;CALL KILLED SUB
690B E1 02150 NOHIT POP HL ;RESTORE HL
690C C9 02160 RET
690D 02170 NEXT1 EQU $
0000 02180 END
00000 TOTAL ERRORS
30096 TEXT AREA BYTES LEFT

ADR2TAB 6789 00160
BASE 6257 00130 02050
BASEM 6463 00140 01780
ERASE 68B3 01710 02030
KILLED 6752 00150 02140
MOVE0 67A1 00290 00160
MOVE1 67BB 00440 00170
MOVE10 6882 01460 00260
MOVE11 68C9 01810 00270
MOVE2 67E6 00680 00180
MOVE3 67FE 00810 00190
MOVE4 680B 00860 00200
MOVE5 6814 00900 00210
MOVE6 683A 01110 00220
MOVE7 6843 01150 00230
MOVE8 6850 01200 00240
MOVE8A 685F 01280 01230
MOVE9 6869 01330 00250
MOVE9A 6876 01400 01350
MOVED 6821 00950 00900 01150
MOVEL 67EF 00720 00680 01110
MOVER 67AA 00340 00290 00860
MOVEU 67C8 00490 00440 00810
NEXT1 690D 02170
NOHIT 690B 02150 02100 02130
NOPE10 688C 01520 01480
NOPE11 68D3 01870 01830
OK10 68A6 01670 01650
SKIP50 67D4 00570 00510 00540
SKIP60 6828 01000 00970
TEMPW 640B 00120
TEST4 68F7 02040 01610 01960
YES10 689B 01610 01510
YES11 68E2 01960 01860

```

End

Program Listing 3. TEXT3C/SRC.

```

690D 00100 ;**** PART 3C
00110 ORG 690DH
6789 00120 ADR2TAB EQU 6789H
6359 00130 BUG1 EQU 6359H
6389 00140 BUG2 EQU 6389H
63B9 00150 BUG3 EQU 63B9H
6734 00160 DBUG1 EQU 6734H
6737 00170 DBUG2 EQU 6737H
673A 00180 DBUG3 EQU 673AH
640B 00190 TEMPW EQU 640BH
00200 ;**** DRAW SUB REDRAW THE BUGS
690D DD7E17 00210 DRAW LD A,(IX+23) ;TEST REDRAW FLAG
6910 B7 00220 OR A
6911 C8 00230 RET Z ;RETURN IF Z
6912 3A0C64 00240 LD A,(TEMPW+1) ;TEST FOR SHOT
6915 B7 00250 OR A
6916 2805 00260 JR Z,SKIP17 ;IF ZERO THEN SKIP
6918 2A0B64 00270 LD HL,(TEMPW) ;ELSE GET SHOT LOC
691B 368C 00280 LD (HL),8CH ;DRAW SHOT
691D DD361700 00290 SKIP17 LD (IX+23),0 ;RESET REDRAW FLAG
6921 113467 00300 LD DE,DBUG1 ;DE=>DESIGN OF BUG 1
6924 FD215963 00310 LD IY,BUG1 ;DRAW BUG TYPE 1
6928 CD3C69 00320 CALL DRAW10

```

```

692B 113767 00330 LD DE,DBUG2
692E FD218963 00340 LD IY,BUG2 ;DRAW BUG TYPE 2
6932 CD3C69 00350 CALL DRAW10
6935 113A67 00360 LD DE,DBUG3
6938 FD21B963 00370 LD IY,BUG3 ;DRAW BUG TYPE 3
693C 0610 00380 DRAW10 LD B,16 ;MAXIMUM # OF BUGS
693E C5 00390 LOOP20 PUSH BC ;STORE COUNTER
693F FD7E01 00400 LD A,(IY+1) ;TEST MSB
6942 B7 00410 OR A ;0?
6943 280C 00420 JR Z,SKIP28 ;SKIP IF SO
6945 67 00430 LD H,A ;GET MSB
6946 FD6E00 00440 LD L,(IY) ;HL=LOCATION
6949 D5 00450 PUSH DE
694A EB 00460 EX DE,HL
694B 010300 00470 LD BC,3
694E EDB0 00480 LDIR ;LENGTH=3
6950 D1 00490 POP DE ;MOVE
6951 C1 00500 SKIP28 POP BC
6952 FD23 00510 INC IY ;IY=IY+3
6954 FD23 00520 INC IY
6956 FD23 00530 INC IY
6958 10E4 00540 DJNZ LOOP20 ;LOOP UNTIL B=0
695A 0E00 00550 LD C,0
695C C9 00560 RET
695D DD3505 00570 ;**** MOVE BUG ROUTINES FOLLOW
695D DD3505 00580 MOVEB1 DEC (IX+5) ;DECREMENT COUNTER
6960 C0 00590 RET NZ ;RETURN IF NOT 0
6961 DD7E06 00600 LD A,(IX+6) ;RESTORE COUNTER
6964 DD7705 00610 LD (IX+5),A
6967 FD215963 00620 LD IY,BUG1 ;IY=>BUG1 TABLE
696B 213467 00630 LD HL,DBUG1 ;HL=>BUG DESIGN
696E 1824 00640 JR MOVE ;MOVE 'EM
6970 DD3507 00650 MOVEB2 DEC (IX+7) ;DECREMENT COUNTER
6973 C0 00660 RET NZ ;RETURN IF NOT ZERO
6974 DD7E08 00670 LD A,(IX+8) ;RESET COUNTER
6977 DD7707 00680 LD (IX+7),A
697A FD218963 00690 LD IY,BUG2 ;IY=>BUG 2 TABLE
697E 213767 00700 LD HL,DBUG2 ;IY=>BUG DESIGN
6981 1811 00710 JR MOVE
6983 DD3509 00720 MOVEB3 DEC (IX+9) ;DECREMENT COUNTER
6986 C0 00730 RET NZ ;RET IF NOT ZERO
6987 DD7E0A 00740 LD A,(IX+10) ;RESTORE COUNTER
698A DD7709 00750 LD (IX+9),A
698D FD21B963 00760 LD IY,BUG3 ;IY=>BUG 3 TABLE
6991 213A67 00770 LD HL,DBUG3 ;IY=>BUG DESIGN
6994 0610 00780 MOVE LD B,16 ;B=MAX. NUMBER OF BUGS
6996 C5 00790 LOOP40 PUSH BC ;STORE COUNTER
6997 E5 00800 PUSH HL
6998 FD7E01 00810 LD A,(IY+1) ;GET MSB
699B B7 00820 OR A
699C 2833 00830 JR Z,RETURN ;SKIP IF 0
699E 57 00840 LD D,A ;D=MSB
699F FD5E00 00850 LD E,(IY) ;E=LSB
69A2 0603 00860 LD B,3
69A4 3E80 00870 LD A,80H
69A6 D5 00880 PUSH DE
69A7 12 00890 LOOP44 LD (DE),A ;ERASE BUG
69A8 13 00900 INC DE
69A9 10FC 00910 DJNZ LOOP44
69AB D1 00920 POP DE
69AC 2A0B64 00930 LD HL,(TEMPW) ;CHECK IF BUG HITS SHOT
69AF 7A 00940 LD A,D ;COMPARE MSB'S
69B0 BC 00950 CP H
69B1 200A 00960 JR NZ,NOTHIT
69B3 7D 00970 LD A,L
69B4 93 00980 SUB E
69B5 FE03 00990 CP 3
69B7 3004 01000 JR NC,NOTHIT ;SKIP IF NO HIT
69B9 DD362F01 01010 LD B9,DD362F01 ;SET HIT FLAG
69BD FD7E02 01020 NOTHIT LD A,(IY+2) ;A=DIRECTION CODE
69C0 07 01030 RLCA ;A=A*2
69C1 4F 01040 LD C,A
69C2 0600 01050 LD B,0 ;BC=0
69C4 210967 01060 LD HL,ADR2TAB ;HL=>ADDRESS TABLE
69C7 09 01070 ADD HL,BC ;HL=>MOVE ADDRESS

```

Listing 3 continued

Listing 3 continued

```

69C8 4E 01080 LD C,(HL) ;BC=ADDRESS
69C9 23 01090 INC HL
69CA 46 01100 LD B,(HL)
69CB 21D169 01110 LD HL,RETURN ;HL=RETURN ADDRESS
69CE E5 01120 PUSH HL ;STORE ON STACK
69CF C5 01130 PUSH BC ;STORE ON STACK
69D0 C9 01140 RET ;AND JUMP TO IT
69D1 FD5E00 01150 RETURN LD E,(Y) ;GET DE
69D4 FD5601 01160 LD D,(Y+1)
69D7 FD23 01170 INC Y
69D9 FD23 01180 INC Y
69DB FD23 01190 INC Y
69DD E1 01200 POP HL ;GET DESIGN ADDRESS
69DE E5 01210 PUSH HL ;AND SAVE IT
69DF 010300 01220 LD BC,3
69E2 EDB0 01230 LDIR ;DISPLAY BUG
69E4 E1 01240 POP HL
69E5 C1 01250 POP BC ;RESTORE COUNTER
69E6 10AE 01260 DJNZ LOOP40 ;LOOP UNTIL B=0
69E8 C9 01270 RET ;RETURN
        01280
69E9 01290 NEXT1 EQU $
0000 01300 END
00000 TOTAL ERRORS
31600 TEXT AREA BYTES
    
```

LEFT

```

ADRTAB 6789 00120 01060
BUG1 6359 00130 00310 00620
BUG2 6389 00140 00340 00690
BUG3 63B9 00150 00370 00760
DBUG1 6734 00160 00300 00630
DBUG2 6737 00170 00330 00700
DBUG3 673A 00180 00360 00770
DRAW 690D 00210
DRAW10 693C 00380 00320 00350
LOOP20 693E 00390 00540
LOOP40 6996 00790 01260
LOOP44 69A7 00890 00910
MOVE 6994 00780 00640 00710
MOVEB1 695D 00580
MOVEB2 6970 00650
MOVEB3 6983 00720
NEXT1 69E9 01290
NOTHIT 69BD 01020 00960 01000
RETURN 69D1 01150 00830 01110
SKIP17 691D 00290 00260
SKIP20 6951 00500 00420
TEMPW 640B 00190 00240.00270 00930
    
```

End

Program Listing 4. MAIN3/SRC, the third version of Bugs' main program.

```

00100 ;***** MAIN PROGRAM
00110 ; VERSION 3
6DDD 00120 ORG 6DDD
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 HBASE EQU 640DH
6C57 00340 HBOMB 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 SOUNDI 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 DD7E00 00880 LD A,(IX+0)
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
    
```

Listing 4 continued

Listing 4 continued

```

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
        01110 LD (IX+31),0
        01120 LD (IX+32),0
6E70 DD362F00 01130 LD (IX+47),0
6E74 DD7E21 01140 LD A,(IX+33) ;RESTORE SPEEDS
6E77 DD7706 01150 LD (IX+6),A
6E7A DD7E22 01160 LD A,(IX+34)
6E7D DD7708 01170 LD (IX+8),A
        01180 ; CALL FLASH ;FLASH AND CLS
        01190 ; CALL SOUNDI ;SOUND AND INC LEVEL
        01200 ; CALL START ;INITIALIZE
6E80 0610 01210 LOOPMN LD B,16 ;***** B=16 FOR MAIN 3 & 4 ONLY
6E82 C5 01220 LOOPX0 PUSH BC
6E83 CD5D69 01230 CALL MOVEB1
6E86 CD7069 01240 CALL MOVEB2
6E89 CD8369 01250 CALL MOVEB3
6E8C CD0D69 01260 CALL DRAW
        01270 ; CALL TEST8
        01280 ; CALL MBOMB
6E8F DD7E1E 01290 LD A,(IX+30) ;BASE HIT?
6E92 B7 01300 OR A
6E93 CC0D64 01310 CALL Z,MBASE ;MOVE IT IF NOT
        01320 ; CALL ADDBMB
        01330 ; CALL SOUND4
6E96 CD9464 01340 CALL MSHOT
6E99 CD8764 01350 CALL SOUND1
        01360 ; CALL TEST
        01370 ; CALL SOUND2
        01380 ; CALL BOOM
        01390 ; CALL TEST2
        01400 ; CALL TEST3
        01410 ; CALL SOUND3
        01420 ; CALL TEST5
        01430 ; CALL TEST6
6E9C C1 01440 POP BC
6E9D DD7E2A 01450 LD A,(IX+42) ;NEXT LEVEL?
6EA0 B7 01460 OR A
6EA1 C2386E 01470 JP NZ,NEXT
6EA4 DD7E29 01480 LD A,(IX+41)
6EA7 B7 01490 OR A
6EAB C2C36E 01500 JP NZ,CONT ;JP IF BASE HIT
6EAB 10D5 01510 DJNZ LOOPX0
        01520 ; CALL ATTACK
6EAD DD342B 01530 INC (IX+43)
6EB0 CDC065 01540 CALL ADD1
6EB3 CD3A66 01550 CALL ADD2
6EB6 CDB466 01560 CALL ADD3
6EB9 3A0438 01570 LD A,(3804H) ;CHECK FOR 'P'
6EBC E601 01580 AND 1
6EBE C4326F 01590 CALL NZ,PAUSE ;PAUSE IF SO
6EC1 18BD 01600 JR LOOPMN ;LOOP
6EC3 DD3523 01610 DEC (IX+35) ;DECREMENT LEVEL
6EC6 DD363001 01620 LD (IX+48),1 ;SET FLAG
6ECA 216865 01630 LD HL,SHIPS ;TEST IF 0 LEFT
6ECD 0603 01640 LD B,3
6ECF AF 01650 XOR A
6ED0 B6 01660 OR (HL) ;OR # SHIPS
6ED1 23 01670 INC HL
6ED2 10FC 01680 DJNZ CONT10 ;LOOP UNTIL B=0
6ED4 C2386E 01690 JP NZ,NEXT ;JP IF NOT GAME OVER
6ED7 210B70 01700 LD HL,MESS10 ;DISPLAY MESSAGE
6EDA 119B3C 01710 LD DE,3CA0H-5
6EDD 010B00 01720 LD BC,11
6EE0 EDB0 01730 LDIR
6EE2 211670 01740 LD HL,MESS20 ;DISPLAY SECOND LINE
6EE5 11D33C 01750 LD DE,3CE0H-13
6EE8 011D00 01760 LD BC,29
6EEB EDB0 01770 LDIR
6EED 1E0A 01780 LD E,0AH ;SOUND
6EEF 0E10 01790 OVER05 LD C,10H

```

```

6EF1 0640 01800 OVER10 LD B,40H
6EF3 C5 01810 OVER20 PUSH BC
6EF4 10FE 01820 DJNZ $
6EF6 C1 01830 POP BC
6EF7 CD8A61 01840 CALL SOUNDX
6EFA 10F7 01850 DJNZ OVER20
6EFC 0D 01860 DEC C
6EFD 20F2 01870 JR NZ,OVER10
6EFF 010003 01880 LD BC,300H
6F02 CD6000 01890 CALL 60H
6F05 1D 01900 DEC E
6F06 20E7 01910 JR NZ,OVER05
6F08 3A4038 01920 LD A,(3840H)
6F0B 10FE 01930 DJNZ $
6F0D E602 01940 AND 2
6F0F 28F7 01950 JR Z,OVER30 ;LOOP UNTIL <CLEAR>
6F11 21003C 01960 LD HL,3C00H ;CLEAR SCREEN
6F14 11013C 01970 LD DE,3C01H
6F17 3680 01980 LD (HL),128
6F19 01FF03 01990 LD BC,1023
6F1C EDB0 02000 LDIR
6F1E C3E06D 02010 JP GAME ;DO IT
6F21 DD7E2F 02020 TEST8 LD A,(IX+47) ;BUG HIT?
6F24 B7 02030 OR A
6F25 C8 02040 RET Z ;RETURN IF NOT
6F26 DD362F00 02050 LD (IX+47),0 ;RESET FLAG
6F2A 3A0C64 02060 LD A,(TEMPW+1) ;SHOT FIRED?
6F2D B7 02070 OR A
6F2E C8 02080 RET Z ;RETURN IF NOT
6F2F C3DF64 02090 JP TEST7 ;BUG HIT SUB
6F32 1E20 02100 PAUSE LD E,20H
6F34 0E40 02110 PAUSEA LD C,40H ;SOUND
6F36 43 02120 PAUSEB LD B,E
6F37 CD8A61 02130 CALL SOUNDX
6F3A 10FE 02140 DJNZ $
6F3C 0D 02150 DEC C
6F3D 20F7 02160 JR NZ,PAUSEB
6F3F 43 02170 LD B,E
6F40 10FE 02180 DJNZ $
6F42 1D 02190 DEC E
6F43 20EF 02200 JR NZ,PAUSEA ;STORE LINE
6F45 21803C 02210 LD HL,3C80H
6F48 118C6F 02220 LD DE,BUFFER
6F4B 014000 02230 LD BC,64
6F4E EDB0 02240 LDIR
6F50 21CC6F 02250 LD HL,MESS ;DISPLAY MESSAGE
6F53 11803C 02260 LD DE,3C80H
6F56 014000 02270 LD BC,64
6F59 EDB0 02280 LDIR
6F5B 3A4038 02290 PAUSE1 LD A,(3840H)
6F5E 10FE 02300 DJNZ $
6F60 E602 02310 AND 2
6F62 28F7 02320 JR Z,PAUSE1 ;LOOP UNTIL <CLEAR>
6F64 218C6F 02330 LD HL,BUFFER ;RESTORE LINE
6F67 11803C 02340 LD DE,3C80H
6F6A 014000 02350 LD BC,64
6F6D EDB0 02360 LDIR
6F6F 010020 02370 LD BC,2000H ;DELAY
6F72 CD6000 02380 CALL 60H
6F75 1E20 02390 LD E,20H ;MORE SOUND
6F77 0E20 02400 PAUSE2 LD C,20H
6F79 7B 02410 PAUSE3 LD A,E
6F7A ED44 02420 NEG
6F7C 47 02430 LD B,A
6F7D CD8A61 02440 CALL SOUNDX
6F80 10FE 02450 DJNZ $
6F82 0D 02460 DEC C
6F83 20F4 02470 JR NZ,PAUSE3
6F85 43 02480 LD B,E
6F86 10FE 02490 DJNZ $
6F88 1D 02500 DEC E
6F89 20EC 02510 JR NZ,PAUSE2
6F8B C9 02520 RET
0040 02530 BUFFER DEFS 64
6FCC 2A 02540 MESS DEFM '* * * * * PAUSE --- Press <CLEAR> to pl
ay * * * * *'

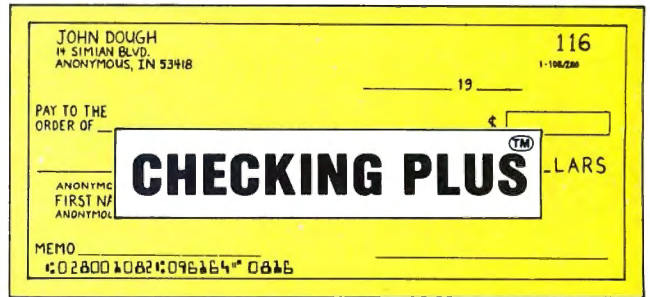
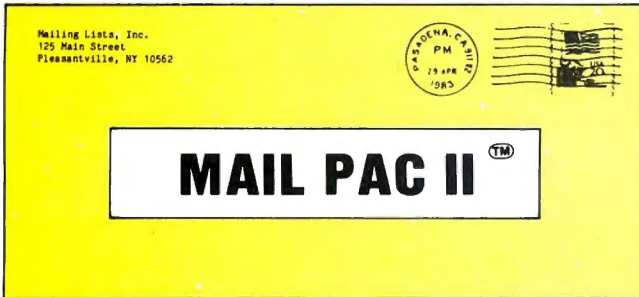
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Listing 4 continued

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Listing 4 continued

```

700B 20      02550 MESS10 DEFM
7016 20      02560 MESS20 DEFM
6DDD        02570      END
00000 TOTAL ERRORS
29341 TEXT AREA BYTES LEFT

ADD1      65C0 00130      01540
ADD2      663A 00140      01550
ADD3      66B4 00150      01560
ADDRESSB 68FB 00160
ATTACK 6A8B 00170      00760
BASEN    6463 00180      01010 01020
BOMBS    63EB 00190
BOOM     69E9 00200
BUFFER   6F8C 02530      02220 02330
BUG1     6359 00210      00910 00920
BUG2     6389 00220
BUG3     63B9 00230
CONT     6EC3 01610      01500
CONT10   6ED0 01660      01680
DISSCR   6203 00240      00820 00850
DRAW     690D 00250      01260
ENTRY    6DDD 00610      02570
EXPTAB   6590 00260      00960 00970

FLASH    6CCD 00570
GAME     6DE0 00620
HIGH     624F 00270
INGSCR   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
MCOMB    6C57 00340
MESS     69CC 02540      02250
MESS10   700B 02550      01740
MESS20   7016 02560      01700
MINUS1   656C 00350      01230
MOVEB1   695D 00360      01240
MOVEB2   6970 00370      01250
MOVEB3   6983 00380      01340
MSHOT    6494 00390      01470 01690
NEXT     6E38 00910
ONE      6AB4 00400      01910
OVER05   6EEF 01790      01870
OVER10   6EF1 01800      01850
OVER20   6EF3 01810

OVER30   6F08 01920
PARAMS   6259 00410      01950
PAUSE    6F32 02100      00630 00740
PAUSE1    6F5B 02290      02320
PAUSE2    6F77 02400      02510
PAUSE3    6F79 02410      02470
PAUSE4    6F34 02110      02200
PAUSE5    6F36 02120      02160
SCORE    6253 00420      00690 00700 00780
SHIPS    6568 00430      00710 00730 00810 01630
SHOT     63E9 00440      01070
SOUND1   6487 00450      01350
SOUND2   6B56 00460
SOUND3   6BE4 00470
SOUND4   6CAB 00480
SOUNDX   6CF4 00580
SOUNDX   618A 00490
START    6D1B 00590
TENPV    640B 00500
TEST     6B20 00510      01080 02130 02440
TEST2    6B74 00520      01080 02060
TEST3    6B9B 00530
TEST5    6BC1 00540
TEST6    6CB6 00550
TEST7    64DF 00560      02090
TEST8    6F21 02020
    
```

End

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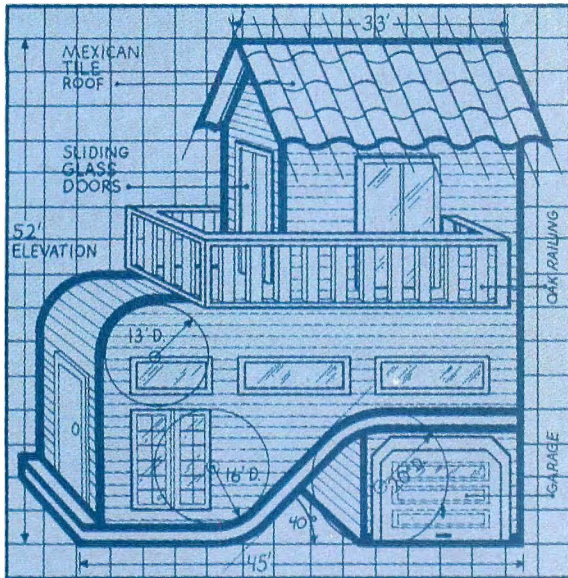
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BUSINESS 100 PROGRAM LIST

NAME	DESCRIPTION
1 RULE78	Interest Apportionment by Rule of the 78's
2 ANNU1	Annuity computation program
3 DATE	Time between dates
4 DAYYEAR	Day of year a particular date falls on
5 LEASEINT	Interest rate on lease
6 BREAKEVN	Breakeven analysis
7 DEPRSL	Straightline depreciation
8 DEPRSY	Sum of the digits depreciation
9 DEPRDB	Declining balance depreciation
10 DEPRDDB	Double declining balance depreciation
11 TAXDEP	Cash flow vs. depreciation tables
12 CHECK2	Prints NEBS checks along with daily register
13 CHECKBK1	Checkbook maintenance program
14 MORTGAGE/A	Mortgage amortization table
15 MULTMON	Computes time needed for money to double, triple, etc.
16 SALVAGE	Determines salvage value of an investment
17 RRVARIN	Rate of return on investment with variable inflows
18 RRCONST	Rate of return on investment with constant inflows
19 EFFECT	Effective interest rate of a loan
20 FVAL	Future value of an investment (compound interest)
21 PVAL	Present value of a future amount
22 LOANPAY	Amount of payment on a loan
23 REGWITH	Equal withdrawals from investment to leave 0 over
24 SIMPDISK	Simple discount analysis
25 DATEVAL	Equivalent & nonequivalent dated values for oblig.
26 ANNUDEF	Present value of deferred annuities
27 MARKUP	% Markup analysis for items
28 SINKFUND	Sinking fund amortization program
29 BONDVAL	Value of a bond
30 DEplete	Depletion analysis
31 BLACKSH	Black Scholes options analysis
32 STOCVAL1	Expected return on stock via discounts dividends
33 WARVAL	Value of a warrant
34 BONDVAL2	Value of a bond
35 EPSEST	Estimate of future earnings per share for company
36 BETAALPH	Computes alpha and beta variables for stock
37 SHARPE1	Portfolio selection model-i.e. what stocks to hold
38 OPTWRITE	Option writing computations
39 RTVAL	Value of a right
40 EXPVAL	Expected value analysis
41 BAYES	Bayesian decisions
42 VALPRINF	Value of perfect information
43 VALADINF	Value of additional information
44 UTILTY	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 queuing (waiting line) model
49 CVP	Cost-volume-profit analysis
50 CONDPFOT	Conditional profit tables
51 OPTLOSS	Opportunity loss tables
52 FQIQOQ	Fixed quantity economic order quantity model
53 FQEQOWSH	As above but with shortages permitted
54 FQEQQPB	As above but with quantity price breaks
55 QJIEUECB	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 BUSBJD	DOE 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 INSFIL	Insurance policy file
94 PAYROLL2	In memory payroll system
95 DILANAL	Dilution analysis
96 LOANAFD	Loan amount a borrower can afford
97 RENTPRCH	Purchase price for rental property
98 SALELEAS	Sale-leaseback analysis
99 RRCONVBD	Investor's rate of return on convertible bond
100 PORTVAL9	Stock market portfolio storage-valuation program

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Making the Upgrade

Radio Shack will upgrade your Model III to a Model 4 for \$859—but what do you really get?

Radio Shack sells a kit that turns your Model III into a Model 4. But do you get a real Model 4, or just a work-alike? Well, an upgraded Model III and a new Model 4 aren't exactly the same. The kit nevertheless gives you the essentials of a Model 4 without the expense of a new machine.

I recently watched a Radio Shack technician upgrade my Model III, and here's what I got for my money.

The Hardware

The conversion kit (Radio Shack catalog number 26-1066, \$799 plus \$60 labor) is not an add-on, but a new main computer board. It includes a sheet-metal holder and shield assembly on which to install the new central processing unit (CPU) board, and the Model 4 *Disk System Owner's Manual*. You also get a new floppy-disk controller and keyboard.

Radio Shack requires you to trade in your Model III CPU board, keyboard, and disk controller to buy the upgrade kit. Although I tried to work out a deal to keep these pieces, Radio Shack was adamant.

To install the upgrade, the technician disassembles the computer case and removes the electromagnetic interference (EMI) shielding, RS-232C serial interface board, and floppy-disk controller boards. He then disconnects all leads and removes the main computer board and the sheet-metal holder.

The floppy-disk controller is not the same as that on the Model 4's; it's a Model III controller modified with a number of trace cuts and jumper wires so it operates in the Model 4 mode.

The technician then remounts the controller and the serial interface board (no modifications to the serial board are necessary), refastens the connectors, and attaches the new shield to the rear of the assembly.

Radio Shack added several modifications after I bought my Model III. The upgrade instructions refer to side and top shields for the disk drive chimney, but my machine doesn't have these, and they aren't part of the upgrade kit.

The kit also comes with a large ferrite toroid and instructions to loop the 110-volt power leads through it two and one-half times, but the leads don't have enough slack to make more than one and a half turns.

To install the toroid, the technician must remove the soldered leads from the main power switch at the front right side of the bottom plate, wind them through the toroid, and solder them back on.

To install the keyboard, he must desolder the right-angle cable connector and solder it onto the new keyboard. Finally, the technician refastens the lead clips and brackets for the power supply, ground, and video leads, and reassembles the case.

The Clock

Two oscillators provide the Model 4 clock signals: a Basic system oscillator running at 20 MHz, and an oscillator for the video that runs at 12 MHz. These frequencies make up the synchronization signals and the two system clocks at 2 and 4 MHz.

When configured as a Model III system, the upgrade operates at a frequency of 2.02752 MHz, the same as a Model III. When running in Model 4 mode, the system runs at 4.05504 MHz, but you can opt for the slower speed by typing in the system command SYSTEM (SLOW) (see the Radio Shack *Technical Reference Manual*, p. 363). To return to fast speed, type SYSTEM (FAST).

The Keyboard

The new keyboard's layout is almost

identical to the Model III's. The feel, however, is much stiffer. The arrow keys and the other control keys are white.

The main differences between the keyboards are the addition of a capital lock key at the right end of the space bar, a control key at the left end of the space bar, and function keys F1, F2, and F3 on the top row of the numeric keypad. These keys only function in the Model 4 mode.

Memory Configuration

The Model 4 disk system's standard memory configuration is 64K. It uses eight 64K RAM chips, with eight sockets on board for expanding it to 128K.

If you use mail-order chips to expand memory, however, you must replace a programmable array logic (PAL) chip to accommodate the memory addressing and bank selection. The additional 64K costs \$149, excluding installation. Installing it yourself voids the warranty.

In addition to the 64K of RAM, the upgrade kit includes the Model III ROMs and 1K of video RAM. The 14K of ROM corresponds exactly to the Model III memory addresses. This switches into the low end of memory in place of the first 16K of RAM when the computer is in Model III mode.

The additional 1K of video RAM is necessary for the 80-column by 24-line display mode, which takes 1,920 bytes instead of the 1,024 required for a 64-column by 16-line pixel display. In the 80-column mode, Tandy has addressed the 2K of video memory as two banks of 1K each, read alternately during the video cycle.

The I/O Interfaces

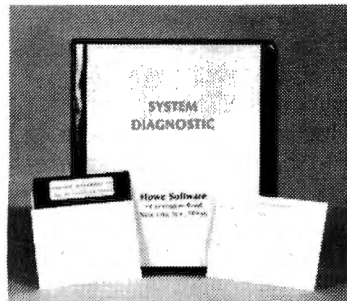
The upgrade does not affect the input/output (I/O) interface connectors. The 50-contact expansion connector

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has the same specifications as the Model III's. For more details, see "Using the Model III I/O Bus," 80 Micro, October 1983, p. 126.

The RS-232C serial communication board and the printer and disk drive expansion connectors also retain the same specifications. This means that you can plug almost any peripheral used with the Model III into the Model 4 without modification. You might, however, need to make modifications in software communication between these devices in the Model 4 mode, depending on program design.

The Video Display

The upgrade makes no modifications to the video sections in the Model III, nor are there any significant differences in the video display supplied with Model 4, according to the technical specifications.

When I write out a large section of screen, however, a wiggly pattern appears on the display. The problem isn't particularly distracting, though, and you can adjust the brightness and contrast.

The upgrade board comes with a new

character generator and video display controller for displaying both the Model III characters in 64-column mode and the Model 4 characters in 80-column mode.

The Sound Board

A plug-in sound board is a standard feature of the 64K and 128K upgrade versions, and an optional feature on the 16K cassette upgrade version.

The sound board plugs into a four-pin connector on the main CPU board and mounts deep in the innards of the machine on an adhesive pad. This is a problem, since the volume of the piezoelectric transducer is not very great, and its signals are sometimes barely audible.

A technician can improve this by lengthening the leads and mounting the sound board under the louvers on the rear and top of the case.

Radio Shack mapped the sound board as internal port 90 hexadecimal (hex). You operate it by toggling bit D0. The upgrade manual describes this operation as software intensive. The delay between toggling on and off and the duration of the number of cycles controls the frequency (tone).

Disk Drives

Disk parameters (number of tracks, number of sectors, and total disk capacity) are the same after the upgrade. The Model 4 manual hints that the upgrade can accommodate other disk formats under other operating systems, but doesn't indicate which ones.

Formatting disks, which is software dependent, is different under Model III and 4 modes. The read and write operations under Model 4 mode appear to have more critical timing and alignment requirements.

Disk drives usually need realignment at the time of installation, so it's a good idea to have this done while you're having the machine upgraded.

The Model 4 *Disk System Owner's Manual* that comes with the upgrade kit is missing bits of information such as the SYSTEM (SLOW) command mentioned above. Readers who opt for the upgrade should purchase Radio Shack's *Technical Reference Manual* (Radio Shack catalog number 26-2110, \$24.95) to get the most out of the system. ■

You can reach James N. Cameron at P.O. Box 742, Port Aransas, TX 78373.

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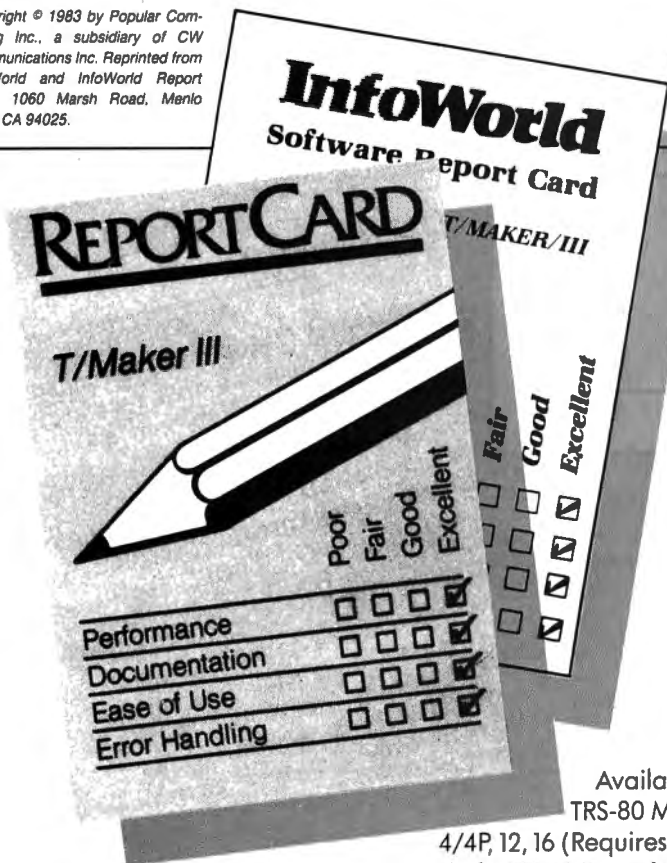
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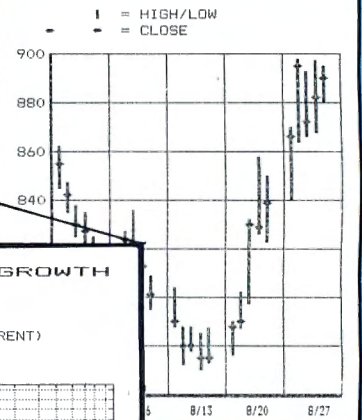
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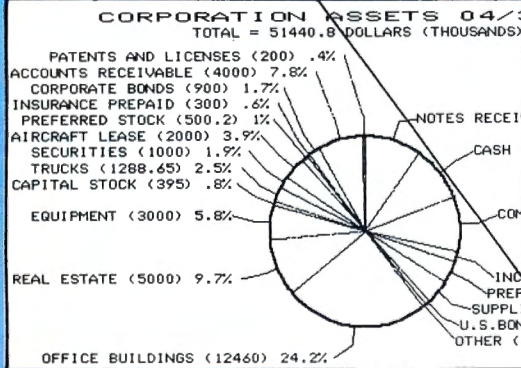
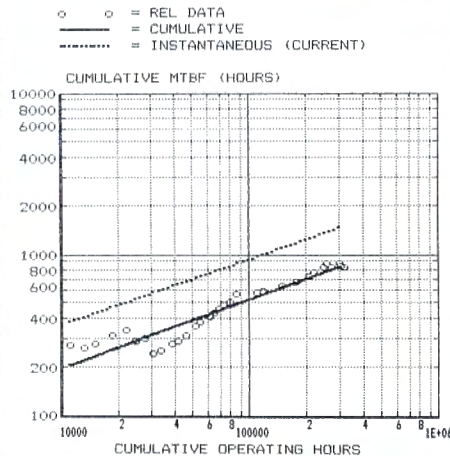
ELECTRONIC WORKSHEET										
January	NYCI	DJIA	DIT	DOJ	S&P 500	Advances	Declines	Up Vol	Dr Vol	
1231	77.86	963.99	378.10	114.42	135.76	1040	573	24,838	11,356	
102	78.26	972.78	401.43	115.12	136.34	1062	475	17,275	8,405	
105	79.08	972.56	405.77	117.81	137.97	1028	433	41,159	14,669	
106	79.14	984.69	402.89	117.16	138.12	1049	540	38,483	23,707	
107	77.29	980.89	391.19	115.19	135.68	216	1555	5,683	85,844	
108	76.20	965.70	385.24	114.07	133.68	578	1028	11,757	37,075	
109	76.44	968.69	384.82	112.89	133.48	907	620	28,933	15,739	
112	76.52	968.77	388.34	112.85	133.52	928	633	23,813	19,192	
113	76.35	965.10	387.18	112.49	133.29	578	993	12,407	24,532	
114	76.55	966.47	389.55	112.38	133.47	914	612	23,382	13,773	
115	76.99	989.07	376.10	112.60	134.22	789	691	21,567	13,526	
116	77.33	973.29	401.98	113.22	134.77	880	642	23,222	14,425	
119	77.10	970.99	403.55	114.35	134.37	740	750	16,112	15,338	
120	75.81	950.68	394.89	113.80	131.63	371	1172	5,689		
121	75.39	946.25	392.46	113.80	131.36	517	754	15,737		
122	74.76	940.44	392.03	113.00	130.26	437	1024	11,057		
123	74.72	940.19	391.61	111.76	130.23	683	780	16,694		
126	74.45	938.01	389.19	111.47	129.84	544	893	14,874		
127	75.19	949.41	394.64	111.72	131.12	943	559	28,173		
128	74.78	942.53	395.43	112.49	130.34	636	788	14,433		
129	74.69	948.09	398.04	112.74	130.24	774	710	19,432		
130	74.27	947.27	402.22	112.82	129.55	727	776	16,777		

WORKSHEET				
NYSE Vol	100 NYCI	A-D	ADL	
1231	41.21	77.83	447	-1572
102	28.87	77.49	567	1025
105	38.74	77.78	893	-132
106	67.40	78.92	409	277
107	92.89	77.89	1338	-1052
108	55.35	77.59	450	-1512
109	50.19	77.38	289	-1223
112	48.76	77.23	295	-928
113	46.82	77.07	415	-1343

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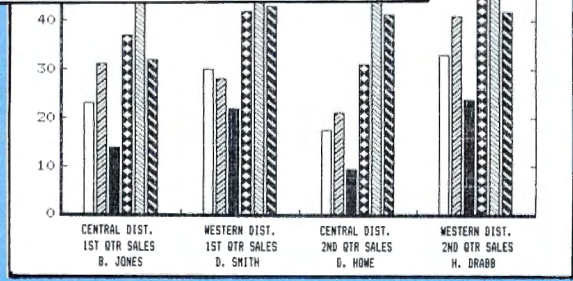
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SmartTalk

Listing 1 continued from p. 56

Listings 2-6 begin on p. 152

```

5435 FE80      01380      CP      128D
5437 DA3E54   01390      JP      C,OUTTT
543A 2F       01400      CPL
543B F680     01410      OR      128D
543D 77       01420      LD      (HL),A
543E 2B       01430      OUTTT  DEC  HL
543F 7C       01440      LD      A,H
5440 B8       01450      CP      B
5441 D23454   01460      JP      NC,INNN
5444 C1       01470      POP     BC
5445 10DE     01480      DJNZ   X4
5447 D9       01490      EXX
5448 DDE5     01500      PUSH   IX
544A FDE5     01510      PUSH   IY
544C 3E8F     01520      LD      A,143D
544E DD21003F 01530      LD      IX,3F00H
5452 FD217B54 01540      LD      IY,COPRT
5456 DD7701   01550      SHOW9  LD      (IX+01H),A
5459 F5       01560      PUSH   AF
545A FD7E00   01570      LD      A,(IY)
545D DD7700   01580      LD      (IX),A
5460 DD23     01590      INC    IX
5462 FD23     01600      INC    IY
5464 FD7E00   01610      LD      A,(IY)
5467 FE0D     01620      CP      0DH
5469 CAAB54   01630      JP      Z,COMM9
546C C5       01640      PUSH   BC
546D 01F82A   01650      LD      BC,11000D
5470 CD6000   01660      CALL   0060H
5473 C1       01670      POP    BC
5474 C27754   01680      JP      NZ,PPOPP
5477 F1       01690      PPOPP  POP    AF
5478 C35654   01700      JP      SHOW9
547B 20       01710      COPRT  DEFM   '
3.0'
54AA 0D       01720      DEFB   0DH
54AB 3E80     01730      COMMM9 LD      A,128D
54AD DD7700   01740      LD      (IX),A
54B0 F1       01750      POP    AF
54B1 FDE1     01760      POP    IY
54B3 DDE1     01770      POP    IX
54B5 00       01780      NOP
54B6 CD6953   01790      CALL   DELAY
54B9 CD6953   01800      CALL   DELAY
54BC CD6953   01810      CALL   DELAY
54BF 211B43   01820      LD      HL,431BH
54C2 7E       01830      LD      A,(HL)
54C3 FE0D     01840      CP      0DH
54C5 CA6455   01850      JP      Z,RUNN
54C8 23       01860      INC    HL
54C9 7E       01870      LD      A,(HL)
54CA FE2A     01880      CP      '*'
54CC CA7555   01890      JP      Z,RUNB
54CF CDC901   01900      CALL   CLS
54D2 21DB54   01910      LD      HL,ERRR
54D5 CDDF64   01920      CALL   SHOW
54D8 C30044   01930      JP      4400H
54DB 20       01940      ERRR   DEFM   'COMMAND ERROR: '
54EB 0A       01950      DEFB   0AH
54EC 20       01960      DEFM   'CORRECT COMMANDS ARE "MPH *" (KEEPS BUFFER
CONTENTS INTACT)'
5528 0A       01970      DEFB   0AH
5529 20       01980      DEFM   'MPH' (START WITH A
CLEAR BUFFER)'

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BY DAVID MARK FISCHER / VERSION

```

5562 0A       01990      DEFB   0AH
5563 0D       02000      DEFB   0DH
5564 CD7265   02010      RUNN   CALL   CLRBUF
5567 3E00     02020      LD      A,00H
5569 0604     02030      LD      B,04H
556B 215653   02040      LD      HL,SAV
556E 77       02050      DSDS   LD      (HL),A
556F 23       02060      INC    HL
5570 10FC     02070      DJNZ   DSDS
5572 C39155   02080      JP      SOK
5575 CDC178   02090      RUNB   CALL   CNBND
5578 21E078   02100      LD      HL,WARMM
557B CDDF64   02110      CALL   SHOW
557E CD6953   02120      CALL   DELAY
5581 CD6953   02130      CALL   DELAY
5584 CD6953   02140      CALL   DELAY
5587 CD6953   02150      CALL   DELAY
558A CD6953   02160      CALL   DELAY
558D C39155   02170      JP      SOK
5590 0F       02180      INITM  DEFB   0FH
5591 CDC901   02190      SOK    CALL   01C9H
5594 CD7853   02200      CALL   SETCUS
5597 2A2040   02210      LD      HL,(4020H)
559A 22DC61   02220      LD      (CURLO),HL
559D 216456   02230      MAIN  LD      HL,MENUD
55A0 C5       02240      PUSH   BC
55A1 D5       02250      PUSH   DE
55A2 E5       02260      PUSH   HL
55A3 CDC901   02270      CALL   01C9H
55A6 E1       02280      POP    HL
55A7 D1       02290      POP    DE
55A8 C1       02300      POP    BC
55A9 CDDF64   02310      CALL   SHOW
55AC 21003D   02320      LD      HL,3D00H
55AF 222040   02330      LD      (4020H),HL
55B2 31FC41   02340      INCMD  LD      SP,41FCH
55B5 21B255   02350      LD      HL,INCMD
55B8 E5       02360      PUSH   HL
55B9 2A0000   02370      LD      HL,(0000H)
55BC 222040   02380      LD      (4020H),HL
55BF 3E1E     02390      LD      A,1EH
55C1 CD3300   02400      CALL   DISPL
55C4 AF       02410      XOR    A
55C5 32515F   02420      LD      (SPF),A
55C8 3E08     02430      LD      A,08H
55CA 065A     02440      LD      B,73H-25D
55CC CD3300   02450      LOOP9  CALL   DISPL
55CF 10FB     02460      DJNZ   LOOP9
55D1 21DA55   02470      LD      HL,COMMM
55D4 CDDF64   02480      CALL   SHOW
55D7 C3E555   02490      JP      GO20
55DA 1B       02500      COMMM  DEFB   27D
55DB 1B       02510      DEFB   27D
55DC 43       02520      DEFM   'COMMAND '
55E4 0D       02530      DEFB   0DH
55E5 3E3F     02540      GO20  LD      A,'?'
55E7 CD3300   02550      CALL   DISPL
55EA 21403C   02560      LD      HL,3C40H
55ED 117F3C   02570      LD      DE,3C40H+63D
55F0 3E83     02580      STICK  LD      A,131D
55F2 77       02590      LD      (HL),A
55F3 23       02600      INC    HL
55F4 DF       02610      RST   18H
55F5 CAF555   02620      JP      Z,DMFSTR
55F8 20F6     02630      JR      NZ,STICK
55FA 00       02640      DMFSTR NOP
55FB 211843   02650      LD      HL,4318H
55FE 060E     02660      LD      B,0EH
5600 CD6A61   02670      CALL   INP
5603 DA9D55   02680      JP      C,MAIN
5606 3E1F     02690      LD      A,1FH
5608 CD3300   02700      CALL   DISPL
560B CDF653   02710      CALL   NEXT
560E C8       02720      RET
560F FE3F     02730      CP      '?'

```

Listing 1 continued

Listing 1 continued

```

5611 CA337B 02740 JP Z,HLP
5614 CBAF 02750 RES 5,A
5616 FE58 02760 CP 'X'
5618 CAEE64 02770 JP Z,FINE
561B FE54 02780 CP 'T'
561D CA905E 02790 JP Z,TERM
5620 FE50 02800 CP 'P'
5622 CA8465 02810 JP Z,PHONED
5625 FE48 02820 CP 'H'
5627 CA8F6A 02830 JP Z,HELP
562A FE51 02840 CP 'Q'
562C CA9F59 02850 JP Z,BSTT
562F FE45 02860 CP 'E'
5631 CA915A 02870 JP Z,ECHO
5634 FE52 02880 CP 'R'
5636 CA8163 02890 JP Z,RESET
5639 FE5A 02900 CP 'Z'
563B CA8D7A 02910 JP Z,COLDST
563E FE57 02920 CP 'W'
5640 CA0560 02930 JP Z,SAVE
5643 FE53 02940 CP 'S'
5645 CA7D5F 02950 JP Z,SEND
5648 FE4C 02960 CP 'L'
564A CAD960 02970 JP Z,LOAD
564D FE44 02980 CP 'D'
564F CA835F 02990 JP Z,DISP
5652 FE55 03000 CP 'U'
5654 CA8179 03010 JP Z,LCUCK
5657 FE43 03020 CP 'C'
5659 CAF15A 03030 JP Z,CLEAR
565C FE4F 03040 CP 'O'
565E CA2F78 03050 JP Z,LPRINT
5661 C9 03060 RET
5662 0A 03070 DEFB 0AH
5663 0D 03080 DEFB 0DH
5664 0F 03090 DEFB 0FH
5665 1C 03100 DEFB 1CH
5666 1F 03110 DEFB 1FH
5667 44 03120 DEFM 'DYNATERM - VERSION 3.0 - AUTO DIALER - BY D
AVID M. FISCHER '
56A2 0A 03130 DEFB 0AH
56A3 0A 03140 DEFB 0AH
56A4 3C 03150 DEFM '<C>LEAR TUFFER <Q>UERY STATU
S OF RS232'
56D9 0A 03160 DEFB 0AH
56DA 3C 03170 DEFM '<D>ISPLAY BUFFER <R>S232 SET'
5703 0A 03180 DEFB 0AH
5704 3C 03190 DEFM '<E>CHO (ON/OFF) SWITCH <S>END BUFFER
DATA OUT'
5738 0A 03200 DEFB 0AH
5739 3C 03210 DEFM '<H>ELP FOR COMMANDS <T>ERMINAL MO
DE (ON) '
576B 0A 03220 DEFB 0AH
576C 3C 03230 DEFM '<L>OAD FILE FROM DISK <W>RITE BUFPE
RED DATA TO DISK'
57A7 0A 03240 DEFB 0AH
57A8 3C 03250 DEFM '<P>HONE DIAL A NUMBER E<X>IT TO DOS'
57D2 0A 03260 DEFB 0AH
57D3 3C 03270 DEFM '<O>UTPUT BUFFER TO PRINTER <@> EXECUTE D
OS COMMAND'
5808 0A 03280 DEFB 0AH
5809 3C 03290 DEFM '<U>C - LC CONVERSION <Z> COLD STAR
T'
5835 0A 03300 DEFB 0AH
5836 20 03310 DEFM ' <SHIFT + LETTER = SENDS PRINTER
CODE'
5868 0A 03320 DEFB 0AH
5869 20 03330 DEFM ' <?> HEX DISPLAY OF BUFFER'
5892 0A 03340 DEFB 0AH
5893 0D 03350 DEFB 0DH
5894 20 03360 BAD DEFM ' ### COMMAND NOT FOUND ###
'
58BF 0D 03370 DEFB 0DH
58C0 20 03380 PAR DEFM ' ### PARAMETER(S) ERROR ##
#'
58EC 0D 03390 DEFB 0DH

```

```

58ED 00 03400 AHIB DEFB 00H
58EE 3AED58 03410 BITS LD A,(AHIB)
58F1 2F 03420 CPL
58F2 32ED58 03430 LD (AHIB),A
58F5 C9 03440 RET
58F6 210E59 03450 OUTMEM LD HL,OME
58F9 C3FF58 03460 JP AAL
58FC 21C058 03470 PARERR LD HL,PAR
58FF CDDF64 03480 AAL CALL SHOW
5902 CD6953 03490 CALL DELAY
5905 CD6953 03500 CALL DELAY
5908 CD6953 03510 CALL DELAY
590B C39D55 03520 JP MAIN
590E 23 03530 OME DEFM '### BUFFER OVERFLOW, SAVE BUFFER TO DISK ##
#'
593A 0D 03540 DEFB 0DH
593B 53 03550 ASTATM DEFM 'STATUS INFO:'
5947 0A 03560 DEFB 0AH
5948 20 03570 DEFM ' AS READ THROUGH SOFTWARE SETTINGS:'
596F 0A 03580 DEFB 0AH
5970 0A 03590 DEFB 0AH
5971 0D 03600 DEFB 0DH
5972 0A 03610 HIT DEFB 0AH
5973 0A 03620 DEFB 0AH
5974 20 03630 DEFM ' PRESS ANY KEY TO GO BACK TO MENU'
599E 03 03640 DEFB 03H
599F CDC901 03650 BSTT CALL 01C9H
59A2 213B59 03660 LD HL,ASTATM
59A5 CDDF64 03670 CALL SHOW
59A8 113D7C 03680 LD DE,EOP
59AB 2A6661 03690 LD HL,(HNB)
59AE B7 03700 OR A
59AF ED52 03710 SBC HL,DE
59B1 22ED5C 03720 LD (INT),HL
59B4 21395C 03730 LD HL,BMSG+09H
59B7 0E01 03740 LD C,01H
59B9 CDEF5C 03750 CALL COUNT5
59BC ED5B6661 03760 LD DE,(HNB)
59C0 2A4940 03770 LD HL,(4049H)
59C3 B7 03780 OR A
59C4 ED52 03790 SBC HL,DE
59C6 22ED5C 03800 LD (INT),HL
59C9 0E01 03810 LD C,01H
59CB 21625C 03820 LD HL,BMSG1+09H
59CE CDEF5C 03830 CALL COUNT5
59D1 2A6363 03840 LD HL,(XBAUD)
59D4 22ED5C 03850 LD (INT),HL
59D7 0E01 03860 LD C,01H
59D9 21B75B 03870 LD HL,RSTAT+0AH
59DC CDF55C 03880 CALL COUNT4
59DF 3A6663 03890 LD A,(WORD)
59E2 32CC5B 03900 LD (MMQ1+09H),A
59E5 3A6763 03910 LD A,(STOP)
59E8 32EL5B 03920 LD (MMQ2+09H),A
59EB 3A6561 03930 LD A,(HDX)
59EE FE00 03940 CP 00H
59F0 CAFCS9 03950 JP Z,ECHOFF
59F3 211B5A 03960 LD HL,ECHMON
59F6 CDDF64 03970 CALL SHOW
59F9 C3305A 03980 JP DDFD
59FC 21055A 03990 ECHOFF LD HL,ECHM
59FF CDDF64 04000 CALL SHOW
5A02 C3305A 04010 JP DDFD
5A05 20 04020 ECHM DEFM ' ECHO ((OFF))'
5A1A 0D 04030 DEFB 0DH
5A1B 20 04040 ECHMON DEFM ' ECHO ((ON))'
5A2F 0D 04050 DEFB 0DH
5A30 00 04060 DFDF NOP
5A31 21AD5B 04070 LD HL,RSTAT
5A34 CDDF64 04080 CALL SHOW
5A37 3A6863 04090 LD A,(APAR)
5A3A 21075C 04100 LD HL,APEVEN
5A3D FE45 04110 CP 45H
5A3F CA4D5A 04120 JP Z,NEXTCR
5A42 21A85C 04130 LD HL,APODD

```

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Listing 1 continued

```

5A45 FE4F 04140 CP 4FH
5A47 CA4D5A 04150 JP Z,NEXTCR
5A4A 21C85C 04160 LD HL,,APNONE
5A4D CDDF64 04170 NEXTCR CALL SHOW
5A50 21045C 04180 LD HL,,MMQ3
5A53 CDDF64 04190 CALL SHOW
5A56 0609 04200 LD B,09H
5A58 3E20 04210 LD A,20H
5A5A CD3300 04220 HSMD CALL DISPL
5A5D 10FB 04230 DJNZ HSMD
5A5F 3A4A40 04240 LD A,(HIMEM+01H)
5A62 CD5F7B 04250 CALL HEXPR
5A65 3A4940 04260 LD A,(HIMEM)
5A68 CD5F7B 04270 CALL HEXPR
5A6B 3E48 04280 LD A,'H'
5A6D CD3300 04290 CALL DISPL
5A70 21825A 04300 LD HL,HMSS
5A73 CDDF64 04310 CALL SHOW
5A76 217259 04320 LD HL,HIT
5A79 CDDF64 04330 CALL SHOW
5A7C CD4900 04340 CALL 0049H
5A7F C39D55 04350 JP MAIN
5A82 20 04360 HMSS DEFM ' = HIGH MEMORY'
5A90 0D 04370 DEFB 0DH
5A91 3A6561 04380 ECHO LD A,(HDX)
5A94 EEF 04390 XOR 0FFH
5A96 326561 04400 LD (HDX),A
5A99 F5 04410 PUSH AF
5A9A 21C85A 04420 LD HL,AECHO
5A9D CDDF64 04430 CALL SHOW
5AA0 21C85A 04440 LD HL,AOFF
5AA3 F1 04450 POP AF
5AA4 CAAA5A 04460 JP Z,DIST
5AA7 21B95A 04470 LD HL,AON
5AAA CDDF64 04480 DIST CALL SHOW
5AAD CD6953 04490 CALL DELAY
5AB0 CD6953 04500 CALL DELAY
5AB3 CD6953 04510 CALL DELAY
5AB6 C39D55 04520 JP MAIN
5AB9 28 04530 AON DEFM '( (ON) )'
5ABF 0D 04540 DEFB 0DH
5AC0 28 04550 AOFF DEFM '( (OFF) )'
5AC7 0D 04560 DEFB 0DH
5AC8 20 04570 AECHO DEFM '
5AF0 03 04580 DEFB 03H
5AF1 21095B 04590 CLEAR LD HL,SURE
5AF4 CDDF64 04600 CALL SHOW
5AF7 CD4900 04610 CALL 0049H
5AFA CBAF 04620 RES 5,A
5AFC FE59 04630 CP 'Y'
5AFE CA5C5B 04640 JP Z,KILLYS
5B01 FE4E 04650 CP 'N'
5B03 CA9D55 04660 JP Z,MAIN
5B06 C29D55 04670 JP NZ,MAIN
5B09 20 04680 SURE DEFM '
THE ECHO MODE IS NOW: '
KILL CONTENTS OF BUFFER ?
Y = YES, N = NO'
5B34 0A 04690 DEFB 0AH
5B35 20 04700 DEFM '
5B5A 0A 04710 DEFB 0AH
5B5B 0D 04720 DEFB 0DH
5B5C 00 04730 KILLYS NOP
5B5D 213D7C 04740 LD HL,EOP
5B60 226661 04750 LD (HNB),HL
5B63 226861 04760 LD (HCB),HL
5B66 217B5B 04770 LD HL,BCLE
5B69 CD7265 04780 CALL CLRBUF
5B6C CDDF64 04790 CALL SHOW
5B6F CD6953 04800 CALL DELAY
5B72 CD6953 04810 CALL DELAY
5B75 CD6953 04820 CALL DELAY
5B78 C39D55 04830 JP MAIN
5B7B 20 04840 BCLE DEFM '
5B87 8F8F 04850 DEFW 8F8FH
5B89 20 04860 DEFM ' BUFFER HAS BEEN RESET (CLEARED) '
5BAA 8F8F 04870 DEFW 8F8FH
5BAC 0D 04880 DEFB 0DH

```

```

5BAD 0A 04890 RSTAT DEFB 0AH
5BAE 20 04900 DEFB ' 300 BAUD '
5BC2 0A 04910 DEFB 0AH
5BC3 20 04920 MMQ1 DEFM ' 8 BIT WORD '
5BD7 0A 04930 DEFB 0AH
5BD8 20 04940 MMQ2 DEFM ' 1 STOP BITS '
5BED 0A 04950 DEFB 0AH
5BEE 20 04960 DEFM ' FULL DUPLEX '
5C02 0A 04970 DEFB 0AH
5C03 03 04980 DEFB 03H
5C04 2A 04990 MMQ3 DEFM '***** CHARACTER READING ON BUFFER *****'
5C2F 0A 05000 DEFB 0AH
5C30 20 05010 BMSG DEFM ' XXXXX BYTES (DEC.) ALREADY USED '
5C58 0A 05020 DEFB 0AH
5C59 20 05030 BMSG1 DEFM ' XXXXX UNUSED BYTES (DEC.) IN BUFFE
R '
5C85 0A 05040 DEFB 0AH
5C86 03 05050 DEFB 03H
5C87 20 05060 APEVEN DEFM ' PARITY BIT IS ((EVEN)) '
5CA6 0A 05070 DEFB 0AH
5CA7 03 05080 DEFB 03H
5CA8 20 05090 APODD DEFM ' PARITY BIT IS ((ODD)) '
5CC6 0A 05100 DEFB 0AH
5CC7 03 05110 DEFB 03H
5CC8 20 05120 APNONE DEFM ' PARITY BIT IS ((DISABLED)) '
5CEB 0A 05130 DEFB 0AH
5CEC 03 05140 DEFB 03H
5CED 0000 05150 INT DEFW 0000H
5CEF 111027 05160 COUNT5 LD DE,10000D
5CF2 CD0D5D 05170 CALL COUNT
5CF5 11E803 05180 COUNT4 LD DE,1000D
5CF8 CD0D5D 05190 CALL COUNT
5CFB 116400 05200 COUNT3 LD DE,100D
5CFE CD0D5D 05210 CALL COUNT
5D01 110A00 05220 COUNT2 LD DE,10D
5D04 CD0D5D 05230 CALL COUNT
5D07 3AED5C 05240 LD A,(INT)
5D0A C3A5D 05250 JP LOP4
5D0D C5 05260 COUNT PUSH BC
5D0E 0600 05270 LD B,00H
5D10 E5 05280 PUSH HL
5D11 2AED5C 05290 LD HL,(INT)
5D14 B7 05300 LOP OR A
5D15 ED52 05310 SBC HL,DE
5D17 DA235D 05320 JP C,LOP3
5D1A F5 05330 PUSH AF
5D1B 04 05340 INC B
5D1C F1 05350 POP AF
5D1D CA245D 05360 JP Z,LOP2
5D20 C3145D 05370 JP LOP
5D23 19 05380 LOP3 ADD HL,DE
5D24 22ED5C 05390 LOP2 LD (INT),HL
5D27 78 05400 LD A,B
5D28 E1 05410 POP HL
5D29 C1 05420 POP BC
5D2A B7 05430 OR A
5D2B CA335D 05440 JP Z,LOP4A
5D2E 0E00 05450 LD C,00H
5D30 C33A5D 05460 JP LOP4
5D33 79 05470 LOP4A LD A,C
5D34 B7 05480 OR A
5D35 CA3A5D 05490 JP Z,LOP4
5D38 3ED0 05500 LD A,0D0H
5D3A C630 05510 LOP4 ADD A,30H
5D3C 77 05520 LD (HL),A
5D3D 23 05530 INC HL
5D3E C9 05540 RET
5D3F 1C 05550 ATERM DEFB 1CH
5D40 1F 05560 DEFB 1FH
5D41 0E 05570 DEFB 0EH
5D42 50 05580 DEFM 'PRESS <SHIFT> + @ TO ABORT, AND RECALL DIAL
TONE ON PHONE'
5D7A 0A 05590 DEFB 0AH
5D7B 50 05600 DEFM 'PRESS <SHIFT> + <*> TO TOGGLE BIT 7 '
5D9E 0A 05610 DEFB 0AH

```

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Listing 1 continued

```

5D9F 50      05620  DEFM  'PRESS <SHIFT> + <1> FOR 32 CHAR. MODE'
5DC4 0A      05630  DEFB  0AH
5DC5 50      05640  DEFM  'PRESS <SHIFT> + <2> FOR 64 CHAR. MODE'
5D8A 0A      05650  DEFB  0AH
5DEB 50      05660  DEFM  'PRESS <CLEAR> + <Q> TO BUFFER DATA RECEIVED'
1
5E16 0A      05670  DEFB  0AH
5E17 50      05680  DEFM  'PRESS <CLEAR> + <P> TO STOP BUFFERING DATA'
5E41 0A      05690  DEFB  0AH
5E42 50      05700  DEFM  'PRESS <CLEAR> + </> TO TURN OFF CURSOR'
5E68 0A      05710  DEFB  0AH
5E69 50      05720  DEFM  'PRESS <CLEAR> + <.> TO TURN ON CURSOR'
5E8E 0A      05730  DEFB  0AH
5E8F 0D      05740  DEFB  0DH
5E90 AF      05750  TERM  XOR
5E91 213F5D  05760  LD    HL,ATERM
5E94 CDDF64  05770  CALL SHOW
5E97 C305F   05780  JP    NDI
5E9A CDB053  05790  TMAIN CALL INPUT
5E9D DAA85E  05800  JP    C,NIP
5EA0 37      05810  SCF
5EA1 FE12    05820  CP    12H
5EA3 CA225F  05830  JP    Z,STI
5EA6 FE14    05840  CP    14H
5EA8 CA005F  05850  JP    Z,NDI
5EAB CD525F  05860  CALL OUTDEV
5EAE 00      05870  NIP   NOP
5EAF CD2B00  05880  CALL 002BH
5EB2 B7      05890  OR    A
5EB3 CA9A5E  05900  JP    Z,TMAIN
5EB6 FE01    05910  CP    01H
5EB8 CA435F  05920  JP    Z,CSW
5EBB FE1F    05930  CP    1FH
5EBD CA9A5E  05940  JP    Z,TMAIN
5EC0 FE60    05950  CP    '!'
5EC2 CA9F66  05960  JP    Z,MAIN2
5EC5 FE21    05970  CP    '!'
5EC7 CC0F78  05980  CALL Z,CHAR32
5ECA FE22    05990  CP    '*'
5ECC CC1A78  06000  CALL Z,CHAR64
5ECF FE2A    06010  CP    '*'
5ED1 CCEE58  06020  CALL Z,BITS
5ED4 4F      06030  LD    C,A
5ED5 3A4038  06040  LD    A,(3840H)
5ED8 CB4F    06050  BIT   1,A
5EDA 79      06060  LD    A,C
5EDB CAEA5E  06070  JP    Z,CLW
5EDE E61F    06080  AND   1FH
5EE0 FE11    06090  CP    11H
5EE2 CA225F  06100  JP    Z,STI
5EE5 FE10    06110  CP    10H
5EE7 CA005F  06120  JP    Z,NDI
5EEA CDE053  06130  CLW  CALL OUTPUT
5EED 3A6561  06140  LD    A,(HDX)
5EF0 B7      06150  OR    A
5EF1 CA9A5E  06160  JP    Z,TMAIN
5EF4 79      06170  LD    A,C
5EF5 FE0A    06180  CP    0AH
5EF7 CAFD5E  06190  JP    Z,SKIPD
5EFA CD3300  06200  CALL DISPL
5EFD C39A5E  06210  SKIPD JP TMAIN
5F00 AF      06220  NDI  XOR
5F01 32515F  06230  LD    (SPF),A
5F04 210D5F  06240  LD    HL,SPOFF
5F07 CDDF64  06250  CALL SHOW
5F0A C39A5E  06260  JP    TMAIN
5F0D 2A      06270  SPOFF DEFM '** BUFFER CLOSED **'
5F20 0A      06280  DEFB 0AH
5F21 0D      06290  DEFB 0DH
5F22 32515F  06300  STI  LD (SPF),A
5F25 212E5F  06310  LD    HL,SPON
5F28 CDDF64  06320  CALL SHOW
5F2B C39A5E  06330  JP    TMAIN
5F2E 2A      06340  SPON DEFM '** BUFFER OPENED **'
5F41 0A      06350  DEFB 0AH
5F42 0D      06360  DEFB 0DH

```

```

5F43 3A8038  06370  CSW  LD    A,(3800H)
5F46 1F      06380  RRA
5F47 DA9D55  06390  JP    C,MAIN
5F4A 3A505F  06400  LD    A,(ABREAK)
5F4D C3EA5E  06410  JP    CLW
5F50 01      06420  ABREAK DEFB 01H
5F51 00      06430  SPF  DEFB 00H
5F52 4F      06440  OUTDEV LD C,A
5F53 FE0A    06450  CP    0AH
5F55 CA5B5F  06460  JP    Z,NOPD
5F58 CD3300  06470  CALL DISPL
5F5B 3A515F  06480  NOPD LD A,(SPF)
5F5E B7      06490  OR    A
5F5F 79      06500  LD    A,C
5F60 C8      06510  RET   Z
5F61 ED5B6661 06520  LD    DE,(HNB)
5F65 2A4940  06530  LD    HL,(HIMEM)
5F68 ED52    06540  SBC   HL,DE
5F6A DA755F  06550  JP    C,NTH
5F6D 79      06560  LD    A,C
5F6E 12      06570  LD    (DE),A
5F6F 13      06580  INC   DE
5F70 ED536661 06590  LD    (HNB),DE
5F74 C9      06600  RET
5F75 3E0E    06610  NTH  LD    A,14
5F77 CD3300  06620  CALL DISPL
5F7A C39A5E  06630  JP    TMAIN
5F7D 11E053  06640  SEND LD DE,OUTPUT
5F80 C30A00  06650  JP    SAL
5F83 213D7C  06660  DISP LD HL,EOP
5F86 ED5B6661 06670  LD    DE,(HNB)
5F8A DF      06680  RST   18H
5F8B CA5360  06690  JP    Z,PRER
5F8E 7E      06700  LOOP LD A,(HL)
5F8F CD3300  06710  CALL DISPL
5F92 F5      06720  PUSH AF
5F93 CD2B00  06730  CALL 002BH
5F96 FE60    06740  CP    '!'
5F98 CA6E65  06750  JP    Z,GOL
5F9B FE50    06760  CP    'P'
5F9D CCB25F  06770  CALL Z,PAUSE
5FA0 FE70    06780  CP    70H
5FA2 CCB25F  06790  CALL Z,PAUSE
5FA5 F1      06800  POP   AF
5FA6 ED5B6661 06810  LD    DE,(HNB)
5FAA DF      06820  RST   18H
5FAB CAB75F  06830  JP    Z,WAIT
5FAE 23      06840  INC   HL
5FAP C28E5F  06850  JP    NZ,LOOP
5FB2 CD4900  06860  PAUSE CALL 0049H
5FB5 AF      06870  XOR   A
5FB6 C8      06880  RET   Z
5FB7 21C35F  06890  WAIT LD HL,WAITM
5FBA CDDF64  06900  CALL SHOW
5FBD CD4900  06910  CALL 0049H
5FC0 C39D55  06920  JP    MAIN
5FC3 0A      06930  WAITM DEFB 0AH
5FC4 2A      06940  LD    DEFM '** END OF BUFFERED DATA **'
5FDE 0A      06950  DEFB 0AH
5FDF 3E      06960  DEFB ' >>>> PRESS ANY KEY TO RETURN TO MENU'
6004 0D      06970  DEFB 0DH
6005 3E1B    06980  SAVE LD A,1BH
6007 5F      06990  LD    E,A
6008 1600    07000  LD    D,00H
600A ED534E60 07010  SAI  LD (PCPOS+1),DE
600E 4F      07020  LD    C,A
600F AF      07030  XOR   A
6010 E5      07040  HL   PUSH HL
6011 213D7C  07050  LD    HL,EOP
6014 ED5B6661 07060  LD    DE,(HNB)
6018 DF      07070  RST   18H
6019 CA5360  07080  JP    Z,PRER
601C E3      07090  EK    (SP),HL
601D CEA760  07100  CALL SAV55
6020 E1      07110  POP   HL
6021 CD9060  07120  LP   CALL MEMS

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6024	C24760	07130	JP	NZ,U55	60FA	113253	07880	LD	DE,FCBV
6027	3A4E60	07140	ENDD	A,(PCPOS+1)	60FD	CD1300	07890	CALL	0013H
602A	FELB	07150	LD	1BH	6100	F5	07900	PUSH	AF
602C	C24460	07160	CP	NZ,HR2	6101	CD2C02	07910	CALL	022CH ;FLASH **
602F	113253	07170	LD	DE,FCBV	6104	F1	07920	POP	AF
6032	CD2844	07180	CALL	4428H	6105	C21061	07930	JP	NZ,EML
6035	CA4460	07190	JP	Z,HR2	6108	77	07940	LD	(HL),A
6038	CDCA60	07200	CALL	ERROR	6109	23	07950	INC	HL
603B	CD6953	07210	CALL	DELAY	610A	226661	07960	LD	(HNB),HL
603E	CD6953	07220	CALL	DELAY	610D	C3F460	07970	JP	LR2
6041	CD6953	07230	CALL	DELAY	6110	FELC	07980	CP	1CH
6044	C39D55	07240	HR2	JP	6112	CALA61	07990	JP	Z,EMN
6047	00	07250	U55	NOP	6115	FELD	08000	CP	1DH
6048	7E	07260	U66	LD	6117	C2C460	08010	JP	NZ,ERRK
6049	23	07270		INC	611A	212961	08020	LD	HL,LOADMM
604A	113253	07280		LD	611D	CDDF64	08030	CALL	SHOW
604D	CD3300	07290	PCPOS	CALL	6120	CD4900	08040	CALL	0049H
6050	C32160	07300		JP	6123	CDC901	08050	CALL	01C9H
6053	216860	07310	PRER	LD	6126	C39D55	08060	JP	MAIN
6056	CDDF64	07320		CALL	6129	46	08070	LOADMM	DEFM
6059	CD6953	07330		CALL	613F	0A	08080	DEFB	0AH
605C	CD6953	07340		CALL	6140	3E	08090	DEFM	'>>>> PRESS ANY KEY TO RETURN TO MENU'
605F	CD6953	07350		CALL	6164	0D	08100	DEFB	0DH
6062	CD6953	07360		CALL	6165	00	08110	HDX	DEFB
6065	C39D55	07370		JP	6166	3D7C	08120	HNB	DEFW
6068	20	07380	PMH	DEFM	6168	3D7C	08130	HCB	DEFW
607D	8F8F	07390		DEFW	616A	3E0E	08140	INP	LD
607F	20	07400		DEFM	616C	CD3300	08150	CALL	DISPL
608D	8F8F	07410		DEFW	616F	E5	08160	PUSH	HL
608F	0D	07420		DEFB	6170	48	08170	LD	C,B
6090	ED5B6661	07430	MEMS	LD	6171	0600	08180	LD	B,00H
6094	DF	07440		RST	6173	CD4900	08190	INPL	CALL
6095	F5	07450		PUSH	6176	F001	08200	CP	01H
6096	CD2B00	07460		CALL	6178	CACB61	08210	JP	Z,BRKL
6099	FE60	07470		CP	617B	F00D	08220	CP	0DH
609B	CA2760	07480		JP	617D	CACC61	08230	JP	Z,LDON
609E	F1	07490		POP	6180	FE40	08240	CP	'@'
609F	C9	07500		RET	6182	CALA79	08250	JP	Z,DOSCMD
60A0	ED5B4940	07510	HIGH	LD	6185	FELB	08260	CP	1BH
60A4	13	07520		INC	6187	CA3C7A	08270	JP	Z,ESC
60A5	DF	07530		RST	618A	FE08	08280	CP	08H
60A6	C9	07540		RET	618C	CACB61	08290	JP	Z,BCKSP
60A7	79	07550	SAV55	LD	618F	FELF	08300	CP	1FH
60A8	FELB	07560		CP	6191	CAAE61	08310	JP	Z,INPD
60AA	C0	07570		RET	6194	5F	08320	LD	E,A
60AB	23	07580		INC	6195	78	08330	LD	A,B
60AC	CDP653	07590		CALL	6196	B9	08340	CP	C
60AF	113253	07600		LD	6197	CA7361	08350	JP	Z,INPL
60B2	CD1C44	07610		CALL	619A	7B	08360	LD	A,E
60B5	210052	07620		LD	619B	FE20	08370	CP	20H
60B8	0600	07630		LD	619D	DA7361	08380	JP	C,INPL
60BA	CD2044	07640		CALL	61A0	FETB	08390	CP	7BH
60BD	C8	07650		RET	61A2	D27361	08400	JP	NC,INPL
60BE	CDCA60	07660		CALL	61A5	77	08410	LD	(HL),A
60C1	C39D55	07670		JP	61A6	CD3300	08420	CALL	DISPL
60C4	CDCA60	07680	ERRX	CALL	61A9	23	08430	INC	HL
60C7	C39D55	07690		JP	61AA	04	08440	INC	B
60CA	F6C0	07700	ERROR	OR	61AB	C37361	08450	JP	INPL
60CC	CD0944	07710		CALL	61AE	78	08460	INPD	LD
60CF	CD6953	07720		CALL	61AF	B7	08470	OR	A
60D2	CD6953	07730		CALL	61B0	CA7361	08480	JP	Z,INPL
60D5	CD6953	07740		CALL	61B3	3E08	08490	LD	A,08H
60D8	C9	07750		RET	61B5	CD3300	08500	CALL	DISPL
60D9	23	07760	LOAD	INC	61B8	05	08510	DEC	B
60DA	CDP653	07770		CALL	61B9	C37361	08520	JP	INPL
60DD	CAFCS8	07780		JP	61BC	78	08530	BCKSP	LD
60E0	113253	07790		LD	61BD	B7	08540	OR	A
60E3	CD1C44	07800		CALL	61BE	CA7361	08550	JP	Z,INPL
60E6	0600	07810		LD	61C1	3E08	08560	LD	A,08H
60E8	210052	07820		LD	61C3	CD3300	08570	CALL	DISPL
60EB	CD2444	07830		CALL	61C6	2B	08580	DEC	HL
60EE	C2C460	07840		JP	61C7	05	08590	DEC	B
60F1	2A6661	07850		LD	61C8	C37361	08600	JP	INPL
60F4	CDA060	07860	LR2	CALL	61CB	37	08610	BRKL	SCF
60F7	CAF658	07870		JP	61CC	360D	08620	LDON	LD

Listing 1 continued

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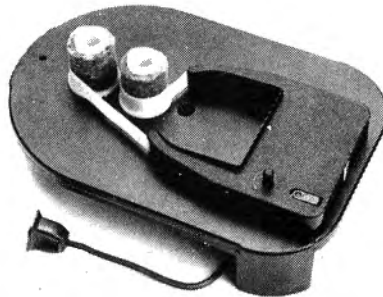
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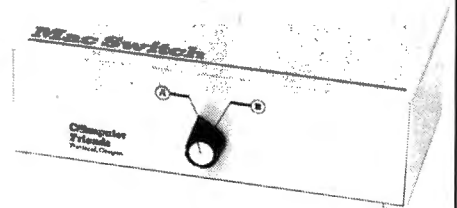
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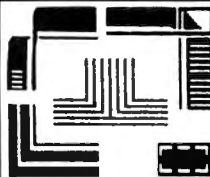

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61CE E1      08630    POP    HL
61CF F5      08640    PUSH   AF
61D0 3E0F    08650    LD     A,0FH
61D2 CD3300  08660    CALL  DISPL
61D5 3E0D    08670    LD     A,0DH
61D7 CD3300  08680    CALL  DISPL
61DA F1      08690    POP    AF
61DB C9      08700    RET
61DC 0000    08710    CURLO DEFW 0000H
61DE 20      08720    MMS1  DEFM '***** BAUD RATE *****
        (110,300,600,1200,4800,9600) ?'
623E 03      08730    DEFB  03H
623F 20      08740    MMS2  DEFM '***** WORD LENGTH *****
        (5,6,7, OR 8) ?'
6297 03      08750    DEFB  03H
6298 20      08760    MMS3  DEFM '***** STOP BITS *****
        HOW MANY (1,2) ?'
62EE 03      08770    DEFB  03H
62EF 20      08780    MMS4  DEFM '***** PARITY *****
        <E>VEN'
633D 0A      08790    DEFB  0AH
633E 20      08800    DEFM  ' <O>DD '
634C 0A      08810    DEFB  0AH
634D 20      08820    DEFM  ' <D>ISABLE ?? '
6362 03      08830    DEFB  03H
6363 33      08840    XBAUD DEFM '300'
6366 38      08850    WORD  DEFB 38H
6367 31      08860    STOP  DEFB 31H
6368 00      08870    APAR  DEFB 00H
6369 6E00    08880    LOOKUP DEFW 110
636B 22      08890    DEFB  22H
636C 2C01    08900    DEFW  300
636E 55      08910    DEFB  55H
636F 5802    08920    DEFW  600
6371 66      08930    DEFB  66H
6372 B004    08940    DEFW 1200
6374 77      08950    DEFB  77H
6375 C012    08960    DEFW 4800
6377 CC      08970    DEFB  0CCH
6378 8025    08980    DEFW 9600
637A EE      08990    DEFB  0EEH
637B 0000    09000    DEFW 0000H
637D 00      09010    AWORDL DEFB 00H
637E 2040    09020    DEFW 4020H
6380 60      09030    DEFB  60H
6381 CD6064  09040    RESET CALL POSNC
6384 21D61  09050    LD     HL,MMS1
6387 CDDF64  09060    CALL  SHOW
638A 211843 09070    LD     HL,4318H ;CMD BUF
638D 0604    09080    LD     B,04H
638F CD6A61  09090    CALL  INP
6392 DA8163  09100    JP     C,RESET
6395 CD6F64  09110    CALL  GETINP
6398 216963  09120    LD     HL,LOOKUP
639B 4E      09130    BST   LD     C,(HL)
639C 23      09140    INC   HL
639D 46      09150    LD     B,(HL)
639E 23      09160    INC   HL
639F 23      09170    INC   HL
63A0 78      09180    LD     A,B
63A1 B1      09190    OR    C
63A2 CA8163  09200    JP     Z,RESET
63A5 7A      09210    LD     A,D
63A6 B8      09220    CP    B
63A7 C29B63  09230    JP    NZ,BST
63AA 7B      09240    LD     A,E
63AB B9      09250    CP    C
63AC C29B63  09260    JP    NZ,BST
63AF 2B      09270    DEC   HL
63B0 7E      09280    LD     A,(HL)
63B1 325453  09290    LD     (XBAUDV),A
63B4 ED536363 09300    LD     (XBAUD),DE
63B8 CD6064  09310    GWL  CALL  POSNC
63BB 213F62  09320    LD     HL,MMS2
63BE CDDF64  09330    CALL  SHOW
63C1 211843  09340    LD     HL,4318H

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63C4 0601    09350    LD     B,01H
63C6 CD6A61  09360    CALL  INP
63C9 DAB863  09370    JP    C,GWL
63CC 7E      09380    LD     A,(HL)
63CD 326663  09390    LD     (WORD),A
63D0 D635    09400    SUB   35H
63D2 DAB863  09410    JP    C,GWL
63D5 FE04    09420    CP    04H
63D7 D2B863  09430    JP    NC,GWL
63DA 217D63  09440    LD     HL,AWORDL
63DD 1600    09450    LD     D,00H
63DF 5F      09460    LD     E,A
63E0 19      09470    ADD   HL,DE
63E1 7E      09480    LD     A,(HL)
63E2 325353  09490    LD     (XCURS),A
63E5 CD6064  09500    GSB  CALL  POSNC
63E8 219862  09510    LD     HL,MMSJ
63EB CDDF64  09520    CALL  SHOW
63EE 211843  09530    LD     HL,4318H
63F1 0601    09540    LD     B,01H
63F3 CD6A61  09550    CALL  INP
63F6 DAE563  09560    JP    C,GSB
63F9 7E      09570    LD     A,(HL)
63FA 326763  09580    LD     (STOP),A
63FD D631    09590    SUB   31H
63FF DAE563  09600    JP    C,GSB
6402 FE02    09610    CP    02H
6404 D2E563  09620    JP    NC,GSB
6407 0E00    09630    LD     C,00H
6409 B7      09640    OR    A
640A CA0F64  09650    JP    Z,Y1SB
640D 0E10    09660    LD     C,10H
640F 3A5353  09670    Y1SB LD     A,(XCURS)
6412 B1      09680    OR    C
6413 325353  09690    LD     (XCURS),A
6416 CD6064  09700    GPB  CALL  POSNC
6419 21EF62  09710    LD     HL,MMS4
641C CDDF64  09720    CALL  SHOW
641F 211843  09730    LD     HL,4318H
6422 0601    09740    LD     B,01H
6424 CD6A61  09750    CALL  INP
6427 DA1664  09760    JP    C,GPB
642A 7E      09770    LD     A,(HL)
642B 326863  09780    LD     (APAR),A
642E 0E80    09790    LD     C,80H
6430 FE45    09800    CP    'E'
6432 CA4D64  09810    JP    Z,YPX
6435 FE64    09820    CP    64H
6437 CA4D64  09830    JP    Z,YPX
643A 0E00    09840    LD     C,00H
643C FE4F    09850    CP    'O'
643E CA4D64  09860    JP    Z,YPX
6441 FE6F    09870    CP    6FH
6443 CA4D64  09880    JP    Z,YPX
6446 0E08    09890    LD     C,08H
6448 FE44    09900    CP    'D'
644A C21664  09910    JP    NZ,GPB
644D 3A5353  09920    YPX  LD     A,(XCURS)
6450 B1      09930    OR    C
6451 F607    09940    OR    07H
6453 325353  09950    LD     (XCURS),A
6456 4F      09960    LD     C,A
6457 3A5453  09970    LD     A,(XBAUDV)
645A CDEE53  09980    CALL  READY
645D C39D55  09990    JP    MAIN
6460 2ADC61  10000    POSNC LD     HL,(CURLO)
6463 114000  10010    LD     DE,64D
6466 19      10020    ADD   HL,DE
6467 222040  10030    LD     (4020H),HL
646A 3E1F    10040    LD     A,1FH
646C C33300  10050    JP    DISPL
646F E5      10060    GETINP PUSH HL
6470 110000  10070    LD     DE,00H
6473 7E      10080    DEC   LD     A,(HL)
6474 FE0D    10090    CP    0DH

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6479 E3 10110 DEC3 EX (SP),HL
647A E1 10120 POP HL
647B C9 10130 RET
647C 23 10140 DEC2 INC HL
647D FE20 10150 CP 20H
647F CA7964 10160 JP Z,DEC3
6482 FE30 10170 CP '0'
6484 DAA464 10180 JP C,HEXINP
6487 FE3A 10190 CP ':'
6489 D2A464 10200 JP NC,HEXINP
648C D630 10210 SUB 30H
648E E5 10220 PUSH HL
648F 62 10230 LD H,D
6490 6B 10240 LD L,E
6491 29 10250 ADD HL,HL
6492 29 10260 ADD HL,HL
6493 19 10270 ADD HL,DE
6494 29 10280 ADD HL,HL ;X 10
6495 DA9D64 10290 JP C,DECX
6498 1600 10300 LD D,00H
649A 5F 10310 LD E,A
649B 19 10320 ADD HL,DE
649C EB 10330 EX DE,HL
649D E1 10340 DECX POP HL
649E D27364 10350 JP NC,DEC
64A1 C37964 10360 JP DEC3
64A4 E1 10370 HEXINP POP HL
64A5 110000 10380 LD DE,00H
64A8 7E 10390 HEX LD A,(HL)
64A9 FE0D 10400 CP 0DH
64AB C8 10410 RET Z
64AC FE20 10420 CP 20H
64AE C8 10430 RET Z
64AF 23 10440 INC HL
64B0 FE48 10450 CP 'H'
64B2 CAA864 10460 JP Z,HEX
64B5 FE30 10470 CP '0'
64B7 D8 10480 RET C
64B8 FE47 10490 CP 47H
64BA 3F 10500 CCF
64BB D8 10510 RET C
64BC FE3A 10520 CP 3AH
64BE DAC664 10530 JP C,HEX1
64C1 FE41 10540 CP 41H
64C3 D8 10550 RET C
64C4 D607 10560 SUB 07H
64C6 D630 10570 HEX1 SUB 30H
64C8 EB 10580 EX DE,HL
64C9~F5 10590 PUSH AF
64CA 7C 10600 LD A,H
64CB E6F0 10610 AND 0F0H ;REAL #
64CD 37 10620 SCF
64CE CAD464 10630 JP Z,HEX7
64D1 EB 10640 EX DE,HL
64D2 F1 10650 POP AF
64D3 C9 10660 RET
64D4 29 10670 HEX7 ADD HL,HL
64D5 29 10680 ADD HL,HL
64D6 29 10690 ADD HL,HL
64D7 29 10700 ADD HL,HL
64D8 F1 10710 POP AF
64D9 B5 10720 OR L
64DA 6F 10730 LD L,A
64DB EB 10740 EX DE,HL
64DC C3A864 10750 JP HEX
64DF 7E 10760 SHOW LD A,(HL)
64E0 FE0D 10770 CP 0DH
64E2 C8 10780 RET Z
64E3 CD3300 10790 CALL DISPL
64E6 7E 10800 LD A,(HL)
64E7 FE03 10810 CP 03H
64E9 C8 10820 RET Z
64EA 23 10830 INC HL
64EB C2DF64 10840 JP NZ,SHOW

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```

64EE 210765 10850 FINE LD HL,DOSM
64F1 CDDF64 10860 CALL SHOW
64F4 CD9C78 10870 CALL NBCB
64F7 3E00 10880 LD A,00H
64F9 322E40 10890 LD (402EH),A
64FC 3E44 10900 LD A,44H
64FE 322F40 10910 LD (402FH),A
6501 CDA953 10920 CALL NOCSR
6504 C30044 10930 JP 4400H
6507 20 10940 DOSM DEFM '

556A 0A 10950 DEFEB 0AH
556B 0A 10960 DEFEB 0AH
556C 0A 10970 DEFEB 0AH
556D 0D 10980 DEFEB 0DH
556E F1 10990 GOL POP AF
556F C3B75F 11000 JP WAIT
5572 00 11010 CLRBUF NOP
5573 C5 11020 PUSH BC
5574 E5 11030 PUSH HL
5575 0600 11040 LD B,00H
5577 213D7C 11050 LD HL,EOP
557A 70 11060 ZZZZ LD (HL),B
557B 23 11070 INC HL
557C 7C 11080 LD A,H
557D B5 11090 OR L
557E C27A65 11100 JP NZ,ZZZZ
5581 E1 11110 POP HL
5582 C1 11120 POP BC
5583 C9 11130 RET
01C9 11140 CLS EQU 01C9H
4400 11150 DOS EQU 4400H
05D9 11160 INPUT EQU 05D9H
0049 11170 KEY EQU 0049H
5584 CDC901 11180 PHONED CALL CLS
5587 21BE66 11190 LD HL,PREDM
558A CDDF64 11200 CALL SHOW
558D CD2B00 11210 LOP99 CALL 002BH
5590 FE31 11220 CP '1'
5592 CA1D68 11230 JP Z,D111
5595 FE32 11240 CP '2'
5597 CA2668 11250 JP Z,D222
559A FE33 11260 CP '3'
559C CA2F68 11270 JP Z,D333
559F FE34 11280 CP '4'
55A1 CA3868 11290 JP Z,D444
55A4 FE35 11300 CP '5'
55A6 CA9D55 11310 JP Z,MAIN
55A9 F5 11320 PUSH AF
55AA C5 11330 PUSH BC
55AB 3E3F 11340 LD A,'?'
55AD CD3300 11350 CALL DISPL
55B0 CDAC66 11360 CALL DEL
55B3 3E08 11370 LD A,08H
55B5 CD3300 11380 CALL DISPL
55B8 CDAC66 11390 CALL DEL
55BB C1 11400 POP BC
55BC F1 11410 POP AF
55BD C28D65 11420 JP NZ,LOP99
55C0 00 11430 REGO NOP
55C1 215969 11440 LD HL,PHONEM
55C4 CDDF64 11450 CALL SHOW
55C7 DDE5 11460 PUSH IX
55C9 061E 11470 LD B,30D
55CB 3E0D 11480 LD A,0DH
55CD DD210053 11490 LD IX,DBUFF
55D1 DD7701 11500 LOADPH LD (IX+01H),A
55D4 DD23 11510 INC IX
55D6 10F9 11520 DJNZ LOADPH
55D8 DDE1 11530 POP IX
55DA 00 11540 DES NOP
55DB F3 11550 DI
55DC CDD668 11560 CALL RESETD
55DF D5 11570 GIVE PUSH DE
55E0 061E 11580 LD B,30D

```

DMF 1983 '++++ BACK TO DOS +++++'

Listing 1 continued

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Listing 1 continued

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65E2 210053 11590 LD HL,DBUFF
65E5 CDD905 11600 CALL INPUTP
65E8 D1 11610 POP DE
65E9 FE0D 11620 CP 0DH
65EB CAEF65 11630 JP Z,CORR
65EE 00 11640 NOP
65EF 210053 11650 CORR LD HL,DBUFF
65F2 7E 11660 LD A,(HL)
65F3 FE54 11670 CP 'T'
65F5 CA905E 11680 JP Z,TERM
65F8 FE74 11690 CP 74H
65FA CA905E 11700 JP Z,TERM
65FD FE42 11710 CP 'B'
65FF CA9D55 11720 JP Z,MAIN
6602 FE62 11730 CP 62H
6604 CA9D55 11740 JP Z,MAIN
6607 CD7866 11750 CALL NUM
660A 21E768 11760 LD HL,XTX8
660D 11003E 11770 LD DE,3E00H
6610 012700 11780 LD BC,XTX8L
6613 EDB0 11790 LDIR
6615 CD4900 11800 CHK8 CALL KEY
6618 FE59 11810 CP 'Y'
661A CA2E66 11820 JP Z,CONC
661D FE79 11830 CP 79H
661F CA2E66 11840 JP Z,CONC
6622 FE4E 11850 CP 'N'
6624 CA8465 11860 JP Z,PHONED
6627 FE6E 11870 CP 6EH
6629 CA8465 11880 JP Z,PHONED
662C 20E7 11890 JR NZ,CHK8
662E 210E69 11900 CONC LD HL,XTX9
6631 11003E 11910 LD DE,3E00H
6634 013B00 11920 LD BC,XTX9L
6637 EDB0 11930 LDIR
6639 C33D66 11940 JP CONV
663C 00 11950 NOP
663D 210053 11960 CONV LD HL,DBUFF
6640 7E 11970 LOOPXX LD A,(HL)
6641 FE30 11980 CP 30H
6643 CAA68 11990 JP Z,TEN
6646 FE2D 12000 CP '-'
6648 CASB66 12010 JP Z,NEXTXX
664B FE28 12020 CP '('
664D CASB66 12030 JP Z,NEXTXX
6650 FE29 12040 CP ')'
6652 CASB66 12050 JP Z,NEXTXX
6655 E60F 12060 AND 0FH
6657 47 12070 LD B,A
6658 CD6466 12080 CONT CALL DIAL
665B 23 12090 NEXTXX INC HL
665C 7E 12100 LD A,(HL)
665D FE0D 12110 CP 0DH
665F CA905E 12120 JP Z,TERM
6662 20DC 12130 JR NZ,LOOPXX
6664 3E04 12140 DIAL LD A,4D
6666 D3FF 12150 OUT (0FFH),A
6668 CDAC66 12160 CALL DEL
666B 3E00 12170 LD A,0D
666D D3FF 12180 OUT (0FFH),A
666F CDAC66 12190 CALL DEL
6672 10F0 12200 DJNZ DIAL
6674 CDB566 12210 CALL WAITXX
6677 C9 12220 RET
6678 00 12230 NUM NOP
6679 214969 12240 LD HL,WD8
667C 11403E 12250 LD DE,3E40H
667F 011000 12260 LD BC,WD8L
6682 EDB0 12270 LDIR
6684 DDE5 12280 PUSH IX
6686 DD21523E 12290 LD IX,3E52H
668A 210053 12300 LD HL,DBUFF
668D 7E 12310 LOOPX8 LD A,(HL)
668E DD7700 12320 LD (IX),A
6691 DD23 12330 INC IX

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6693 23 12340 INC HL
6694 7E 12350 LD A,(HL)
6695 FE0D 12360 CP 0DH
6697 CA9C66 12370 JP Z,ROUND
669A 20F1 12380 JR NZ,LOOPX8
669C DDE1 12390 ROUND POP IX
669E C9 12400 RET
669F CDD668 12410 MAIN2 CALL RESETD
66A2 C39D55 12420 JP MAIN
66A5 CD4900 12430 SCAN CALL KEY
66A8 FE59 12440 CP 'Y'
66AA 20F9 12450 JR NZ,SCAN
66AC C5 12460 DEL PUSH BC
66AD 010C17 12470 LD BC,5900D
66B0 CD6000 12480 CALL 0060H
66B3 C1 12490 POP BC
66B4 C9 12500 RET
66B5 C5 12510 WAITXX PUSH BC
66B6 01FC21 12520 LD BC,8700D
66B9 CD6000 12530 CALL 0060H
66BC C1 12540 POP BC
66BD C9 12550 RET
66BE 2A 12560 PREDM DEFM '*****'
66FE 0A 12570 DEFB 0AH
66FF 2A 12580 DEFM '*** DYNATERM - AUTO DIAL SECTION - FOR USE W
ITH INTERFACE ***'
673F 20 12590 DEFM '
6766 0A 12600 DEFB 0AH
6767 0A 12610 DEFB 0AH
6768 2A 12620 DEFM '*****'
67A8 0A 12630 DEFB 0AH
67A9 0A 12640 DEFB 0AH
67AA 31 12650 DEFM '1. BBBS BRONX, N.Y.'
67BD 0A 12660 DEFB 0AH
67BE 32 12670 DEFM '2. RACS I HQ.'
67CB 0A 12680 DEFB 0AH
67CC 33 12690 DEFM '3. BULLET 80 QUEENS, N.Y.'
67E5 0A 12700 DEFB 0AH
67E6 34 12710 DEFM '4. MANUAL DIAL'
67F4 0A 12720 DEFB 0AH
67F5 35 12730 DEFM '5. GO BACK TO MAIN MENU'
680C 0A 12740 DEFB 0AH
680D 0A 12750 DEFB 0AH
680E 0A 12760 DEFB 0AH
680F 43 12770 DEFM 'CHOICE (1-5) '
681C 03 12780 DEFB 03H
681D 216F68 12790 D111 LD HL,DM111
6820 C33E68 12800 JP CONV
6823 C3905E 12810 JP TERM
6826 217868 12820 D222 LD HL,DM222
6829 C33E68 12830 JP CONV
682C C3905E 12840 JP TERM
682F 218768 12850 D333 LD HL,DM333
6832 C33E68 12860 JP CONV
6835 C3905E 12870 JP TERM
6838 CDC901 12880 D444 CALL CLS
683B C3C065 12890 JP REGO
683E 00 12900 CONV
683F 7E 12910 LFXXX LD A,(HL)
6840 FE30 12920 CP 30H
6842 CA6468 12930 JP Z,TENXX
6845 FE2D 12940 CP '-'
6847 CA5A68 12950 JP Z,PASS
684A FE28 12960 CP '('
684C CA5A68 12970 JP Z,PASS
684F FE29 12980 CP ')'
6851 CA5A68 12990 JP Z,PASS
6854 E60F 13000 AND 0FH
6856 47 13010 LD B,A
6857 CD6466 13020 CNTXX CALL DIAL
685A 23 13030 PASS INC HL
685B 7E 13040 LD A,(HL)
685C FE0D 13050 CP 0DH
685E CA6968 13060 JP Z,DELLL

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Listing 1 continued

Listing 1 continued

6861	C23F68	13070		JP	NZ,LPXXX
6864	060A	13080	TENXX	LD	B,10D
6866	C35768	13090		JP	CNTXX
6869	CDB566	13100	DELLL	CALL	WAITXX
686C	C3905E	13110		JP	TERM
686F	39	13120	DM111	DEFM	'933-9459'
6877	0D	13130		DEFB	0DH
6878	31	13140	DM222	DEFM	'1-516-482-8491'
6886	0D	13150		DEFB	0DH
6887	37	13160	DM333	DEFM	'740-5600'
688F	0D	13170		DEFB	0DH
6890	CDC901	13180	CONB	CALL	CLS
6893	CD8163	13190		CALL	RESET
6896	11003C	13200		LD	DE,3C00H
6899	EDB0	13210		LDIR	
689B	CD7866	13220		CALL	NUM
689E	CD6000	13230		CALL	0060H
68A1	CD6000	13240		CALL	0060H
68A4	C33D66	13250		JP	CONV
68A7	C30044	13260	NOW	JP	DOS
68AA	060A	13270	TEN	LD	B,10D
68AC	C9	13280		RET	
68AD	00	13290	MENU	NOP	
68AE	11003F	13300		LD	DE,3F00H
68B1	EDB0	13310		LDIR	
68B3	CD4900	13320	CHK2	CALL	KEY
68B6	FE52	13330		CP	'R'
68B8	CA9068	13340		JP	Z,CONB
68BB	FE72	13350		CP	72H
68BD	CA9068	13360		JP	Z,CONB
68C0	FE45	13370		CP	'E'
68C2	CA9D55	13380		JP	Z,MAIN
68C5	FE65	13390		CP	65H
68C7	CA9D55	13400		JP	Z,MAIN
68CA	FE4E	13410		CP	'N'
68CC	CADA65	13420		JP	Z,DES
68CF	FE6E	13430		CP	6EH
68D1	CADA65	13440		JP	Z,DES
68D4	20DD	13450		JR	NZ,CHK2
68D6	0178E0	13460	RESETD	LD	BC,123000D
68D9	3E04	13470	BEGIN	LD	A,4D
68DB	D3FF	13480		OUT	(0FFH),A
68DD	0B	13490		DEC	BC
68DE	78	13500		LD	A,B
68DF	B1	13510		OR	C
68E0	20F7	13520		JR	NZ,BEGIN
68E2	3E00	13530		LD	A,0D
68E4	D3FF	13540		OUT	(0FFH),A
68E6	C9	13550		RET	
68E7	49	13560	TXT8	DEFM	'IS NUMBER CORRECT AS IT STANDS (Y/N) ??'
0027		13570	TXT8L	EQU	\$-TXT8
690E	20	13580	TXT9	DEFM	'
003B		13590	TXT9L	EQU	\$-TXT9
6949	50	13600	WDS	DEFM	'PHONE # ENTERED:'
0010		13610	WDSL	EQU	\$-WDS
6959	3E	13620	PHONEM	DEFM	'>>>> ENTER UP TO ANY 30 DIGIT PHONE # YOU W
ISH THE COMPUTER TO'					
6997	0A	13630		DEFB	0AH
6998	20	13640		DEFB	' TO DIAL. HOOK UP THE INTERFACE FIRST!
'					
69C4	0A	13650		DEFB	0AH
69C5	59	13660		DEFB	'YOU MAY USE "(", ")", OR "-" IN YOUR NUMBER
'					
IF YOU WISH.'					
69FD	0A	13670		DEFB	0AH
69FE	54	13680		DEFB	'TO RETURN TO THE MAIN MENU TYPE "B" FOLLOE
'					
D BY <ENTER>.'					
6A36	0A	13690		DEFB	0AH
6A37	54	13700		DEFB	'TO GOTO TO THE TERMINAL MODE TYPE "T" FOLLO
'					
WED BY <ENTER>.'					
6A71	0A	13710		DEFB	0AH
6A72	0A	13720		DEFB	0AH
6A73	45	13730		DEFM	'ENTER NUMBER TO BE DIALED:'
6A8E	03	13740		DEFB	03H
6A8F	CDC901	13750	HELP	CALL	CLS
6A92	21206B	13760		LD	HL,WHATT

6A95	CDDF64	13770		CALL	SHOW
6A98	CD2B00	13780	BLINK	CALL	002BH
6A9B	FE3F	13790		CP	'?'
6A9D	CA7F72	13800		JP	Z,HLPH
6AA0	FE2F	13810		CP	'/'
6AA2	CA7F72	13820		JP	Z,HLPH
6AA5	CBAF	13830		RES	5,A ;UC
6AA7	FE5A	13840		CP	'Z'
6AA9	CA4A6E	13850		JP	Z,ZZ000
6AAC	FE41	13860		CP	'A'
6AAE	CA9D55	13870		JP	Z,MAIN
6AB1	FE43	13880		CP	'C'
6AB3	CA5F6B	13890		JP	Z,CEE
6AB6	FE5B	13900		CP	'I'
6AB8	CAAF6B	13910		JP	Z,UPR
6ABB	FE44	13920		CP	'D'
6ABD	CA316C	13930		JP	Z,DEE
6AC0	FE45	13940		CP	'E'
6AC2	CAF86D	13950		JP	Z,EEE
6AC5	FE48	13960		CP	'H'
6AC7	CAAA6E	13970		JP	Z,HHH
6ACA	FE4C	13980		CP	'L'
6ACC	CA1E6F	13990		JP	Z,LLL
6ACF	FE4F	14000		CP	'O'
6AD1	CA0E70	14010		JP	Z,OOO
6AD4	FE50	14020		CP	'P'
6AD6	CAF870	14030		JP	Z,FPP
6AD9	FE55	14040		CP	'U'
6ADB	CA276F	14050		JP	Z,UUU
6ADE	FE51	14060		CP	'Q'
6AE0	CA2572	14070		JP	Z,QQQ
6AE3	FE52	14080		CP	'R'
6AE5	CA1C73	14090		JP	Z,RRR
6AE8	FE53	14100		CP	'S'
6AEA	CAF873	14110		JP	Z,SSS
6AED	FE54	14120		CP	'T'
6AEF	CABA74	14130		JP	Z,TTT
6AF2	FE57	14140		CP	'W'
6AF4	CA5B77	14150		JP	Z,WWW
6AF7	FE58	14160		CP	'X'
6AF9	CAAD77	14170		JP	Z,XXX
6AFC	FE40	14180		CP	'@'
6AFE	CA8273	14190		JP	Z,DOSDOS
6B01	F5	14200		PUSH	AF
6B02	3E8F	14210		LD	A,8FH ;143
6B04	CD3300	14220		CALL	DISPL
6B07	C5	14230		PUSH	BC
6B08	01C800	14240		LD	BC,200D
6B0B	CD6000	14250		CALL	0060H
6B0E	C1	14260		POP	BC
6B0F	3E08	14270		LD	A,08H
6B11	CD3300	14280		CALL	DISPL
6B14	C5	14290		PUSH	BC
6B15	01C800	14300		LD	BC,200D
6B18	CD6000	14310		CALL	0060H
6B1B	C1	14320		POP	BC
6B1C	F1	14330		POP	AF
6B1D	C2986A	14340		JP	NZ,BLINK
6B20	48	14350	WHATT	DEFM	'HIT LETTER OF COMMAND (A,C,D,E,H,L,O,P,Q,R,
S,T,U,W,X,Z,?,I,0):'					
6B5E	03	14360		DEFB	03H
6B5F	21606B	14370	CEE	LD	HL,CC
6B62	CDDF64	14380		CALL	SHOW
6B65	C3D677	14390		JP	BACKM
6B68	0A	14400	CC	DEFB	0AH
6B69	43	14410		DEFM	'CHOICE <C> WILL EMPTY THE DATA BUFFER OF AL
'					
L ITS PREVIOUS'					
6BA2	0A	14420		DEFB	0AH
6BA3	43	14430		DEFM	'CONTENTS. '
6BAE	0D	14440		DEFB	0DH
6BAF	21B86B	14450	UPR	LD	HL,ARROWE
6BB2	CDDF64	14460		CALL	SHOW
6BB5	C3D677	14470		JP	BACKM
6BB8	0A	14480	ARROWE	DEFB	0AH
6BB9	43	14490		DEFM	'COMMAND <SHIFT [> WITH A LETTER FOLLOWING I
T, WILL SEND THAT LETTER CODE TO THE PRINTER. <SHIFT [> = ESC. CHR\$(27)'					

Listing 1 continued

Listing 1 continued

```

6C2F 0A 14500 DEFB 0AH
6C30 0D 14510 DEFB 0DH
6C31 213A6C 14520 DEE LD HL,CD
6C34 CDDF64 14530 CALL SHOW
6C37 C3D677 14540 JP BACKM
6C3A 0A 14550 CD DEFB 0AH
6C3B 43 14560 DEFM 'CHOICE <D> WILL DISPLAY WHATEVER IS IN THE
DATA BUFFER.'
6C72 0A 14570 DEFB 0AH
6C73 45 14580 DEFM 'EACH TIME YOU ENTER THE TERMINAL SECTION, A
ND YOUR BUFFERING'
6CAF 0A 14590 DEFB 0AH
6CB0 49 14600 DEFM 'IS ((ON)), ALL THE DATA WILL APPEND ONE BY
ONE TO EACH OTHER.'
6CED 0A 14610 DEFB 0AH
6CEE 57 14620 DEFM 'WHEN IT IS THROUGH DISPLAYING THE CONTENTS
THE SCROLLING WILL'
6D2B 0A 14630 DEFB 0AH
6D2C 53 14640 DEFM 'STOP. PRESS "<SHIFT> + @" TO RETURN TO THE
MENU.'
6D5E 0A 14650 DEFB 0AH
6D5F 54 14660 DEFM 'TO PAUSE THE DISPLAY PRESS "P" TO FREEZE IT
, TO START IT UP '
6D9B 0A 14670 DEFB 0AH
6D9C 50 14680 DEFM 'PRESS "P" ONCE MORE TO TOGGLE BACK AGAIN.
HOLDING <BREAK> WILL'
6DDB 0A 14690 DEFB 0AH
6DDC 53 14700 DEFM 'SLOW THE SCROLL DOWN A BIT.'
6DF7 0D 14710 DEFB 0DH
6DF8 21016E 14720 EEE LD HL,CE
6DFB CDDF64 14730 CALL SHOW
6DFE C3D677 14740 JP BACKM
6E01 0A 14750 CE DEFB 0AH
6E02 43 14760 DEFM 'CHOICE <E> WILL TOGGLE THE ECHO FEATURE <ON
/OFF> EACH TIME "E"
6E40 0A 14770 DEFB 0AH
6E41 49 14780 DEFM 'IS USED.'
6E49 0D 14790 DEFB 0DH
6E4A 21536E 14800 ZZ000 LD HL,C000
6E4D CDDF64 14810 CALL SHOW
6E50 C3D677 14820 JP BACKM
6E53 0A 14830 C000 DEFB 0AH
6E54 43 14840 DEFM 'COMMAND <Z> WILL RE-INITIALIZE "DYNATERM" A
ND WILL CLEAR THE DATA BUFFER AS WELL.'
6EA8 0A 14850 DEFB 0AH
6EA9 0D 14860 DEFB 0DH
6EAA 21B36E 14870 HHH LD HL,CH
6EAD CDDF64 14880 CALL SHOW
6EB0 C3D677 14890 JP BACKM
6EB3 0A 14900 CH DEFB 0AH
6EB4 2A 14910 DEFM '*** YOU ARE ALREADY RUNNING THIS COMMAND !!
***'
6EE3 0A 14920 DEFB 0AH
6EE4 2D 14930 DEFM '---> PRESSING "A" WILL RETURN YOU TO THE MA
IN MENU <---- '
6F1C 0A 14940 DEFB 0AH
6F1D 0D 14950 DEFB 0DH
6F1E 21A96F 14960 LLL LD HL,CL
6F21 CDDF64 14970 CALL SHOW
6F24 C3D677 14980 JP BACKM
6F27 21306F 14990 UUU LD HL,UL
6F2A CDDF64 15000 CALL SHOW
6F2D C3D677 15010 JP BACKM
6F30 0A 15020 UL DEFB 0AH
6F31 43 15030 DEFM 'CHOICE <U> TOGGLES THE CASE OF THE CHARACTE
RS CONTAINED IN THE DATA BUFFER, AND THEN DISPLAYS THE CONTENTS OF IT.'
6FA7 0A 15040 DEFB 0AH
6FA8 0D 15050 DEFB 0DH
6FA9 0A 15060 CL DEFB 0AH
6FAA 43 15070 DEFM 'CHOICE <L> WILL LOAD AN ASCII FILE INTO THE
BUFFER FOR SENDING'
6FE8 0A 15080 DEFB 0AH
6FE9 54 15090 DEFM 'TO A HOST COMPUTER. EX: "L FILENAME"'
700D 0D 15100 DEFB 0DH
700E 211770 15110 OOO LD HL,CO

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7011 CDDF64 15120 CALL SHOW
7014 C3D677 15130 JP BACKM
7017 20 15140 CO DEFM 'CHOICE <O> ALLOWS CONTENTS OF THE
BUFFER TO BE DUMPED TO YOUR PRINTER AS WELL AS TO THE SCREEN.'
7082 0A 15150 DEFB 0AH
7083 50 15160 DEFM 'PRESS <P> TO PAUSE, <SHIFT> +<@> TO ABORT T
HIS FUNCTION. ** IF THE PRINTER IS BUSY, A MESSAGE WILL BE SHOWN. **'
70F9 0A 15170 DEFB 0AH
70FA 0D 15180 DEFB 0DH
70FB 210471 15190 PPP LD HL,CP
70FE CDDF64 15200 CALL SHOW
7101 C3D677 15210 JP BACKM
7104 0A 15220 CP DEFB 0AH
7105 43 15230 DEFM 'CHOICE <P> WILL DIAL ANY NUMBER ENTERED OR
ALREADY STORED IN THE'
7145 43 15240 DEFM 'COMPUTER. ONCE DONE IT WILL PUT YOU INTO T
HE TERMINAL MODE.'
7181 0A 15250 DEFB 0AH
7182 46 15260 DEFM 'FOR THIS SECTION TO OPERATE PROPERLY, THE I
NSTALLATION OF DYNATERM'
71CA 27 15270 DEFB 27H
71CB 53 15280 DEFM 'S PHONE DIALING INTERFACE.'
71E5 0A 15290 DEFB 0AH
71E6 4D 15300 DEFM 'MORE DETAILS CAN BE RECEIVED FROM THE AUTHE
R OF THIS PROGRAM.'
7223 0A 15310 DEFB 0AH
7224 0D 15320 DEFB 0DH
7225 212E72 15330 QQQ LD HL,CQ
7228 CDDF64 15340 CALL SHOW
722B C3D677 15350 JP BACKM
722E 0A 15360 CQ DEFB 0AH
722F 43 15370 DEFM 'CHOICE <Q> WILL DISPLAY CURRENT SOFTWARE SE
TINGS OF THE RS232'
726D 0A 15380 DEFB 0AH
726E 55 15390 DEFM 'UART CONTROLLER.'
727E 0D 15400 DEFB 0DH
727F 218872 15410 HLPH LD HL,MHLPH
7282 CDDF64 15420 CALL SHOW
7285 C3D677 15430 JP BACKM
7288 0A 15440 MHLPH DEFB 0AH
7289 43 15450 DEFM 'CHOICE <?> WILL DISPLAY THE CONTENTS OF THE
DATA BUFFER IN HEX.'
72C8 0A 15460 DEFB 0AH
72C9 20 15470 DEFM ' <SHIFT> + <@> = STOPS / <P> = PA
USES '
72F9 0A 15480 DEFB 0AH
72FA 20 15490 DEFM ' <BREAK> = SLOW DISPLAY'
731B 0D 15500 DEFB 0DH
731C 212573 15510 RRR LD HL,CR
731F CDDF64 15520 CALL SHOW
7322 C3D677 15530 JP BACKM
7325 0A 15540 CR DEFB 0AH
7326 43 15550 DEFM 'CHOICE <R> WILL ALLOW YOU TO SET THE BAUD R
ATE, PARITY,'
735D 0A 15560 DEFB 0AH
735E 53 15570 DEFM 'STOP BITS, AND WORD LENGTH IN BITS.'
7381 0D 15580 DEFB 0DH
7382 218B73 15590 DOSDOS LD HL,DOSMMM
7385 CDDF64 15600 CALL SHOW
7388 C3D677 15610 JP BACKM
738B 0A 15620 DOSMMM DEFB 0AH
738C 43 15630 DEFM 'CHOICE <@> - WILL ALLOW THE OPERATOR TO EXE
CUTE ANY DOS COMMAND THEN RETURN TO DYNATERM.'
73F9 0A 15640 DEFB 0AH
73FA 0D 15650 DEFB 0DH
73FB 210474 15660 SSS LD HL,CS
73FE CDDF64 15670 CALL SHOW
7401 C3D677 15680 JP BACKM
7404 0A 15690 CS DEFB 0AH
7405 43 15700 DEFM 'CHOICE <S> WILL SEND THE BUFFER TO A HOST C
OMPUTER.'
7439 0A 15710 DEFB 0AH
743A 50 15720 DEFM 'PROVIDED THERE IS DATA IN THE BUFFER.'
745F 0A 15730 DEFB 0AH
7460 54 15740 DEFM 'TO RETURN TO THE MAIN MENU, AT ANY TIME, DU
RING THIS SELECTION'

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Listing 1 continued



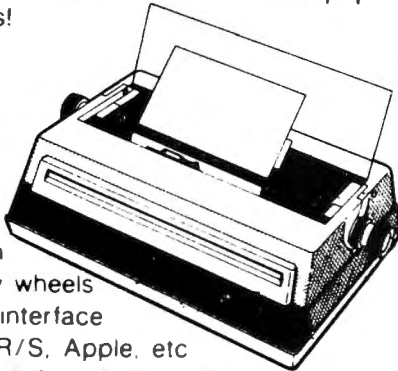
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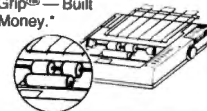
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Listing 1 continued

```

749E 0A 15750 DEF8 0AH
749F 4A 15760 DEF8 'JUST PRESS <SHIFT> + <@>.'
74B8 0A 15770 DEF8 0AH
74B9 0D 15780 DEF8 0DH
74BA 21C374 15790 TTT LD HL,CT
74BD CDDF64 15800 CALL SHOW
74C8 C3D677 15810 JP BACKM
74C3 0A 15820 CT DEF8 0AH
74C4 43 15830 DEF8 'CHOICE <T> IS THE TERMINAL MODE. YOU CAN R
ECEIVE DATA FROM A '
7502 0A 15840 DEF8 0AH
7503 48 15850 DEF8 'HOST COMPUTER.'
7511 0A 15860 DEF8 0AH
7512 2A 15870 DEF8 '*** DUPLEX IS AUTOMATICALLY SET ACCORDING TO
INCOMMING DATA ***'
754F 0A 15880 DEF8 0AH
7550 44 15890 DEF8 'DEPENDING ON SOME BULLETIN BOARDS IT MIGHT
BE NECESSARY TO'
758A 0A 15900 DEF8 0AH
758B 54 15910 DEF8 'TURN ((ON)) OR ((OFF)) BIT #7. THE RESULT
WOULD ELIMATE '
75C4 0A 15920 DEF8 0AH
75C5 47 15930 DEF8 'GARBAGE FROM ENTERING THE INCOMMING DATA.'
75EE 0A 15940 DEF8 0AH
75EF 3C 15950 DEF8 '<SHIFT> +<*> TURNS BITS 7 ON OR OFF'
7612 0A 15960 DEF8 0AH
7613 3C 15970 DEF8 '<SHIFT> +<1> SETS THE 32 CHAR. MODE'
7636 0A 15980 DEF8 0AH
7637 3C 15990 DEF8 '<SHIFT> +<2> SETS THE 64 CHAR. MODE'
765A 0A 16000 DEF8 0AH
765B 3C 16010 DEF8 '<CLEAR> +<Q> BUFFERS INCOMING DATA'
767D 0A 16020 DEF8 0AH
767E 3C 16030 DEF8 '<CLEAR> +<P> CLOSES BUFFER'
7698 0A 16040 DEF8 0AH
7699 2A 16050 DEF8 '*** FUNCTIONS <Q> & <P> ALSO WILL OPERATE WI
TH CHR$(18) OR,'
76D3 0A 16060 DEF8 0AH
76D4 43 16070 DEF8 'CHR$(20), RESPECTIVELY. THIS WILL WORK WIT
H MOST BULLETIN BOARDS. ***'
771F 0A 16080 DEF8 0AH
7720 3C 16090 DEF8 '<CLEAR> + </> TURNS OFF CURSOR / <CLEAR> +
<.> TURNS IT ON'
775A 0D 16100 DEF8 0DH
775B 216477 16110 WWW LD HL,CW
775E CDDF64 16120 CALL SHOW
7761 C3D677 16130 JP BACKM
7764 0A 16140 CW DEF8 0AH
7765 43 16150 DEF8 'CHOICE <W> WILL WRITE THE CONTENTS OF BUFFE
R TO DISK.'
779A 0A 16160 DEF8 0AH
779B 45 16170 DEF8 'EX: "W FILENAME" '
77AC 0D 16180 DEF8 0DH
77AD 21B677 16190 XXX LD HL,CX
77B8 CDDF64 16200 CALL SHOW
77B3 C3D677 16210 JP BACKM
77B6 0A 16220 CX DEF8 0AH
77B7 43 16230 DEF8 'CHOICE <X> RETURNS YOU TO DOS.'
77D5 0D 16240 DEF8 0DH
77D6 21E277 16250 BACKM LD HL,REDD
77D9 CDDF64 16260 CALL SHOW
77DC CD4900 16270 GOOO CALL 0049H
77DF C38F6A 16280 JP HELP
77E2 0A 16290 REDD DEF8 0AH
77E3 3E 16300 DEF8 ')>>>> PRESS ANY KEY TO DISPLAY THE HELP MENU
'
780E 0D 16310 DEF8 0DH
780F CD2878 16320 CHAR32 CALL POSAV
7812 F5 16330 PUSH AF ,32 CHR
7813 3E17 16340 LD A,23D
7815 CD3300 16350 CALL 0033H
7818 F1 16360 POP AF
7819 C9 16370 RET
781A F5 16380 CHAR64 PUSH AF
781B 3E1C 16390 LD A,28D
781D CD3300 16400 CALL 0033H

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7820 2A6653 16410 LD HL,(CURSAV)
7823 222040 16420 LD (4020H),HL
7826 F1 16430 POP AF
7827 C9 16440 RET
7828 2A2040 16450 POSAV LD HL,(4020H)
782B 226653 16460 LD (CURSAV),HL
782E C9 16470 RET
782F 00 16480 LPRINT NOP
7830 3AE837 16490 SETTTT LD A,(37E8H)
7833 CB7F 16500 BIT 7,A
7835 C27378 16510 JP NZ,BUSYP
7838 213D7C 16520 LD HL,EOP
783B ED5B6661 16530 LD DE,(HNB)
783F DF 16540 RST 18H
7840 CA5360 16550 JP Z,PRER
7843 7E 16560 LPRNTX LD A,(HL)
7844 CD3300 16570 CALL 0033H
7847 CD3B00 16580 CALL LPR
784A F5 16590 PUSH AF
784B CD2B00 16600 CALL 002BH
784E FE60 16610 CP ' '
7850 CA6878 16620 JP Z,GOLWT
7853 FE50 16630 CP 'P'
7855 CCB25F 16640 CALL Z,PAUSE
7858 FE70 16650 CP 70H
785A CCB25F 16660 CALL Z,PAUSE
785D F1 16670 POP AF
785E 7C 16680 LD A,H
785F FEFF 16690 CP 0FFH
7861 CAB75F 16700 JP Z,WAIT
7864 23 16710 INC HL
7865 C24378 16720 JP NZ,LPRNTX
7868 3B0D 16730 GOLWT LD A,0DH
786A CD3B00 16740 CALL LPR
786D CD317A 16750 CALL FILLPR
7870 C36E65 16760 JP GOI
7873 217F78 16770 BUSYP LD HL,BUSYM
7876 CDDF64 16780 CALL SHOW
7879 CD6953 16790 CALL DELAY
787C C33078 16800 JP SETTTT
787F 3C 16810 BUSYM DEF8 ' <<<<< PRINTER IS BUSY >>>>'
789A 0A 16820 DEF8 0AH
789B 0D 16830 DEF8 0DH
789C 2A6661 16840 NBCB LD HL,(HNB)
789F 225653 16850 LD (SAV),HL
78A2 2A3D7C 16860 LD HL,(EOP)
78A5 225853 16870 LD (SAV2),HL
78A8 2A6363 16880 LD HL,(XBAUD)
78AB 225A53 16890 LD (XBX),HL
78AE 23 16900 INC HL
78AF 23 16910 INC HL
78B0 7E 16920 LD A,(HL)
78B1 325C53 16930 LD (XBX+2),A
78B4 2A6663 16940 LD HL,(WORD)
78B7 225E53 16950 LD (XCX),HL
78BA 2A6763 16960 LD HL,(STOP)
78BD 226253 16970 LD (XDX),HL
78C0 C9 16980 RET
16990 ;RESTORE
78C1 2A5853 17000 CBNB LD HL,(SAV2)
78C4 223D7C 17010 LD (EOP),HL
78C7 2A5653 17020 LD HL,(SAV)
78CA 226661 17030 LD (HNB),HL
78CD 2A5A53 17040 LD HL,(XBX)
78D0 226363 17050 LD (XBAUD),HL
78D3 2A5E53 17060 LD HL,(XCX)
78D6 226663 17070 LD (WORD),HL
78D9 2A6253 17080 LD HL,(XDX)
78DC 226763 17090 LD (STOP),HL
78DF C9 17100 RET
78E0 1C 17110 WARMM DEF8 1CH
78E1 1F 17120 DEF8 1FH
78E2 0A 17130 DEF8 0AH
78E3 0A 17140 DEF8 0AH
78E4 0A 17150 DEF8 0AH
78E5 0A 17160 DEF8 0AH

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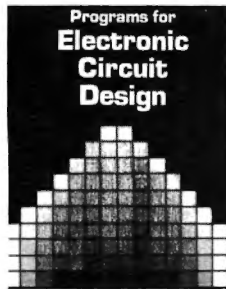
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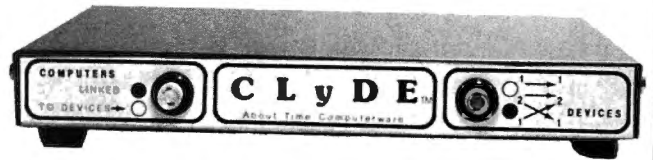
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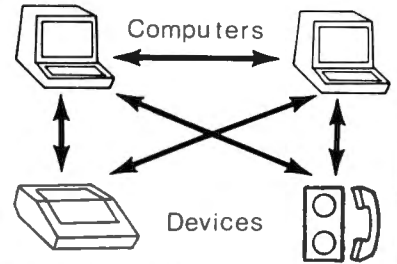


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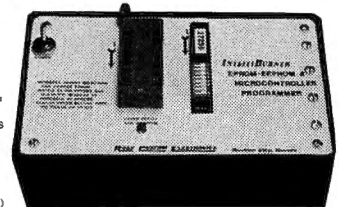
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```

78E6 20      17170  DEFM      '          ** WARM START, BUFFER DATA RES
TORED ***
7919 0D      17180  DEFB      0DH
791A 214579  17190  DOSCMD   LD        HL,EXEC
791D 222E40  17200  LD        (402EH),HL
7920 212979  17210  LD        HL,DOSM2
7923 CDDF64  17220  CALL     SHOW
7926 C30044  17230  JP        4400H
7929 0A      17240  DOSM2    DEFB      0AH
792A 2A      17250  DEFM     '** DYNATERM DOS COMMAND ***'
7944 0D      17260  DEFB      0DH
7945 00      17270  EXEC     NOP
7946 215679  17280  LD        HL,DDONEM
7949 CDDF64  17290  CALL     SHOW
794C CD4900  17300  LOOPEX   CALL     0049H
794F FE20    17310  CP
7951 CA9D55  17320  JP        Z,MAIN
7954 20F6    17330  JR        NZ,LOOPEX
7956 0A      17340  DDONEM   DEFB      0AH
7957 2A      17350  DEFM     '** PRESS <SPACE-BAR> TO RETURN TO MENU ***'
7980 0D      17360  DEFB      0DH
7981 213D7C  17370  LCUCX    LD        HL,EOP
7984 ED5B6661 17380  LD        DE,(HNB)
7988 DF      17390  RST      18H
7989 CABF79  17400  JP        Z,EMERG
798C CDFA79  17410  CALL     OKDOIT
798F CD9579  17420  CALL     TOGGLE
7992 C3835F  17430  JP        DISP
7995 213D7C  17440  TOGGLE   LD        HL,EOP
7998 7E      17450  LOOPLC   LD        A,(HL)
7999 FE40    17460  CP        40H
799B DAA879  17470  JP        C,NEXTL
799E FE5B    17480  CP        'Z'+1
79A0 DAB279  17490  JP        C,LCX
79A3 FE7B    17500  CP        7BH
79A5 DAB879  17510  JP        C,UCX
79A8 ED5B6661 17520  NEXTL    LD        DE,(HNB)
79AC DF      17530  RST      18H
79AD 23      17540  INC      HL
79AE C8      17550  RET      Z
79AF C29879  17560  JP        NZ,LOOPLC
79B2 C620    17570  LCX      ADD      A,32D
79B4 77      17580  LD        (HL),A
79B5 C3A879  17590  JP        NEXTL
79B8 1620    17600  UCX      LD        D,32D
79BA 92      17610  SUB      D
79BB 77      17620  LD        (HL),A
79BC C3A879  17630  JP        NEXTL
79BF 21CF79  17640  EMERG    LD        HL,EMEM
79C2 CDDF64  17650  CALL     SHOW
79C5 0605    17660  LD        B,05H
79C7 CD6953  17670  LOPXPX   CALL     DELAY
79CA 10FB    17680  DJNZ    LOPXPX
79CC C39D55  17690  JP        MAIN
79CF 20      17700  EMEM     DEFM     '          ** NO DATA IN BUFFER ***'
79F9 0D      17710  DEFB      0DH
79FA 21077A  17720  OKDOIT   LD        HL,OKMX
79FD CDDF64  17730  CALL     SHOW
7A00 CD6953  17740  CALL     DELAY
7A03 CD6953  17750  CALL     DELAY
7A06 C9      17760  RET
7A07 20      17770  OKMX     DEFM     '          << REVERSING CASE >>'
7A2F 0A      17780  DEFB      0AH
7A30 0D      17790  DEFB      0DH
7A31 3E0D    17800  FILLPR   LD        A,0DH
7A33 CD3B00  17810  CALL     LPR
7A36 3E0D    17820  LD        A,0DH
7A38 CD3B00  17830  CALL     LPR
7A3B C9      17840  RET
7A3C CD3B00  17850  ESC      CALL     LPR
7A3F CD4900  17860  CALL     0049H
7A42 CBAF    17870  RES      5,A
7A44 325553  17880  LD        (ESCS),A
7A47 CD3B00  17890  CALL     LPR
7A4A 3E0D    17900  LD        A,0DH

```

```

7A4C CD3B00  17910  CALL     LPR
7A4F 21657A  17920  LD        HL,ESCM
7A52 CDDF64  17930  CALL     SHOW
7A55 3A5553  17940  LD        A,(ESCS)
7A58 CD3300  17950  CALL     0033H
7A5B 0607    17960  LD        B,07H
7A5D CD6953  17970  KEYEX    CALL     DELAY
7A60 10FB    17980  DJNZ    KEYEX
7A62 C39D55  17990  JP        MAIN
7A65 0A      18000  ESCM     DEFB      0AH
7A66 20      18010  DEFB      '          SENT CODE: <ESC> + '
7A8C 03      18020  DEFB      03H
7A8D 21A07A  18030  COLDST   LD        HL,CLDSTR
7A90 CDDF64  18040  CALL     SHOW
7A93 CD4900  18050  CALL     0049H
7A96 CBAF    18060  RES      5,A
7A98 FE59    18070  CP        'Y'
7A9A CAF07A  18080  JP        Z,CLDYY
7A9D C29D55  18090  JP        NZ,MAIN
7AA0 0A      18100  CLDSTR   DEFB      0AH
7AA1 20      18110  DEFB      '          COLD START, SURE (Y/N) ?'
7ACB 0A      18120  DEFB      0AH
7ACC 20      18130  DEFM     '          ANSWER: '
7AEF 0D      18140  DEFB      0DH
7AF0 CDC901  18150  CLDYY    CALL     CLS
7AF3 CDA953  18160  CALL     NOCSR
7AF6 21147B  18170  LD        HL,COLDM
7AF9 CDDF64  18180  CALL     SHOW
7AFC 060A    18190  LD        B,0AH
7AFE CD6953  18200  MARK     CALL     DELAY
7B01 10FB    18210  DJNZ    MARK
7B03 CDC901  18220  CALL     01C9H
7B06 212F7B  18230  LD        HL,SATIS
7B09 111843  18240  LD        DE,4318H
7B0C 010400  18250  LD        BC,SATISL
7B0F EDB0    18260  LDIR
7B11 C30154  18270  JP        START
7B14 0A      18280  COLDM    DEFB      0AH
7B15 0A      18290  DEFB      0AH
7B16 0A      18300  DEFB      0AH
7B17 17      18310  DEFB      23D
7B18 20      18320  DEFM     '          ** COLD START ***'
7B2E 0D      18330  DEFB      0DH
7B2F 4D      18340  SATIS    DEFM     'MPH'
7B32 0D      18350  DEFB      0DH
0004      18360  EQU      $-SATIS
7B33 213D7C  18370  HLP      LD        HL,EOP
7B36 ED5B6661 18380  HLP2     LD        DE,(HNB)
7B3A DF      18390  RST      18H
7B3B CABF79  18400  JP        Z,EMERG
7B3E 7E      18410  LD        A,(HL)
7B3F CD5F7B  18420  CALL     HEXPR
7B42 23      18430  INC      HL
7B43 ED5B6661 18440  LD        DE,(HNB)
7B47 DF      18450  RST      18H
7B48 CAB75F  18460  JP        Z,WAIT
7B4B CD2B00  18470  CALL     002BH
7B4E FE70    18480  CP        70H
7B50 CCB25F  18490  CALL     Z,PAUSE
7B53 FE50    18500  CP        'P'
7B55 CCB25F  18510  CALL     Z,PAUSE
7B58 FE60    18520  CP
7B5A CA4579  18530  JP        Z,EXEC
7B5D 18D7    18540  JR        HLP2
7B5F F5      18550  HEXPR    PUSH     AF
7B60 07      18560  RLCA
7B61 07      18570  RLCA
7B62 07      18580  RLCA
7B63 07      18590  RLCA
7B64 CD6E7B  18600  CALL     SETH
7B67 F1      18610  POP      AF
7B68 F5      18620  PUSH     AF
7B69 CD6E7B  18630  CALL     SETH
7B6C F1      18640  POP      AF
7B6D C9      18650  RET
7B6E E60F    18660  SETH    AND      0FH

```

Listing 1 continued

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Rules

1. Final entries must be received by October 1, 1984.
2. All entries must be submitted in a 10 x 13" envelope and must include: typewritten, double-spaced documentation; a printed copy of the program listing; a magnetic disk or cassette containing the program listing, the documentation, and any figures or tables; and a completed entry blank.
3. Documentation should consist of an explanation of the program, its purpose, how to use it, and the necessary software and hardware needed to use it, including disk operating system (DOS) and memory requirements. (If your entry requires unusual hardware configurations, query us before submitting.) Good documentation also points out the interesting algorithms and program techniques used without giving a line-by-line account.
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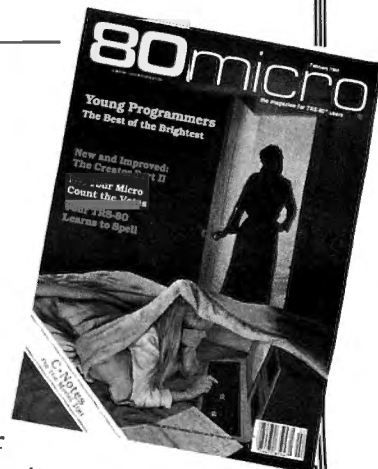
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- Model 4 P

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Listing 1 continued

```

7B70 FE0A 18670 CP 0AH
7B72 3006 18680 JR NC,DIFF
7B74 F630 18690 OR 30H
7B76 CD3300 18700 NODIF CALL DISPL
7B79 C9 18710 DOLPH RET
7B7A C637 18720 DIFF ADD A,37H
7B7C 18F8 18730 JR NODIF
7B7E 8080 18740 DEFW 8080H
7B80 8080 18750 DEFW 8080H
7B82 8097 18760 DEFW 9780H
7B84 8383 18770 DEFW 8383H
7B86 AD90 18780 DEFW 90ADH
7B88 8095 18790 DEFW 9580H
7B8A 8080 18800 DEFW 8080H
7B8C 8095 18810 DEFW 9580H
7B8E 809F 18820 DEFW 9F80H
7B90 9080 18830 DEFW 8090H
7B92 8095 18840 DEFW 9580H
7B94 80A0 18850 DEFW 0A080H
7B96 8783 18860 DEFW 8387H
7B98 A580 18870 DEFW 80A5H
7B9A 8083 18880 DEFW 8380H
7B9C 8397 18890 DEFW 9783H
7B9E 8381 18900 DEFW 8183H
7BA0 8097 18910 DEFW 9780H
7BA2 8383 18920 DEFW 8383H
7BA4 8381 18930 DEFW 8183H
7BA6 8097 18940 DEFW 9780H
7BA8 8383 18950 DEFW 8383H
7BAA 8395 18960 DEFW 9583H
7BAC 80BF 18970 DEFW 0BF80H
7BAE 8080 18980 DEFW 8080H
7BB0 AA95 18990 DEFW 95AAH
7BB2 2874 19000 DEFW 7428H
7BB4 6D29 19010 DEFW 296DH
7BB6 2080 19020 DEFW 8020H
7BB8 8080 19030 DEFW 8080H
7BBA 8080 19040 DEFW 8080H
7BBC 8080 19050 DEFW 8080H
7BBE 8080 19060 DEFW 8080H
7BC0 8080 19070 DEFW 8080H
7BC2 8095 19080 DEFW 9580H
7BC4 8080 19090 DEFW 8080H
7BC6 8095 19100 DEFW 9580H
7BC8 8082 19110 DEFW 8280H
7BCA A4A0 19120 DEFW 0A0A4H
7BCC 8680 19130 DEFW 8086H
7BCE 8095 19140 DEFW 9580H
7BD0 82A4 19150 DEFW 0A482H
7BD2 8095 19160 DEFW 9580H
7BD4 809A 19170 DEFW 9A80H
7BD6 8C8C 19180 DEFW 8C8CH
7BD8 8E90 19190 DEFW 908EH
7BDA 8080 19200 DEFW 8080H
7BDC 8095 19210 DEFW 9580H
7BDE 8080 19220 DEFW 8080H
7BE0 809D 19230 DEFW 9D80H
7BE2 8C8C 19240 DEFW 8C8CH
7BE4 8480 19250 DEFW 8084H
7BE6 809D 19260 DEFW 9D80H
7BE8 AC8C 19270 DEFW 8CAC8H
7BEA 8C85 19280 DEFW 858CH
7BEC 80 19290 DEFB 80H
7BED 95 19300 DEFB 95H
7BEE A5A0 19310 DEFW 0A0A5H
7BF0 8595 19320 DEFW 9585H
7BF2 8080 19330 DEFW 8080H
7BF4 8080 19340 DEFW 8080H
7BF6 8080 19350 DEFW 8080H
7BF8 8080 19360 DEFW 8080H
7BFA 8080 19370 DEFW 8080H
7BFC 8080 19380 DEFW 8080H
7BFE 8080 19390 DEFW 8080H
7C00 8080 19400 DEFW 8080H
7C02 80B5 19410 DEFW 0B580H
7C04 B0B8 19420 DEFW 0B80H

```

Listing continued.

```

7C06 8E81 19430 DEFW 818EH
7C08 8080 19440 DEFW 8080H
7C0A 8095 19450 DEFW 9580H
7C0C 8080 19460 DEFW 8080H
7C0E 8095 19470 DEFW 9580H
7C10 8080 19480 DEFW 8080H
7C12 A995 19490 DEFW 95A9H
7C14 8095 19500 DEFW 9580H
7C16 8080 19510 DEFW 8080H
7C18 8095 19520 DEFW 9580H
7C1A 8080 19530 DEFW 8080H
7C1C 8095 19540 DEFW 9580H
7C1E 8080 19550 DEFW 8080H
7C20 80B5 19560 DEFW 0B580H
7C22 B0B0 19570 DEFW 0B0B0H
7C24 B090 19580 DEFW 90B0H
7C26 8095 19590 DEFW 9580H
7C28 82AD 19600 DEFW 0AD82H
7C2A B090 19610 DEFW 90B0H
7C2C 8095 19620 DEFW 9580H
7C2E 8286 19630 DEFW 8682H
7C30 8095 19640 DEFW 9580H
7C32 8080 19650 DEFW 8080H
7C34 8080 19660 DEFW 8080H
7C36 8080 19670 DEFW 8080H
7C38 8080 19680 DEFW 8080H
7C3A 8080 19690 DEFW 8080H
7C3C 80 19700 DEFB 80H
7C3D 19710 EOP EQU $
5401 19720 END START
00000 Total errors

```

End

Program Listing 2. Model III changes.

```

Delete 10 to 30
00070 FCBV DEFS 50 ;Model III DOS Buffer
00240 HIMEM EQU 4411H ;High Memory Pointer
01120 START LD A,(4210H) ;Initializes for LYNX
01121 OR 16
01122 LD (4210H),A
01123 OUT (236),A ;Initializes for LYNX
01400 XOR 63 ;Reverse graphics
Delete 01410
01820 LD HL,4228H ;In DOS buffer
02262 XOR A ;Set A=0
02264 LD (4214H),A ;Scroll protect 0 lines
Delete 02620
Delete 02640
02650 LD HL,4225H ;Beginning DOS buffer
03770 LD HL,(4411H)
Delete 04650
Delete 04660
06131 CP 0FH ;Turn off cursor
06132 JR Z,FORE
06133 CP 0EH ;Turn on cursor
06134 JR Z,FORE
06200 FORE CALL DISPL
06300 OR A ;Check for both shifts
06390 JP NZ,MAIN
06721 LD A,(3840H) ;Check for break key
06722 CP 04H
06723 JR NZ,NOD
06724 LD BC,300H ;Delay timing to suit
06725 CALL 0060H
06730 NOD CALL 002BH
07902 LD A,(3C3FH) ;Blink Asterik
07904 XOR 0AH
07906 LD (3C3FH),A ;Blink Asterik
Delete 07910
08040 XBAUD DEFW 300 ;Wrong in program
09070 LD HL,4225H
09340 LD HL,4225H
09530 LD HL,4225H

```

Listing 2 continued

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Listing 2 continued

```

09730      LD      HL,4225H
09940      OR      05H      ;Wrong in program
Delete 11150
Delete 12370
12390      POP     IX
Delete 12810
Delete 12840
Delete 12870
Delete 13260
13280      JP      CONT      ;Wrong in program
18240      LD      DE,4225H

```

Program Listing 3. Lynx/Hayes auto-dial routines.

```

00100      XCURS   DEFS   01H      ;Reserves space
00120      XBAUDV  DEFS   01H
00999      READY  LD      A,(XBAUDV) ;Initialization routine
01000      OUT     (MSTT),A
01020      LD      A,(XCURS)
02011      LD      A,6DH      ;Code for 8-N-1
02012      LD      (XCURS),A
02013      LD      A,55H      ;Code for 300 Baud
02014      LD      (XBAUDV),A
02015      CALL   READY
03655      CALL   READY
Delete 09960
Delete 09970

```

Program Listing 4. TRSDOS 1.3 changes.

```

00040      ORG     7000H      ;To avoid system crash
01930      JP      4296H      ;TRSDOS 1.3 JP to DOS
10930      JP      4296H
17230      JP      4296H
10880      LD      A,96H      ;Repair DOS JP
10900      LD      A,42H

```

Program Listing 5. Lynx auto-dial changes.

```

11931      CALL   TONE      ;Get dialtone
11950      LD      A,2
11952      OUT     (BAUD),A  ;Turn on (A=2)
11954      CALL   DELAY
11956      CALL   DELAY
11958      RET
12140      DIAL   XOR      A      ;Start dialing number
12150      OUT     (BAUD),A  ;Turn off (A=0)
12170      LD      A,2
12180      OUT     (BAUD),A
12210      CALL   DELAY
12470      LD      BC,3500D  ;Delay timing to suit
12900      CONVT  CALL   TONE
13460      RESETD IN      A,(MSTT) ;Check for carrier
13470      SUB     128
13480      JR      C,NOTOFF ;JP if carrier present
13490      CALL   READY
Delete 13500 to 13540
13550      NOTOFF RET

```

Program Listing 6. Hayes auto-dial changes.

```

03650      BSTT   IN      A,(MSTT) ;Check for Carrier
03651      SUB     128

```

Listing 6 continued

```

03652      JR      NC,DOFF   ;Go if no Tone
03653      CALL   RST2
03654      CALL   01C9H      ;Old Line 03650
Delete 11560
11925      LDIR     ;Old Line 11930
11926      DIAL   LD      A,0DH
11927      OUT     (INDT),A
11930      JP      CONV
11931      CALL   TONE      ;Pause
11932      LD      A,'+'      ;Control for Hayes CMD
11933      LD      B,3
11934      OUT     (INDT),A
11935      DJNZ   CMD1
11936      CALL   TONE      ;Pause
11940      RET
11950      LD      B,3      ;Pause Routine
11951      TONE   PUSH   BC
11952      TONEL  CALL   DELAY
11956      POP     BC
11957      DJNZ   TONEL
11958      RET
11960      CONV  LD      HL,DBUFF-1 ;CMD Routine for Dial
11961      LD      A,'A'
11962      OUT     (INDT),A
11963      CALL   DELAY
11964      LD      A,'T'
11965      OUT     (INDT),A
11966      CALL   DELAY
11967      LD      A,'D'
11968      OUT     (INDT),A
11969      CALL   DELAY
11970      LOOPXX INC     HL
Delete 11980 to 12090
12101      CP      '-'      ;Skip Extra Characters
12102      JR      Z,SKIP    ;At Least Print Them
12103      CP      '{'
12104      JR      Z,SKIP
12105      CP      '}'
12106      JR      Z,SKIP
12107      CP      '!'
12108      JR      Z,SKIP
12109      CALL   DELAY
12110      OUT     (INDT),A
12111      SKIP  CALL   DISPL
12120      CP      0DH      ;If <CR> then Done
12140      CALL   TONE
12150      JP      TERM
Delete 12160 to 12220
12900      CONVT  LD      DE,DBUFF ;Move to Buffer
12910      LD      BC,31
12920      LDIR
12930      JP      DIAL
Delete 12940 to 13110
Delete 13270 and 13280
13460      RESETD IN      A,(MSTT) ;Check for Carrier
13470      SUB     128
13471      JR      C,NOTOFF ;Carrier Still On
13472      RST2  CALL   01C9H
13473      LD      HL,HANGUP
13474      CALL   SHOW
13475      CALL   CMD      ;Hangup Sequence
13476      LD      A,'A'
13477      OUT     (INDT),A
13478      LD      A,'T'
13479      OUT     (INDT),A
13480      LD      A,'H'
13481      OUT     (INDT),A
13490      LD      A,0DH
13500      OUT     (INDT),A
13510      CALL   READY
13520      NOTOFF RET
13530      HANGUP DEFM 'HANGING UP MODEM'
13540      DEFB  0DH
Delete 13550

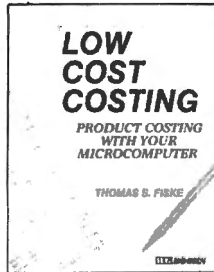
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MOD I or III

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MOD I or MOD III

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A Real Sketch

by John and Aileen Cornman

Sketchpad, a 24K RAM Basic program (with changes for 16K), can turn your Model 100 into a deluxe etch-a-sketch that lets you create designs on the screen and then print them out.

The program overcomes two deficiencies of the 100's graphics capabilities. Since it has no Point command (as in Model III Basic), you can't tell if a particular screen pixel is set or not. Because of this, you can't transfer a design from the screen to a printer—even if it has dot-addressable graphics capability.

Program Listing 1, Sketchpad, lets you draw designs with lines, boxes, circles, or individual dots, and repeat parts of the sketch to create interesting effects. It lets you include text in your designs as well as save and recall sketches from RAM or tape files.

We use machine-language subroutines to provide near instant response in most sketching functions. The heart of the system is the 1,920-byte bit-map area that we use to record the on/off status of each of the 15,360 dots in the display. Each bit in this area corresponds to one dot on the screen. By relaying each dot's status, the bit map makes it possible for you to transfer an entire screen to a printer, bit by bit.

Some Ground Rules

When you run Sketchpad, the title screen gives you the option of going directly to its help menu or into the Sketch routine. If you want to draw, you must instruct the program to either set up for a new sketch or continue with the previous sketch in the bit map.

Pressing the H key at any time while sketching produces a reference listing of the functions and the command key for each (see Table 1). If this table is of sufficient help, press

(A)xes	(G)rid	(L)ine	(Q)uit	(W)here
(B)ox	(H)elp	(M)ove	(R)epet	(X)Y-set
(C)ircle	(I)nput	(N)egative	(S)napshot	(1)black
(D)raw	(J)ump	(O)utput	(T)ext	(0)white
(F)ill	(K)ill	(P)oint	(V)iew	↑ - ↓ cursor

Table 1. Sketchpad function keys.

The Key Box

The programs in "A Real Sketch" and "Getting Personal" run in 24K and 8K RAM, respectively. Both require printers.

Program Listing 1. Sketchpad.

```

10 '*** SKETCHPAD+ ***
1 CLEAR100,MAXRAM-2961:LOADM"SKSUBR":GOS
UB3000:GOSUB6000:GOTO20
2 SC=CH:IFCH>DETHEN9ELSEIFCH=DETHENCH=N4
:GOTO8
3 IFCH>CZTHEN9ELSEIFCH=CZTHENCH=N3:GOTO8
4 IFCH>CRTHEN9ELSEIFCH=CRTHENCH=N5:GOTO8
5 IFCH>N2THEN9ELSEIFCH=N0THENCH=N1:GOTO9
8 PRINT#1,C2$;
9 PRINT#1,CHR$(CH);:CH=SC:RETURN
20 GOSUB50
30 K$="":IFK>96THENK=K-32
32 K=K-64:IFK<>6THENB=0:C=0
33 IFK=-15THENK=25
34 IFK=-16THENK=26
35 IFK<1THEN20
40 ONKGOSUB1900,200,300,400,94,600,2600,
5000,700,1000,1400,1200,94,1800,100,1600
,1700,2400,900,2000,94,2200,2300,2100,50
0,1100:GOTO20
50 IFK$<>"THENRETURNELSEPSET(X,Y)
52 FORI=1TO45:K$=INKEY$:IFK$<>"THENI=45
53 NEXTI
54 PRESET(X,Y):IFK$<>"THEN60
56 FORI=1TO45:K$=INKEY$:IFK$<>"THENI=45
57 NEXTI
58 IFK$="THEN50
60 K=ASC(K$):GOSUB99:IFPEEK(S!+HL)ANDATH
ENPSET(X,Y)
62 IFK=1THENX=X-JX:GOTO90
64 IFK=2THENY=Y+JY:GOTO90
66 IFK=6THENX=X+JX:GOTO90
68 IFK=17THENX=0:GOTO90
70 IFK=18THENX=239:GOTO90
72 IFK=20THENY=Y-JY:GOTO90
74 IFK=23THENY=0:GOTO90
76 IFK=26THENY=63:GOTO90
78 IFK=28THENX=X+1:GOTO90
80 IFK=29THENX=X-1:GOTO90
82 IFK=30THENY=Y-1:GOTO90
84 IFK=31THENY=Y+1
90 IFX<0THENX=0ELSEIFX>239THENX=239
92 IFY<0THENY=0ELSEIFY>63THENY=63
94 RETURN
95 K$=INKEY$:IFK$="THEN95ELSEK=ASC(K$):
RETURN
99 A=X*64+Y:HL=A\8:A=2^(AMOD8):RETURN
100 CLS:PRINT:PRINT"Output to (R)AM, (C)
AS, (P)rinter,":PRINTTAB(7)"or (N)o outp
ut?"
102 GOSUB95
104 IFK$<>"N"ANDK$<>"n"THEN108
106 K$="":GOSUB2500:RETURN
108 IFK$<>"R"ANDK$<>"r"THEN150
110 GOSUB180:GOSUB112:GOTO118
    
```

Listing 1 continued

Listing 1 continued

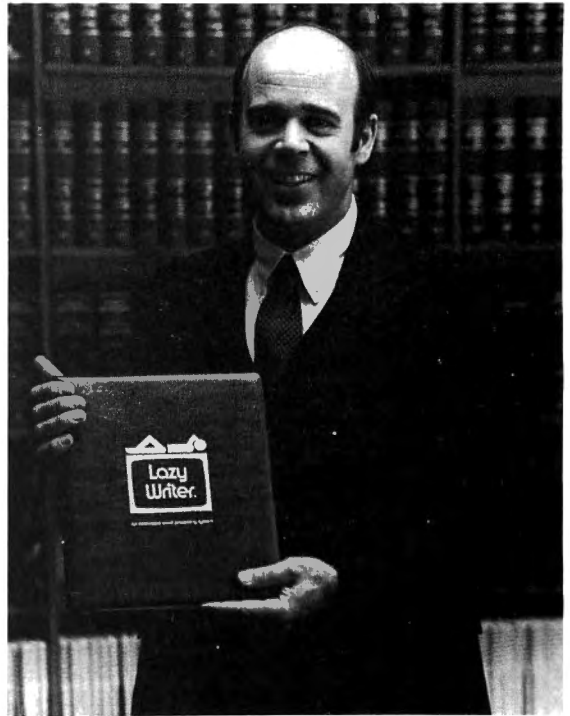
```

112 OPENFI$FOROUTPUTAS1:PRINT:PRINT"Doin
g sketch output, please wait..."
114 M!=S!:Ll!=V!-Nl!:RETURN
118 IFM!>Ll!THEN148ELSECH=PEEK(M!):CN=Nl
120 M!=M!+Nl!:IFPEEK(M!)=CHANDM!<V!THENC
N=CN+Nl:GOTO120
122 IFCN>N5THEN130
124 FORI=NlTOCN
126 GOSUB2:NEXTI
128 GOTO118
130 IFCN>FETHENPRINT#1,C2$;CF$;;GOSUB2:C
N=CN-FF:GOTO130
132 IFCN>DETHENPRINT#1,C2$;CHR$(CN);:GOS
UB2:GOTO118
134 IFCN=DETHENGOSUB2:PRINT#1,C2$;CD$;;G
OSUB2:GOTO118
135 IFCN=CZTHENGOSUB2:PRINT#1,C2$;CZ$;;G
OSUB2:GOTO118
136 IFCN=CRTHENGOSUB2:PRINT#1,C2$;CR$;;G
OSUB2:GOTO118
137 IFCN>N5THENPRINT#1,C2$;CHR$(CN);:GOS
UB2:GOTO118ELSEIFCN=N0THEN118ELSE124
148 CLOSE:CALLV!:K$="":RETURN
150 IFK$<>"C"ANDK$<>"c"THEN170
152 GOSUB180:GOSUB154:GOTO158
154 FI$="CAS:"+FI$:PRINT:PRINT"Press ENT
ER when recorder is ready..."
156 GOSUB95:RETURN
158 GOSUB112:FORM!=S!TOL!
160 PRINT#1,PEEK(M!):NEXTM!
162 GOTO148
170 IFK$<>"P"ANDK$<>"p"THEN102ELSE800
180 PRINT:LINEINPUT"Enter file name: ";F
IS
182 RETURN
200 IFX=PXANDY=PYTHENRETURN
202 LINE(PX,PY)-(X,Y),CO,B
204 HL!=PX*256+PY
206 POKEY2!,PX:POKEY2!,Y:CALLL!,CO,HL!
210 POKEY2!,X:POKEY2!,PY:CALLL!,CO,HL!
212 HL!=X*256+Y
214 POKEY2!,PX:POKEY2!,Y:CALLL!,CO,HL!
218 POKEY2!,X:POKEY2!,PY:CALLL!,CO,HL!
220 B=1:RETURN
300 R2!=(PX-X)^2+(PY-Y)^2:LC=FIX(SQR(R2!
/2)+.5):XX=X:YY=Y
302 FORCY=PYTOPY-LCSTEP-1
304 CX!=PX-SQR(R2!-(PY-CY)^2):CX=FIX(CX!
+.5*SGN(CX!))
306 GOSUB350
308 NEXTCY
310 FORCX=CXTOPX
312 CY!=PY-SQR(R2!-(PX-CX)^2):CY=FIX(CY!
+.5*SGN(CY!))
314 GOSUB350
316 NEXTCX
318 X=XX:Y=YY:IFP=1THENP=0:GOSUB1650
320 C=1:RETURN
350 IFCY<0AND(PY+PY-CY)>63THENCX=PX:CY=P
Y-LC:RETURN
351 X=CX:Y=CY:IFX>=0ANDX<240ANDY>=0ANDY<
64THENIFF=0THENGOSUB380ELSEGOSUB390ELSEI
FF=1THENGOSUB390
352 LY=PY+PY-CY:Y=LY:X=CX:IFY<64ANDX>=0T
HENIFF=0THENGOSUB380ELSEGOSUB390ELSEIFF=
1THENGOSUB390
354 RX=PX+PX-CX:X=RX:Y=CY:IFX<240ANDY>=0
THENIFF=0THENGOSUB380ELSEGOSUB390ELSEIFF
=1THENGOSUB390

```

Listing 1 continued

The Johnson Law Office Depends on Lazy Writer



“When I opened my law office I needed word processing, but my resources were limited. A local computer store recommended Lazy Writer. I purchased a Radio Shack Model III and Lazy Writer, took them home, and within a day felt very comfortable with them. Lazy Writer was easier to use than the dedicated word processors at my old law firm. Now my law practice has grown and we have four Model III's and a Model IV. We recently bought the new Model IV upgrade for Lazy Writer so we can have the 80 x 24 screen display. Every attorney in the office as well as the law clerks and all of the secretaries are capable of using Lazy Writer. We spend 95 percent of our computer time using Lazy Writer.

“My practice involves a lot of estate work. The average set of estate planning documents is about 50 pages. With the text blocks I've developed, using Lazy Writer and Lazy Doc, it takes three hours for a secretary to complete the forms for a client. At my old law firm, it took six hours on a mag card word processor and five hours on a Wang to do the same thing.”

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Attorney at Law

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Listing 1 continued

```

355 Y=LY:X=RX:IFY<64ANDX<240THENIFF=0THE
NGOSUB380ELSEGOSUB390ELSEIFF=1THENGOSUB3
90
356 RETURN
380 GOSUB99:IFCO=1THENPSET(X,Y):CALLO!,A
,HLSELPRESET(X,Y):CALLF!,A,HL
382 RETURN
390 IFY<0ORY>63THENRETURN
391 IFX<0THENX=0ELSEIFX>239THENX=239
392 LINE(X,Y)-(PX,Y),CO
393 HL!=X*256+Y
394 POKEY2!,PX:POKEY2!,Y:CALLL!,CO,HL!
396 RETURN
400 OX=X:OY=Y
402 K$="":GOSUB50
404 IFK>31THENRETURN
406 IFX=OXANDY=OYTHEN402
408 XX=X:YY=Y
410 IFOX=XTHEN412ELSEIFX>OXTHENX=X-1ELSE
X=X+1
412 IFOY=YTHEN414ELSEIFY>OYTHENY=Y-1ELSE
Y=Y+1
414 LINE(OX,OY)-(X,Y),CO
416 HL!=OX*256+OY
418 POKEY2!,X:POKEY2!,Y:CALLL!,CO,HL!
420 X=XX:Y=YY:GOTO400
500 CO=1:RETURN
600 IFB=0THEN620ELSEXX=X:YY=Y
602 IFABS(PX-X)=1ORABS(PY-Y)=1THENB=0:X=
XX:Y=YY:RETURN
604 IFABS(PX-X)>2THENIFPX>XTHENX=X+1ELSE
X=X-1
606 IFPX>XTHENPX=PX-1ELSEPX=PX+1
608 IFABS(PY-Y)>2THENIFPY>YTHENY=Y+1ELSE
Y=Y-1
610 IFPY>YTHENPY=PY-1ELSEPY=PY+1
612 GOSUB202:GOTO602
620 IFC=0THENRETURNELSEF=1
622 GOSUB300:F=0:C=0:RETURN
700 CLS:PRINT:PRINT"Input from (R)AM, (C
)AS, or (N)o input?"
702 GOSUB95
704 IFK$<>"N"ANDK$<>"n"THEN708
706 K$="":GOSUB2500:RETURN
708 IFK$<>"R"ANDK$<>"r"THEN706
710 GOSUB180:GOSUB712:GOTO716
712 OPENFI$FORINPUTAS1:PRINT:PRINT"Getti
ng sketch input, please wait...":M1=S1:R
ETURN
714 IFEOF(1)THEN715ELSE716
715 CLOSE:CALLV!:K$="":RETURN
716 CH=ASC(INPUT$(1,1))
718 IFCH=N2THEN730
720 IFCH=N1THENCH=N0
722 POKEM!,CH:M1=M1+N1!:IFM1=V!THEN715EL
SE714
730 CH=ASC(INPUT$(1,1))
732 IFCH<N6THEN750
734 CN=CH:CH=ASC(INPUT$(1,1))
736 IFCH=N1THENCH=N0:GOTO744
738 IFCH=N2THENCH=ASC(INPUT$(1,1))ELSE74
4
740 IFCH=N1ORCH=N2THEN744
742 IFCH=N3THENCH=CZELSEIFCH=N5THENCH=CR
ELSECH=DE
744 FORI=N1TOCN:POKEM!,CH:M1=M1+N1!:IFM1
=V!THENI=CN
746 NEXT:I=V!THEN715ELSE714

```

Listing 1 continued

the enter key to return to sketching. If you need more information about a particular function, press the first letter of that function's name, and a screen of related information appears. Press any key to return to the help menu.

You can move the cursor around the screen in a number of ways. Each of the four arrow keys moves the cursor one dot at a time in the indicated direction. Pressing the shift key and an arrow key together moves the cursor five dots at a time up or down or 10 dots at a time left or right. Pressing the control key and an arrow key together moves the cursor to the extreme edge of the screen in one leap.

You can control the number of dots that the cursor jumps when you press the shift key and an arrow key together. Type J and the Jump command asks you two questions. Your first answer sets the left/right jump between one and 239 pixels; your second answer sets the up/down jump to between one and 63 pixels. Press the enter key after each answer and the sketchpad reappears.

The X key lets you move the cursor to a specific point on the screen by specifying its X and Y coordinates. As with the Jump function, you do this by answering two questions.

At times you can lose track of the cursor's location. The Where function helps you find it. Pressing the W key first displays the cursor's current X and Y coordinates, and then when you press any key, it restores your sketch to the screen and marks the cursor with a temporary cross.

Another option to keep in mind is your ability to work in black on white, or white on black. When you first run the program, it makes black dots on the white background. You can reverse this at any time by pressing the zero key (for drawing with white dots) or the 1 key (for drawing with black dots). Use this method to erase—simply draw over an unwanted image in the background color.

You can turn a sketch into a "negative" with the Negative function. Pressing the N key turns the background black, and anything drawn in black becomes white. Pressing the N key again returns your sketch to its original "positive" impression. Remember that the Negative function doesn't change the drawing color. If you turn your sketch into a negative, you must press the zero key to begin drawing white dots on the black background.

Drawing the Lines

Once in the Sketch mode, the program displays a blank screen with a blinking cursor in the center. The D key puts you in the Draw mode. The cursor leaves a trail of dots as you move it around the screen. Pressing any non-arrow key cancels the Draw mode. You can, however, use the shift and control keys in combination with the arrow keys, or the M key (the Move function which lets you move the cursor without leaving a trail) without breaking out of the Draw function.

The Draw mode is useful for drawing single dots and horizontal and vertical lines, but you can best draw diagonal lines with the Line function, which lets you draw a straight line between two points. First use the P key to set a reference point at one end of the line. Position the cursor at the desired point and press the P key. Move the cursor to the other end of the line you want to draw and press the L key (for the Line function). The program draws a line from point P to the point where you press the L key.

Use the Kill function (K key) to kill the current sketch in memory and start all over again with a blank screen. The

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Menus

Visicalc menu

Main Menu

1. Tutorial	9. BASIC
2.	10. Utilities
3. Letters	11.
4.	12. Communications
5. Business	13.
6.	14. NICE development
7.	15.
8. Visicalc	16. Entertainment

Selection => _<

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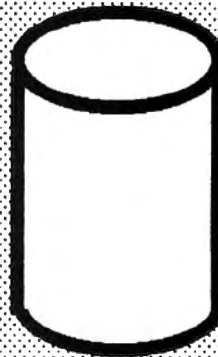
Visicalc^(tn) interface

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

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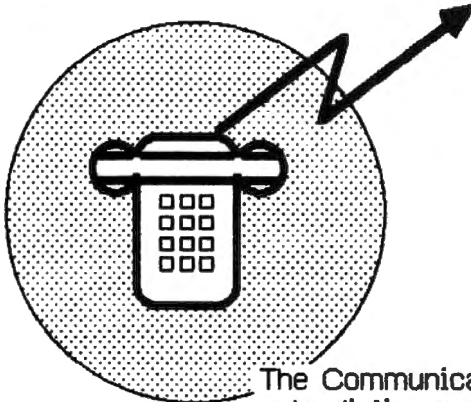


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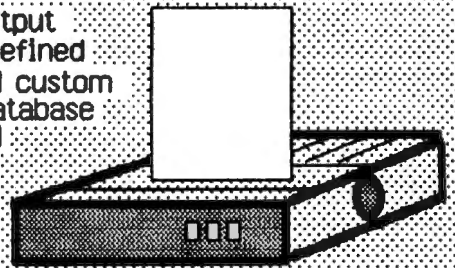
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C•NOTES

program asks you to confirm the kill (Y or N) in case you hit the key by mistake.

The Quit command (Q key) similarly asks you to verify your request (Y or N) and upon execution it returns you to the Model 100 main menu.

Although the Draw and Line commands are sufficient to create any imaginable sketch, easier ways to draw boxes and circles and fill them in with a solid color exist.

To draw a box, place the cursor at one corner and press P to set it as a reference point. Then move the cursor to the opposite diagonal and press B (the Box command). Fill the box (if desired) by pressing the F key (the Fill command) immediately after pressing B.

You can draw a circle by indicating its center point with the cursor and pressing P. Move the cursor along the radius of your circle to the desired length and press the C key—and

Listing 1 continued

```

750 IFCH=N1ORCH=N2THEN722
752 IFCH=N3THENCH=CZ:GOTO722
754 IFCH=N5THENCH=CR:GOTO722
755 CH=DE:GOTO722
760 IFK$<>"C"ANDK$<>"c"THEN702
762 GOSUB180:GOSUB154:GOSUB712
768 FORM!=S!TOV!-1
770 INPUT#1,CH:POKEM!,CH:NEXTM!
772 GOTO715
800 CLS:PRINT:PRINT"Enter desired left m
argin as a number":PRINT"between 0 and 3
9,":PRINT"or enter 'N' to exit without p
rinting."
802 PRINT:LINEINPUT"Enter margin: ";M$
804 IFM$<>"N"ANDM$<>"n"THEN808
806 GOSUB2500:K$="":RETURN
808 M=VAL(M$):IFM<0ORM>39THEN800
810 PRINT:PRINT"Press any key when print
er is ready..."
812 GOSUB95:GOSUB850:GOTO806
850 LPRINTCHR$(18);:FORH=0TO7:GOSUB880
852 FORM!=S!+HTOS!+1912+HSTEP8
854 CL=(PEEK(M!)AND(2^(7-H)-1))*2^H
856 CH=PEEK(M!-1)\2^(8-H)
858 LPRINTCHR$((CHORCL)OR128);
860 NEXTM!:LPRINTCHR$(13);:NEXTH
862 GOSUB880:FORM!=S!+7TOS!+1919STEP8
864 LPRINTCHR$(PEEK(M!)OR128);
866 NEXTM!:LPRINTCHR$(13);
868 GOSUB880:FORM!=S!+7TOS!+1919STEP8
870 LPRINTCHR$((PEEK(M!)\128)OR128);
872 NEXTM!:LPRINTCHR$(13);
874 LPRINTCHR$(30):RETURN
880 IFM<>0THENLPRINTCHR$(28);CHR$(M*6);C
HR$(128);:RETURNELSERETURN
900 IFPX=XANDPY=PTHENRETURN
902 IFPX<XTHENIX=PX:XI=XELSEIX=X:XI=PX
904 IFPY<YTHENIY=PY:YI=YELSEIY=Y:YI=PY
906 IFP=1THENP=0:GOSUB1650
908 LINE(IX,IY)-(XI,YI),CO,B
910 IB=1:RETURN
1000 CLS:LPRINTCHR$(155)CHR$(154);:INPUT"
jump: how many dots (1-239)";JX!:IFJX!<
10RJX!>239THEN1000
1002 LPRINTCHR$(152)CHR$(153);:INPUT" jum
p: how many dots (1-63)";JY!:IFJY!<10RJY
!>63THEN1002
1004 GOSUB2500:JX=JX!:JY=JY!:RETURN
1100 CO=0:RETURN
1200 IFX=PXANDY=PYTHENRETURN
1202 LINE(PX,PY)-(X,Y),CO
1204 IFPY>YTHEN1210
1206 HL!=PX*256+PY
1208 POKEX2!,X:POKEY2!,Y:CALLL!,CO,HL!:R
ETURN
1210 HL!=X*256+Y
1212 POKEX2!,PX:POKEY2!,PY:CALLL!,CO,HL!
:RETURN

```

```

1400 PRINT@280,"Kill old sketch? (press
Y or N)";
1401 GOSUB95
1402 IFK$="Y"ORK$="y"THEN1404
1403 GOSUB2500:K$="":RETURN
1404 CLS:X=120:Y=32:CALLA!,0:AX=0:G=0:IB
=0:XI=0:IX=0:IY=0:YI=0:P=0:CO=1:R=0:GOTO
1403
1600 PX=X:PY=Y:P=1
1602 GOSUB99:IF(PEEK(S!+HL)ANDA)<>0THENP
RESET(X,Y):CALLF!,A,HLELSEPSET(X,Y):CALL
O!,A,HL
1604 RETURN
1650 XX=X:YY=Y:X=PX:Y=PY:GOSUB1602
1652 X=XX:Y=YY:RETURN
1700 PRINT@280,"Quit sketching? (press Y
or N)";
1701 GOSUB95:IFK$="Y"ORK$="y"THENMENUELS
EGOSUB2500:K$="":RETURN
1800 R=NOTR:CALLN!:GOSUB2500:RETURN
1900 IFR=0THENAC=1ELSEAC=0
1901 LINE(0,32)-(239,32),AC:LINE(120,0)-
(120,63),AC
1902 FORI=0TO235STEP5:IFIMOD10=0THENLINE
(I,30)-(I,34),ACELSELINE(I,31)-(I,33),AC
1904 NEXT
1906 FORI=2TO62STEP5:IFIMOD10=0THENLINE(
118,I)-(122,I),ACELSELINE(119,I)-(121,I)
,AC
1908 NEXT:AX=1:RETURN
2000 K$="":GOSUB50
2002 IFK=27THENK$="":RETURN
2003 IF(K=127ORK=8)ANDX>5THENX=X-6:K=32:
D=1ELSED=0
2004 IFX>234ORY>62ORY<6ORK<32ORK>126THEN
2000
2006 POKEX2!,Y-6:POKEY2!,X
2008 CALLC!,CO,(K-32)*5
2010 XX=X:YY=Y:XP=PX:YP=PY:X=X+5:PX=X:PY
=Y+1:Y=Y-6:TC=CO
2012 IFCO=1THENCO=0ELSECO=1
2014 GOSUB1200
2016 X=XX:Y=YY:PX=XP:PY=YP:CO=TC
2018 IFX<229ANDD=0THENX=X+6
2020 GOTO2000
2100 CLS:PRINT:INPUT"Enter X coordinate
(0-239)";JX!:IFJX!<0ORJX!>239THEN2100
2102 PRINT:INPUT"Enter Y coordinate (0-6
3)";JY!:IFJY!<0ORJY!>63THEN2102
2104 GOSUB2500:X=JX!:Y=JY!:RETURN
2200 AX=0:G=0:GOSUB2500:RETURN
2300 PRINT@280,"X =";X;"," Y =";Y;" (Press
any key)";
2302 GOSUB95:GOSUB2500
2304 X=X:Y=Y:FORX=XX-3TOXX+3:GOSUB2308
:NEXTX
2306 X=XX:FORY=YY-3TOYY+3:GOSUB2308:NEXT
Y:Y=YY:K$="":RETURN

```

Listing 1 continued

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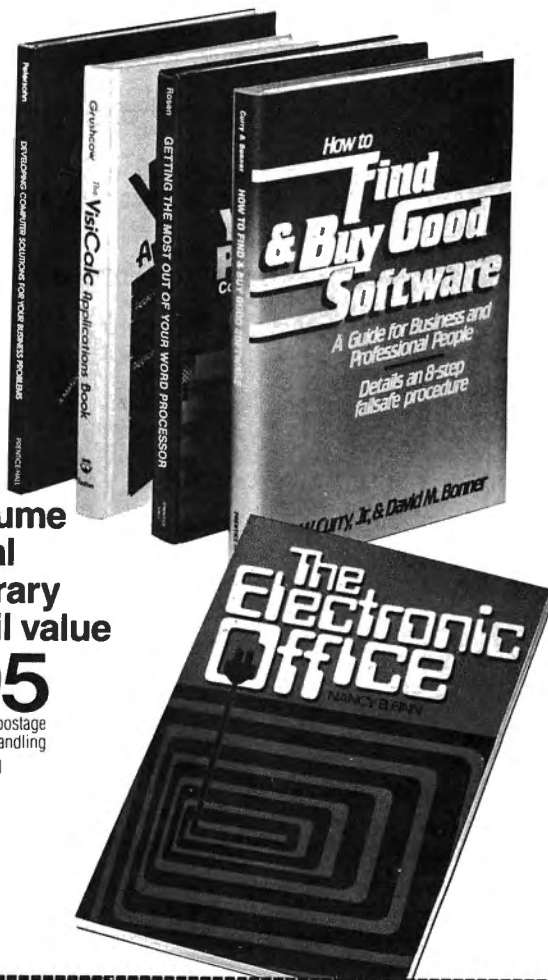
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the program draws the circle. Again you may fill the circle by immediately pressing the F key.

You can add text or characters (any of the 95 characters from ASCII 32 through 126) to the screen sketch with the Text command. Press T to enter the mode, and enter text in the usual fashion. The cursor indicates where the lower-left corner of the character will appear.

After drawing a character the program advances the cursor six dots (normal text spacing). You can control exactly

where each character appears by manually positioning the cursor. The only requirement is that you must be able to fit the whole character in at the selected location. In the Text mode, use the delete/backspace key to erase and the escape key to terminate the Text mode.

Getting Fancy

You can create nice effects by repeating a simple pattern. Once you create a design you like, you can take a snapshot of

Listing 1 continued

```

2308 IFX>=0ANDX<240ANDY>=0ANDY<64THENGOS
UB99:IF(PEEK(S!+HL)ANDA)<>0THENPRESET(X,
Y)ELSEPSET(X,Y)
2310 RETURN
2400 IFIY=0ANDIX=0ANDYI=0ANDXI=0THENRETR
RN
2402 DX=XI-IX:DY=YI-IY:IFX+DX>239THENDX=
239-X
2404 IFY+DY>63THENDY=63-Y
2406 DX=DX+1:DY=DY+1
2408 XX=X:YY=Y:X=IX:Y=IY:GOSUB99
2410 POKE X2!,XX:POKEY2!,YY
2412 POKEX!,DX:POKEY!,DY
2414 CALLR!,A,HL
2416 Y=YY:X=XX:IFIB=1THENIB=0:GOSUB2500
2418 RETURN
2500 CALLV!:IFG=1THENGOSUB2606
2502 IFAX=1THENGOSUB1900
2504 IFIB=1THENGOSUB908
2506 RETURN
2600 G=1:PRINT@280,"Grid size: (F)ive or
(T)en units?";
2602 GOSUB95:IFK$<>"F"ANDK$<>"f"THEN2610
ELSEGS=5
2604 GOSUB2500:K$="":RETURN
2606 IFR=0THENAC=1ELSEAC=0
2607 FORG=2TO62STEPGS:LINE(0,G)-(239,G),
AC:NEXTG
2608 FORG=0TO235STEPGS:LINE(G,0)-(G,63),
AC:NEXTG:G=1:RETURN
2610 IFK$<>"t"ANDK$<>"T"THEN2602ELSEGS=1
0:GOTO2604
3000 CLS:DEFINTA-Z:X=120:Y=32:CO=1:JX=10
:JY=5
3010 MR!=MAXRAM:S!=MR!-2960:V!=MR!-1040:
O!=MR!-991:A!=MR!-984:F!=MR!-967:N!=MR!-
959:L!=MR!-934:C!=MR!-658:R!=MR!-106
3020 X2!=MR!-942:Y2!=MR!-941:NX!=MR!-111
:NY!=MR!-110
3030 C2$=CHR$(2):N0=0:N1=1:N2=2:N3=3:N4=
4:N5=5:N6=6:CR=13:CZ=26:DE=127:N1!=N1:CR
$=CHR$(12):CZ$=CHR$(25):CD$=CHR$(126):CF
$=CHR$(255):FE=254:FF=255:RETURN
5000 CLS:PRINT"Key is first letter of a
function name:":LINE(0,7)-(239,7):PRINT"
Axes Grid Line Quit Where?
Box Help Move Repeat XY-set
Circle Input Negative Snapshot l:black"
5001 PRINT"Draw Jump Output Text
0:white Fill Kill Point View
"CHR$(152)":cursor";:LINE(0,47)-(239,
47):PRINT"For help on a function, type i
ts key, or press enter to return to sk
etchpad.";
5003 GOSUB95:IFK=13THENGOSUB2500:K$="":R
ETURNELSEIFK>96THENK=K-32
5005 IFK=85ORK=69ORK>88THEN5003

```

```

5006 IFK=49THENK=69ELSEIFK=48THENK=85ELS
EIFK>27ANDK<32THENK=89
5007 K=K-64:IFK<1THEN5003
5008 CLS:ONKGO SUB5010,5020,5030,5040,505
0,5060,5070,5080,5090,5100,5110,5120,513
0,5140,5150,5160,5170,5180,5190,5200,521
0,5220,5230,5240,5250:GOTO5000
5010 PRINT:PRINT"(A) draws temporary X a
nd Y axes through the center of the scree
n. The scales are marked in 5 and 10 dot
increments."
5011 PRINT"It can be removed with (V)iew
."
5012 PRINT@280,"Press any key...";
5014 IFINKEY$=" "THEN5014ELSERETURN
5020 PRINT:PRINT"(B) draws a box with on
e corner where you put a point with (P
), and the":PRINT"opposite corner at the
cursor.":GOTO5012
5030 PRINT:PRINT"(C) draws a circle with
its center where you put a point with (P
), and its radius extending to the cursor
.":GOTO5012
5040 PRINT:PRINT"(D) puts you in draw mo
de. Wherever you move the cursor, you dr
aw a trail of"
5042 PRINT"dots. Exit from draw mode by
pressing any non-arrow key (usually M
for Move).":GOTO5012
5050 PRINT"(1) means you want everything
you sketch to be done in black dots. Thi
s remains in effect until you type a (0
) to change to white dots. When you first
run the"
5052 PRINT"program you can sketch with b
lack dots without first typing a (1).":
GOTO5012
5060 PRINT:PRINT"(F) fills the box or ci
rcle you just drew with dots of the s
ame color as the border.":GOTO5012
5070 PRINT:PRINT"(G) adds a temporary gr
id of 5 or 10 unit squares to the scr
een.":GOTO5011
5080 PRINT:PRINT"(H) shows the help menu
you just saw. The functions are used
by typing the first letter of their n
ame.":GOTO5012
5090 PRINT:PRINT"(I) allows you to input
a sketch that has been stored in RAM
or on tape.":GOTO5012
5100 PRINT:PRINT"(J) lets you set the nu
mber of dots the cursor jumps when you p
ress a shift and arrow key together. Shi
ft"CHR$(152)" and shift"CHR$(153)" ini
tially jump 5 dots, while shift"CHR$(155
)" and shift"CHR$(154)" initially jump 1
0 dots."

```

Listing 1 continued

C•NOTES

it and repeat it elsewhere on the screen. To do this, imagine you are drawing a box around the original pattern. Mark one corner of the imaginary box by placing the cursor at that spot and pressing P. Move the cursor to the opposite corner, and press S to take a snapshot of the image between the points. A temporary frame appears around the snapshot as confirmation of what you will reproduce.

Now, to repeat the snapshot pattern, move the cursor to the point on the screen where you want the upper-left corner

Listing 1 continued

```
5105 GOTO 5012
5110 PRINT:PRINT"(K) allows you to kill
the entire sketchand start over with an
empty screen. You must confirm that y
ou want to kill the old sketch.":GOTO50
12
5120 PRINT:PRINT"(L) draws a line from w
herever you put apoint with (P) to the c
ursor.":GOTO5012
5130 PRINT:PRINT"(M) lets you move the c
ursor without drawing anything. It is
used to exit from (D)raw mode.":GOTO
5012
5140 PRINT:PRINT"(N) makes a negative of
your sketch by changing all white dots
to black and allblack dots to white. Pr
essing (N) a second time will restor
e the sketch to its original condition.
":GOTO5012
5150 PRINT:PRINT"(O) allows you to outpu
t your sketch. You may save it in a RA
M or tape file, or print it on a printe
r that can handledot-addressable graphic
codes.":GOTO5012
5160 PRINT:PRINT"(P) sets a reference po
int at the cursorfor use with other func
tions.":GOTO5012
5170 PRINT"(Q)uit allows you to end the
program after asking for confirmation
. If you re-run the program, your sket
ch will still be there, unless you ra
n another program that destroyed the sk
etch memoryarea.":GOTO5012
5180 PRINT"(R) is used to repeat part of
the sketchthat you took a snapshot of w
ith (S). The snapshot will be repeated
at the"
5182 PRINT"cursor with the cursor being
the upper left corner of the repeated s
napshot. You may repeat the same snaps
hot any number of times.":GOTO5012
5190 PRINT"(S) takes a snapshot of a par
t of the sketch you want to repeat els
ewhere with(R). Put a point at one corne
r with (P),then move the cursor to the o
pposite"
5192 PRINT"corner and press (S). A tempo
rary frame appears around the snapshot t
hat will disappear when you repeat it
with (R).":GOTO5012
5200 PRINT"(T) puts you in text mode so
you can addtext characters to your sketc
h.":PRINT:PRINT"BKSP erases the previous
character.":PRINT:PRINT"ESC escapes fro
m text mode.":GOTO5012
```

Listing 1 continued

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of the imaginary box to appear and press R (Repeat command). The program inserts the snapshot in the selected position, and you can repeat this process as many times as you want.

Understand that the copy always appears with the present cursor position at its top-left corner. Depending on the cursor position, the copy may not all fit on the screen or it may overlap other images. Remember that you always repeat the original snapshot, and if by chance a Repeat command overlaps the original, all Repeat commands thereafter will reproduce the overlapped original. This may sometimes be desirable.

To help you create symmetry, the program includes two functions, Axes (A key) and Grid (G key), that act as temporary overlays. The Axes function draws an X and a Y axis through the center of the screen scaled in five and 10 dot units. The Grid function lets you set the grid size to five or 10

dot squares. It's useful when copying a design from another source to your sketchpad.

As you move across a grid or axis line, the cursor erases the line at that point. If after much moving about there is little left of the original overlay, you can restore it by pressing the A or G key again. To remove the grid or axes, use the V key (the View function) to see how your sketch appears in memory. This command also removes the temporary cross that the Where function places on the cursor.

As you gain experience with the sketchpad, you'll discover many ways to accomplish the same results. For example, there are several ways to erase part of a sketch. As mentioned earlier, you can redraw what you want to erase in the background color. A faster way to do bulk erasing is to draw a box and fill it with the background color. Even in the Text mode you can white out or black out an area of 6 by 8 dots with each press of the space bar.

Storing and Printing Sketches

Once a sketch is complete you can save it to a RAM file, a cassette file, or send it to a Radio Shack Line Printer VII for a printout by pressing the O key (Output function). The program prompts you through the process, and if you decide to go back to the sketchpad without saving the drawing, it gives you that option as well. If you choose to print your sketch, the program lets you set the left margin between zero and 39 spaces.

In order to use the print feature, your parallel dot-matrix printer must handle the 7-bit graphic codes used by the Line Printer VII. If you have another printer, make sure it understands the decimal codes listed in Table 2.

The Input command (press I) lets you load a sketch that you have saved as a .DO file in memory or on tape. It gives you three options: to input a sketch from RAM, input a sketch from cassette, or cancel the input request and return to sketching.

To input a file enter the file name without the .DO extension. Again the program prompts you through the process. A message displays while the program inputs or outputs a program, and when done the sketch reappears.

If you get an error message from Basic such as "?FF Error in 712," simply rerun the program and try a new file name. Your sketch will not be lost.

Installing the Programs

Since machine-language subroutines aren't relocatable, placing the Sketchpad subroutines in machines of differing memory capacity is complicated. The subroutines must be placed in the highest part of the available memory. Here we present the steps to create a workable version of Sketchpad on a 16K or 24K computer.

Listing 1 continued

```
5210 PRINT:PRINT"(0) means you want ever
ything you sketchto be done in white dot
s. This remains in effect until you typ
e a (1) to changeto black dots.":GOTO5012
2
5220 PRINT:PRINT"(V) lets you view the s
ketch as it looksin memory. It removes a
ll grid and axes lines as well as the te
mporary cross that (W) puts around the c
ursor.":GOTO5012
5230 PRINT:PRINT"(W) tells you where the
cursor is by displaying its X and Y
coordinates and also highlighting the c
ursor by placing a temporary cross over
it.":GOTO5012
5240 PRINT:PRINT"(X) lets you move the c
ursor to a specific location by se
tting its X and Ycoordinates.":GOTO5012
5250 PRINT("CHR$(152)") ("CHR$(153)") (
"CHR$(155)") ("CHR$(154)") move the curs
or one dot in the indicated direction. S
hift/arrowsmove it 5 dots "CHR$(152)CHR$
(153)" and 10 dots "CHR$(155)CHR$(154)".
These amounts can be changed with (J)um
p."
5252 PRINT"Ctrl/arrows move the cursor t
o the edgesof the screen.":GOTO5012
6000 PRINTTAB(14)"SKETCHPAD +"
6002 PRINT"designed by structured softwa
re services"
6004 PRINT"Create sketches by drawing li
nes and"
6006 PRINT"shapes with white or black do
ts. Imaginethrowing your eraser away: ju
st draw"
6008 PRINT"with dots of the opposite col
or! Press"
6010 PRINT"H for help or enter to start
sketching.,";
6012 GOSUB95:IFK=72ORK=104THENRETURN
6016 CLS:PRINT:PRINT"Press K to kill the
old sketch and start a new one."
:PRINT"or":PRINT:PRINT"Press any other k
ey to continue with the old sketc
h in memory.,";
6018 GOSUB95:IFK=75ORK=107THENRETURNELSE
GOSUB2500:K$="":RETURN
```

End

Code	Function
13	Initiates carriage return and line feed
18	Designates graphics mode
28,xx	Repeats next graphic pattern xx times
30	Designates character print mode
128 and up	Contain dot pattern that prints in low order seven bits of the byte

Table 2. Printer codes.

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15. ZBASIC 2.2 now has an INPUT @ command (similar to PRINT @).
16. The TAB function will now tab 255 columns on a printer. (BASIC cannot tab past column 64.)
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18. NEW and EASIER to use USR COMMANDS.
19. New math functions to calculate XOR and INTEGER REMAINDERS of a DIVISION.
20. Logical STRING COMPARISONS are now supported.
21. The disk commands INSTR, MID\$, ASSIGNMENT are now supported on both DISK AND TAPE ZBASIC.
22. DEFSTR is now supported.
23. Eight disk files may be opened simultaneously; random, sequential or mixed.
24. LINE INPUT#, is now supported.
25. Invoke the compiler by simply hitting these two keys: ":-"
26. NEW 60+ PAGE MANUAL WITH DESCRIPTIONS AND EXAMPLE.
27. ZBASIC 2.2 Comes with CMDFILE/CMD program from MISOSYS, to allow appending or merging compiled programs and machine language programs from tape or disk.

ZBASIC 2.2 DOES NOT SUPPORT THESE BASIC COMMANDS:

1. ATN, EXP, COS, SIN, LOG, TAN, and exponentiation. (However, subroutines are included in the manual for these functions.)
2. ERROR, ON ERROR GOTO, ERL, ERR RESUME.
3. No direct commands like AUTO, EDIT, LIST, LLIST ETC, although these commands may be used when writing programs.
4. Others NOT supported: CDBL, CINT, CSNG, DEFFN, FIX, FRE.
5. Normal CASSETTE I/O. (ZBASIC supports it's own SPECIAL CASSETTE I/O statements.)
6. SOME BASIC COMMANDS MAY DIFFER IN ZBASIC. For instance, END jumps to DOS READY, STOP jumps to BASIC READY etc.
7. MEMORY REQUIREMENTS: to approximate the largest BASIC program that can be compiled in your machine (at one time), enter BASIC and type: PRINT (MEM-6500)/2. Remember, you can merge compiled programs together to fill memory.

ZBASIC 2.2 SPEED COMPARISON DEMO

To help give you an idea how fast compiled programs are, we have included this demo program:

ZBASIC 2.2 DEMO PROGRAM

Time to compile and run complete program : 0 MIN. 2 SEC.
BASIC Execution speed MOD 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 sub-routine package.) Program shown exactly as compiled and run in BASIC and ZBASIC.

```

10 '===== ZBASIC 2.2 EXAMPLE PROGRAM AND TIME TEST=====
20 CLS: CLEAR 100: DEFINT A-X: DEFSTR Z: DIM AA(64, 24), Z(50): RANDOM
30 AA=100: BB=-1000: CC=3: DD=-3: EE=-9999: ST$="START TIME "+TIME$
40 FOR I=1 TO 127 STEP 2: FOR J=47 TO 1 STEP -3: XX=POINT(I, J): SET(I, J)
50 XX=(I-J)/CC*(7+I+J): XY=ABS(INT(RND(I*J)-AA)+7): RESET(I, J)
60 XX=PEEK(I+J): POKE I+5360+I+J, J: OUT 255, J AND (3*J): XX=INP(I)
70 AB$=STR$(I+J): BA$=LEFT$(AB$, 2): AA(I/2, J/2)=VAL(BA$)+AA*3
80 BA$=BA$+RIGHT$(BA$, RND(3)): XX=INSTR(1, BA$, "9"): XX=SQR(I+J)
90 BA$=MID$(BA$, 2, 2): MID$(BA$, 1, 1)=2: IF XX THEN 100 ELSE CLS
100 IF LEN(BA$) > 3 OR SGN(XX)=1 AND ASC(BA$)=32 THEN PRINT "+++";
110 IF POS(0) < 62 THEN TRON: TROFF: PRINT ELSE XX=NOT(RND(99))+100
120 A$=INKEY$: IF A$="Y" OR A$="y" AND I < 120 THEN PRINT "TRUE.."
130 RESTORE: READ A, C, Z(J), D: GOSUB 170: GOSUB 170: GOSUB 170: GOTO 210
140 NEXT: PRINT "*": NEXT I: CLS: PRINT @512, ST$, "STOP TIME "+TIME$
150 STOP' ===== END OF MAIN TEST LOOP =====
160 DATA 12345, -1, "TEST", -9999
170 ON RND(6) GOTO 180, 190, 200, 180, 190, 200
180 RETURN
190 RETURN
200 RETURN
210 ON RND(9) GOSUB 180, 190, 200, 180, 190, 200, 180, 190, 200
220 GOTO 140
    
```

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Program Listing 2. Hex.DO.

```

CD3142215F*A110000237E06080FD2FC*
1F5C5D5E5CD4C74E1D1C1F11C05C2ED*
17BFE40DAE9*1141E003EEFBAD8C3E9*11160*
A19B677C9018007215F*A23770B5778B17AC21E*
2C91160*A192FA677C9018007215F*
A237E2F770B78B1C237*
2C9000000000000000E54F3A42*2BCD25B*
22F3C8426FFC35E*2942601573A43*
295B72E01F26D*22EFF2F3C5F7ABBDACF*
2B7C27C*2E1CD21*3C9477B87E56F26002244*
27A2F3CC54F06FF092246*2092248*
2C1E1545DE1CD21*37C8267E52A46*27CB7FAC0*
2D5545D2A48*2192246*2D17BE1856F05C29A*
2CD21*3C9D5545D2A44*2192246*2D1E1C3B8*
243E56F2600292244*27B2F3CC54F06FF092246*
2092248*2C1E1545DE1CD21*37D836FE52A46*
27CB7FA12*3D5545D2A48*2192246*
2D17AE1846705C2EC*2CD21*3C9D5545D2A44*
2192246*2D1E1C30A*
3E5D5C57DE607477D1F1FE61F6F7C070707F5E
60757F1E6F8855F2160*A1978B73E01CA4C*
38705C247*34779B778C25A*
32FA677C1D1E1C9B6C355*3545D21A6*
34F19E52A42*
2545D0605E1D5C506087E0FF5C5D5E5DA81*
30DCA81*30E01626BCD21*379B7CA91*
3CD4C74C394*3CD4D74E1D1C1F11C05C273*
3C1D1142305C26E*
3C90000000000000000000007000700147F147
F14242A7F2A1223130864623A454A30280004020
100001C2241000041221C0022147F142208083E0
8080080600000080808080800606000004020100
8043E5149453E44427F404062515149462241494
9361814127F1047454529113CA4A949300301790
5033649494936064949291E0000240000080640
000081C3663411414141414163361C080201510
906324979413E7C1211127C417F4949361C22414
122417F41221C7F494949417F090909013E41494
93A7F0808087F00417F41003040413F017F08142
2417F404040407F020C027F7F0608307F3E41414
13E7F090909063E4151215E7F091929462649494
93201017F01013F4040403F0F3040300F7F20182
07F631408146307087808076151494543007F414
10004081020400041417F0004020102044040404
040000102040020545454787F284444383844444
428384444287F385454541808087E090A18A4A49
87C7F0404047800447D40004080847D00007F102
84400417F40007C047804787C080404783844444
438FC1824241818242418FC7C080404085854545
424043F4444203C40403C40IC2040201C3C40384
03C44281028441CA0A0907C4464544C440008364
1410000770000414136080002010204020000000
000545D3283*53A81*5472160*A3A42*2192284*
5573242*23A82*54F3A43*25F3A83*
5E5D5C5F5A6626BCADB*50E01CD21*
3CD4C74F1C1D1E1D0CABC*5071CD2A8*523C3A8*
505C82A84*51E0816003A42*23CC395*
50E00CD21*3CD4D74C3BA*5
    
```

End

First, save your current files and programs on tape, and delete them from the computer's memory until you have 17,000 bytes free for a 24K machine, or 12,000 bytes free for a 16K machine.

Then use the Model 100's Text program to create a text file named HEX.DO. Type Program Listing 2, Hex, into this file exactly as it appears. Type in all numbers, letters and asterisks continuously without pressing the space bar or the enter key. Don't be concerned when the Model 100 seems to insert spaces between groups of characters; if you don't press the space bar, there are no actual spaces in the file. After you check your work, press the Function 8 key—return to menu key.

Go into Basic and type in and run Program Listing 3, Loader. This program reads the contents of Hex, calculates the correct addresses for the amount of RAM in your machine, and loads the machine-language instructions into memory.

Listing 3 also checks your Hex file for accuracy. If it finds a non-hex character (other than the asterisks), it displays the incorrect character pair and tells you how many pairs into the file the error exists. If you omit or mistype a character(s), the program gives a checksum error and asks you to recheck your Hex file.

The asterisks in the Hex file represent the high order bits of addresses you must relocate for a particular memory size. Listing 3 adjusts these addresses and loads the instruction into memory locations based on the number returned by the MAXRAM function in your machine. The Checksum routine ensures that the total number of bytes (not counting the asterisks) and the number of bytes loaded are correct.

When everything checks out correctly, you have created SKSUBR.CO, the Sketchpad subroutines. At this point, make a back-up of SKSUBR.CO which contains the machine-language subroutines tailored for your machine. Making back-ups of Hex and Loader is a good idea if you ever add memory to your computer and need to move SKSUBR.CO to a higher location in memory.

SKSUBR.CO is protected by a return instruction at its entry point address, to prevent harm from accidentally running the program directly from the main machine menu. If you should ever hit the enter key while the cursor is on SKSUBR.CO, the screen goes blank for a second, and the main menu reappears.

Once SKSUBR is successfully intact, kill the Loader and Hex files. Type in Listing 1, Sketchpad, and save it as Sketch.BA.

For a 16K machine, you must omit the help feature as well as the title screen. When you run the 16K version, you see only a blank screen and a blinking cursor. Press V (the View function) to see the old sketch in memory, or press K (the Kill function) to start a new sketch. See Table 3 for program changes for a 16K version.

Any time you feel the urge to sketch, run Sketch.BA and it automatically loads SKSUBR.CO. The subroutines and sketch bit map remain in protected memory unless you run another program that again makes that area available to Basic, such as a Clear 100, MAXRAM statement. ■

1. Delete line 5000 through end of program.
2. Add: 5000 RETURN
3. Add: 6000 RETURN

Table 3. Changes for a 16K machine.

Contact John and Aileen Cornman c/o Structured Software Services, 9233 N.E. 269th St., Battle Ground, WA 98604.

Program Listing 3. Loader.BA.

```

1  '*** LOADER ***
10 CLEAR100,MAXRAM-2961
12 CLS:DEFINT A-Z:I=0:CS#=0
14 M1=MAXRAM-1040
16 IFM1>60000THENAD=15:GOTO20
17 IFM1>52000THENAD=13:GOTO20
18 IFM1>44000THENAD=11:GOTO20
19 AD=9
20 OPEN"HEX"FORINPUTAS1
30 PRINT:PRINT"LOADING 'HEX.DO' INTO
MEMORY..."
40 HX$=INPUT$(2,1)
50 D$=LEFT$(HX$,1)
55 IFD$="*"THEN300
60 GOSUB500
65 IFD=-1THEN200
70 DC=D*16
80 D$=RIGHT$(HX$,1)
90 GOSUB500
95 IFD=-1THEN200
100 DC=DC+D:CS#=CS#+DC
110 POKE(M1+I),DC:I=I+1
120 IFEOF(1)THEN130ELSE40
130 CLOSE:IFCS#=77855ANDI=1030THEN140
132 PRINT:PRINT"CHECKSUM ERROR. PLEASE
RECHECK CONTENTS"
134 PRINT"OF 'HEX.DO' FILE AND RERUN
LOADER WITH"
136 PRINT"CORRECTED FILE."
138 END
140 PRINT:PRINT"SUCCESSFUL LOAD.
'SKSUBR.CO' WILL BE"
142 PRINT"CREATED FOR USE WITH SKETCHPAD
+."
150 SAVEM"SKSUBR",M1,M1+1029,M1+155
160 END
200 CLOSE:PRINT:PRINT"NON-HEX CHARACTER
IN 'HEX.DO':"
210 PRINT:PRINT"PAIR #";I+1;"READS:
";HX$
220 PRINT:PRINT"PLEASE CORRECT AND RE-
RUN LOADER":END
300 D$=RIGHT$(HX$,1)
310 GOSUB500
320 IFD=-1THEN200
330 CS#=CS#+D
340 IFD=10THENDC=(AD-1)*16+DELSEDC=AD*16
+D
350 GOTO110
500 D=ASC(D$)
502 IFD>47ANDD<58THEND=D-48:RETURN
504 IFD>64ANDD<71THEND=D-55:RETURN
506 D=-1:RETURN

```

End

From Soup to Nuts

by Ben Firschein

You can create a professional-looking command menu for your Model 100 programs. Menu.BA displays all of your program's options and lets you select one by hitting a few arrow keys (see Program Listing 4).

Besides adding elegance to your programs, Menu demonstrates how to use reverse video, move a cursor around the screen with the PRINT@ command, and format data with the Print Using command.

When you run Menu, sample commands appear on the screen just as programs and files appear on the Model 100's menu. Use the arrow keys to move the reverse-video cursor up, down, left, and right. This menu wraps around like the Model 100's own menu: go past the last command, and the cursor returns to the first command; hit the left-arrow key at the first command, and the cursor goes to the last command.

If you hold down the arrow key for more than a few seconds, the cursor continues to move in that direction. If you press the up- or down-arrow key for more than a few seconds, the cursor stops when it comes to the top or bottom of the screen, and if you hold down the left- or right-arrow key for more than a few seconds, the cursor continues moving and wrapping around when it hits a side.

To make a selection, position the cursor over the command you want to invoke and hit the return key. The program tells you the item you picked, as well as its number. When you select exit, the program ends.

You don't have to test to ensure that you've entered a valid command since you can choose only those commands displayed in the menu.

help	exit	assets	profit	intrst
inven	sales	margin	portfol	file
print	retail	utility	billing	rent
amort	request	calc		

SELECT: USE ARROW KEYS AND ENTER KEY

Figure. Sample menu selection.

Program Description

Menu is a sample program that illustrates the idea behind the command menu. In using this menu subroutine within your programs, substitute your own options for the sample selections shown here (see the Figure).

Lines 100-995 make up the main program. Line 110 sets the maximum number of selections. I've chosen 20 as a maximum (see the Figure), but you can configure the screen to accommodate more.

Lines 350-400 call the subroutines that load the names of the selections, display, and let you choose among them. Line 500 prints your choice and its number, determined by its position in the data (lines 1008-1020). Your program could use an ON GOTO or ON GOSUB statement to branch to the part of the program dealing with a given command.

For example, if line 8000 gives help, line 8100 lets you exit, and line 8200 tells you your assets, you can add the following line:

505 ON CS GOSUB 8000, 8100, 8200

Lines 1000-1050 load the choices and store them in the array

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C•NOTES

Program Listing 4. Menu.BA.

```

10 ' Menu Program
20 ' Ben Firschein
50 '
100 '---MAIN PROGRAM---'
102 '
110 MSL=20:REM maximum number of
selections
200 CLS:PRINT
210 DIM SL$(MSL):REM stores names of
selections
350 GOSUB 1000:REM load names of
selections
360 GOSUB 2000:REM display selections
400 GOSUB 3000:REM make choice
500 CLS:PRINT:PRINT"you selected:
";SEL$;" (choice";CS;"")
510 FOR ZZ=1 TO 1000:NEXT
520 IF SEL$="exit"THEN CLS:END ELSE 360
990 '
995 END
998 '
1000 '---LOAD SELECTIONS---
1002 '
1008 DATA
help,exit,assets,profit,intrst,inven,sal
es,margin,portfol,file,print
1010 DATA
retail,utility,billing,rent,amort,reques
t,calc
1020 DATA *
1030 SL=0:REM no selections
1035 RESTORE
1040 READ SL$:IF SL$<>"*" AND SL<MSL
THEN SL=SL+1:SL$(SL)=SL$:GOTO 1040
1042 IF SL$<>"*" THEN BEEP:PRINT"too
many selections in data":END
1050 RETURN
1060 '
2000 '---DISPLAY SELECTIONS---
2002 '
2010 CLS
2012 PRINT @241," ";CHR$(27)
;"p";"SELECT:USE ARROW KEYS AND ENTER
KEY";CHR$(27);"q";
2013 ' print at screen position 241
instructions in reverse video
2014 ' chr$(27);"p" turns on rev
video. chr$(27);"q" turns off rev video
2015 PRINT @40,"";:REM place cursor at
print position 40
2017 FOR K=1 TO SL
2020 PRINT USING "\ \";SL$(K);
2021 ' print selection with 8 column
width.
2022 'there are six spaces between
2023 'the slashes. For a slash hit
2024 'GRPH -
2025 '
2035 NEXT K
2040 CS=1:REM current selection
2045 PS=0:REM used by selection
subroutine
2050 RETURN
2060 '
3000 REM -----SELECT AN ENTRY -----
3002 '
3010 GOSUB 4000:REM show first choice
3020 K$=INKEY$:IF LEN(K$)=0 THEN
3020:REM TEST FOR KEY

```

Listing 4 continued

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Listing 4 continued

```

3050 A=ASC(K$)
3055 IF A=13 THEN SEL$=SL$(CS)
:RETURN:REM user has selected SEL$
3056 ' 13 is ascii code for carriage
return
3057 '
3060 IF A<>28 THEN 3070
3065 CS=CS+1: IF CS <=SL THEN GOSUB 4000
ELSE CS=1:GOSUB 4000:REM right arrow
3070 IF A<>29 THEN 3080
3075 CS=CS-1:IF CS>=1 THEN GOSUB 4000
ELSE CS=SL:GOSUB 4000:REM left arrow
3080 IF A=31 AND CS+5 <=SL THEN CS=CS+
5:GOSUB 4000:REM down arrow
3090 IF A=30 AND CS-5 >0 THEN CS=CS-
5:GOSUB 4000:REM up arrow
3095 GOTO 3020:REM another key
3100 '
4000 REM ---DISPLAY CURRENT SELECTION---
4002 '
4005 IF PS <>0 THEN PRINT @PS,"";:PRINT
USING "\ \";S2$;
4010 ' print over reverse vidio. (5
spaces inside \\)
4020 PS=40+(CS-1)*8:REM print position
on screen
4022 PRINT @PS,CHR$(27);"p";:REM reverse
video on
4023 PRINT USING "\ \";SL$(CS);:REM
print selection (5 spaces in \\)
4024 PRINT CHR$(27);"q";:REM reverse
video off
4025 S2$=SL$(CS):REM store prev choice
4030 RETURN
    
```

End

SL\$. Substitute your own choices for those in my program.

Lines 2000–2050 display the selections. This section of the program features the commands PRINT@ and Print Using, and also demonstrates how to print in reverse video. PRINT@ 241 in line 2012 tells the computer to start printing at position 241, the first column of the seventh line. CHR\$(27);“p” creates reverse video. CHR\$(27);“q” reactivates normal video display.

Line 2015 starts printing at print position 40. The program prints the selections stored in the array SL\$. The PRINT USING “\ \”;SL\$(K); command prints the entry in a field of eight columns. It pads entries of fewer than eight letters with spaces, and truncates longer entries. Print Using makes a field of two plus the number of spaces between the inverted slashes (six in my program). You get the inverted slash character (\) by pressing the graphics (grph) and then the hyphen key.

Lines 3000–3095 select an entry. The program initially positions the cursor on the first entry. Line 3010 places the cursor on the menu. The program tests for a key using INKEY\$, and when it detects one, converts it to its ASCII code. ASCII code 13 is a carriage return; once you press a carriage return, you’ve made a selection. Lines 3060–3090 test for arrow keys. If you’ve pressed one, then the program must modify the pointer to the array SL\$, indicating what selection you’re pointing to. It then calls subroutine 4000 to change the cursor’s screen location.

Lines 4000–4030 remove the old cursor, compute the position of the new one, and display it. The program again uses a PRINT@ command on line 4005 to move the cursor to its old

location. The PRINT USING “\ \”;S2\$ command removes the reverse-video cursor and replaces the normal one.

I use a field of seven, rather than eight, columns for the cursor so that it doesn’t touch the entry to its right—a choice I made for aesthetic reasons. (A seven-column field requires five spaces inside the dashes.) Line 4020 computes the print position on the screen. Since the program displays five entries per line, each in a field eight characters wide, each line uses 40 characters, the width of the Model 100’s screen.

Line 4022 moves the cursor to the new position and turns on the reverse video. Line 4023 prints the entry pointed to in reverse video in a seven-character field; this is the cursor. Line 4024 turns off the reverse video.

Menu never looks at the screen; by maintaining a pointer, CS, to the current entry, the program always knows over which entry the cursor is positioned. When you hit the return key, the program returns SEL\$, the last command indicated. ■

You can reach Ben Firschein at 29 Stowe Lane, Menlo Park, CA 94025.

Tidbit #5

Here’s a way to hide program lines so they don’t appear on screen when someone lists the program. This is handy for teachers who don’t want to disable the break key but also don’t want students listing a program to find the answers.

End each line that you want to make disappear with a REM statement and insert one or two characters. Using the Edit mode, change those characters to a shift/up-arrow. This makes the next program line list on top of the one protected with the up arrow.

For an example, type in my sample program and run it. Then, type EDIT 30 <enter> SQ C <shift><up arrow> C <shift><up arrow> <enter>. Make sure you press the shift and up-arrow keys at the same time.

Run the program again. List it, and notice that lines 20 and 30 do not appear.

To reinsert the lines to the listing, enter the Edit mode and delete the REM statements.

David Dickey
Millinocket, ME

```

10 CLS
20 FOR X=1TO5:READ A$:PRINT A$:NEXT X
30 DATA THIS, LINE, WILL, DISAPPEAR, SOON: END
40 'THIS WORKS FOR ANYTHING YOU WANT AND FOR MORE
PROGRAM LINES
    
```

It's a Chimer

My BIGBEN program in Program Listing 1 makes the Model 100 sound Westminster chimes every quarter hour and count the time on the hour. I hope you enjoy running it.

James M. Stubchaer
869 North Kellogg Ave.
Santa Barbara, CA 93111

A Better Solution

John Hicks' letter, "Peripheral Problems" (RAM Files, February 1984, p. 197), gives an unnecessarily complex remedy to stop the STR\$ instruction from inserting a space character to the right of the numerals.

It is simpler to use the MID\$ instruction with the position set at 2 and the length omitted as follows:

```
MID$(STR$(BAL),2)
```

Program Listing 2 is a test program that demonstrates this remedy. This idiosyncrasy also occurs on my Color Computer.

Palmer O. Hanson Jr.
Box 1421
Largo, FL 34294-1421

Mysterious Disappearance

I redefined function key 7 as "Kill" to delete files, but the function key definition disappears every time I use my parallel printer.

Is there anything I can do to protect the function key definitions when running my printer?

J. Hoke Peacock II
Box 1751
Beaumont, TX 77004

You've got us; can anyone else help?—Eds.

Program Listing 2. Test program using the MID\$ instruction.

```
10 BAL=133
20 B$="$"+STR$(BAL)+".00"
25 LPRINT
30 LPRINTB$
40 B$="$"+RIGHT$(STR$(BAL),LEN(STR$(BAL))
)-1+".00"
45 LPRINT
50 LPRINTB$
60 B$="$"+MID$(STR$(BAL),2)+".00"
65 LPRINT
70 LPRINTB$
80 END
```

End

Program Listing 1. Westminster chimes program.

```
10 PRINT"pgm 'BIGBEN', time & chimes"
20 REM for TRS-80 Model 100
30 REM by James M. Stubchaer
40 REM 869 N. Kellogg Ave.
50 REM Santa Barbara, Ca. 93111
60 REM
70 READ B,A,G,D,C
80 DATA 2484,2793,3134,4184,4697
90 S=15: L=25
100 IF MID$(TIME$,4,2)="15" THEN GOSUB
190 ELSE 120
110 GOSUB 290
120 IF MID$(TIME$,4,2)="30" THEN GOSUB
190: ELSE 140
130 GOSUB 290
140 IF MID$(TIME$,4,2)="45" THEN GOSUB
190: GOSUB 210: GOSUB 230 ELSE 160
150 GOSUB 290
160 IF MID$(TIME$,4,2)="00" THEN GOSUB
190: GOSUB 210: GOSUB 230: GOSUB 250
ELSE 180
170 GOSUB 290
180 GOTO 100
```

```
190 SOUND B,S: GOSUB 300: SOUND A,S:
GOSUB 300
200 SOUND G,S: GOSUB 300: SOUND D,L:
GOSUB 300: RETURN
210 SOUND D,S: GOSUB 300: SOUND A,S:
GOSUB 300
220 SOUND B,S: GOSUB 300: SOUND G,L:
GOSUB 300: RETURN
230 SOUND B,S: GOSUB 300: SOUND G,S:
GOSUB 300
240 SOUND A,S: GOSUB 300: SOUND D,L:
GOSUB 300: RETURN
250 SOUND D,S: GOSUB 300: SOUND A,S:
GOSUB 300
260 SOUND B,S: GOSUB 300: SOUND G,L:
GOSUB 300
270 N=VAL(LEFT$(TIME$,2)): IF N>12 THEN
N=N-12
280 FOR J=1 TO N: SOUND C,L: FOR K=1 TO
300: NEXT: NEXT
290 FOR J=1 TO 35000: NEXT: RETURN
300 FOR J=1 TO 225: NEXT: RETURN
```

End

RAM FILES

Autoliner Appended

Since I don't always finish typing in a listing at one sitting, I made some changes to Richard Ramella's "Autoliner" (January 1984, p. 178). Program Listing 3 lets you continue where you left off on a listing or change the number sequence in the middle of a listing.

Jacqueline Davis
Box J
Loveland, NV 89419

Program Listing 3. Changes for Richard Ramella's "Autoliner."

```

140 DEFINTB,D,F,W:DEFSTR A,L,Z,M
211 INPUT"New Program or <E>xisting
Program";M
212 IF M="E" GOTO 610
213 IF M="e" GOTO 610
365 IFA="#"THEN INPUT"NEW Line
Sequence";B:GOTO 330
610 OPEN ZFOR INPUT AS 1
612 N=0
620 IF EOF(1) THEN 650
630 N=N+1:LINEINPUT #1,A
640 PRINTA:GOTO 620
650 CLOSE 1:A=""
660 OPEN ZFOR APPEND AS 1
670 GOSUB 580:GOTO 240
710 END
    
```

End

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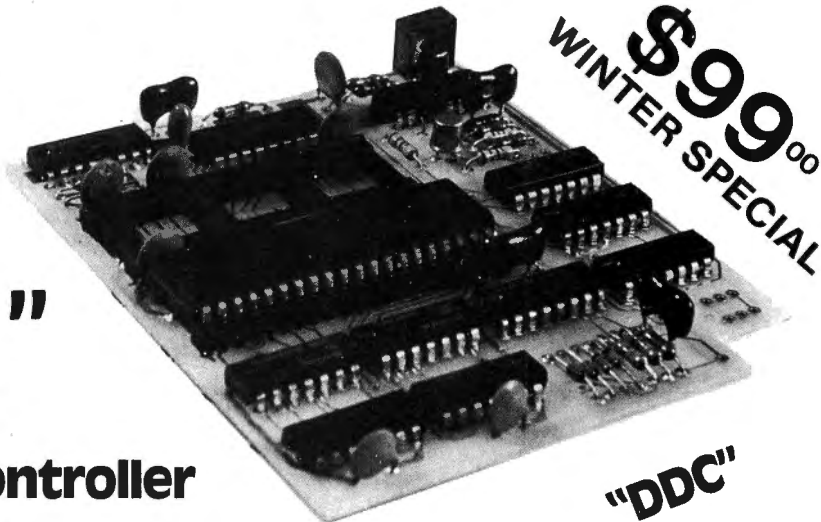
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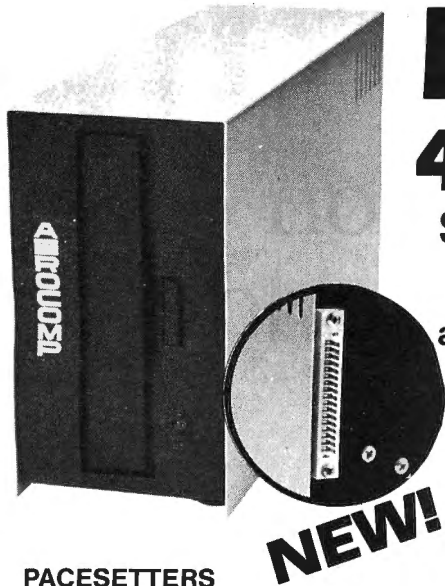
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Microcomputers can remotely control external devices or instruments with digital signals. But ours is an analog world, and you often have to access analog equipment. Since analog and digital signals are incompatible, you need a way to translate analog data to digital format and vice versa. You can do this with an analog-to-digital (A/D) converter. This month, I'll describe how to build an economical data-acquisition system (DAS) featuring an eight-channel A/D converter for the Models I, III, and 4, with any memory size.

This A/D converter uses one of the more common methods of converting an analog input voltage to a digital output value: successive approximation. (Other types include the integration, the parallel, and the binary ramp A/D converters.)

The successive approximation A/D converter uses a trial-and-error method to determine the binary value for an input voltage. To guess several possible voltages, it uses an internal digital-to-analog (D/A) converter, as well as a voltage comparator to determine if the guess was low, high, or accurate. The tested voltages are weighted in successive powers of two, allowing for a binary value output. The voltage guess begins with the highest, and continues through to the lowest, voltage.

For example, if the first voltage guess, as well as each guess thereafter, is higher than the unknown input voltage, the converter places a zero in the result register. Conversely, if the guessed voltage is lower than the input voltage, the converter puts a 1 bit in the result register. When the computer has tested all N voltages (for an N-bit A/D converter), an external processor is ready to read the N-bit result. The

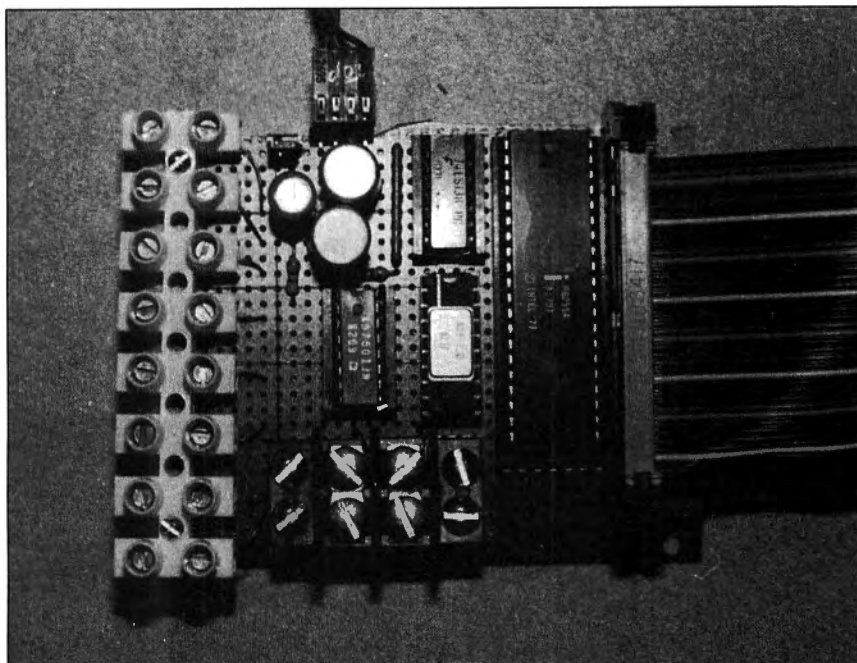


Photo. Completed project: the data-acquisition system board.

more bits used, the more accurate the A/D converter.

Channels and Multiplexing

A typical data acquisition system specifies eight or 16 A/D converter channels, amounts referring not to the number of A/D converters in the system, but to the number of points the A/D converters in the system can look at. Because the DAS in this month's project has one A/D converter and specifies eight channels, its A/D converter can look selectively at any of eight different analog (voltage) inputs.

An analog multiplexer (MUX) provides this ability to look at more than one analog point. It usually has binary digital inputs to specify which one of

its analog inputs goes to the A/D converter. It will then have its one analog output going to the A/D converter.

In my DAS I use Analog Devices' AD570 8-bit A/D converter or AD571 10-bit A/D converter (see Fig. 1). These two are pin-compatible; in fact, the AD570 is merely a selected version of the AD571 that can't meet the full 10-bit accuracy.

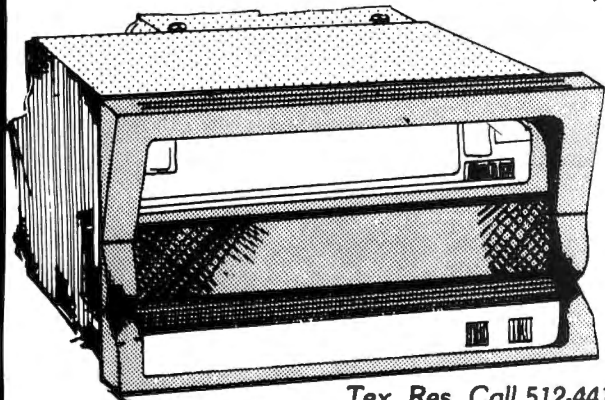
A blank and convert line (B&C/) (see pin 11 in Fig. 1) controls the AD570/1. When this pin is high, the computer clears the outputs and prepares the A/D converter. When the line is dropped low, the conversion begins, typically taking 25 microseconds, although it could take as long as 40 microseconds. When the conversion is complete, the AD570/1 brings the

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data ready (DR/) line (pin 17) low, indicating to the computer that conversion is over and it can read the output data lines.

Data remains on the output pins as long as the B&C line remains low. To begin a new conversion, the B&C line must go high for at least 2 microseconds before going low again. Don't be concerned, though: the Models I, III, and 4 Z80s can't exceed this speed.

A bipolar offset control line (pin 15) in the AD570/1 lets you choose one of two possible voltage input ranges. If the line is left open, the A/D converter accepts input voltages between -5V and +5V (bipolar operation). If you've jumped the line to ground, the A/D converter will accept input voltages between zero and +10V (unipolar operation). My board provides a jumper letting you select the most appropriate operating mode.

To provide eight input channels, you need an eight-channel analog MUX. I chose the CMOS AD7501 from Analog Devices (see Fig. 2); it has TTL (transistor-transistor logic)

level digital inputs for easy interface to digital systems. Three address inputs A0-A2 select which input to route to the output, and thus to the A/D converter. The MUX acts like a set of eight physical switches, routing one of eight inputs to a common output.

Constructing the Board

I use the 8255A programmable peripheral interface (PPI) to select the MUX channel, control the A/D converter, read its status and its digital output (see Table 1 for a parts list). A programmable interface like the 8255A simplifies the board's design, eliminating latches and further port decoding that would otherwise be necessary (see the schematic in Fig. 3).

As in previous projects, Model III/4 users need an extra gate (74LS32) to provide the internal I/O buffer direction change. The 74LS138 selects the port address range of the 8255A. I've chosen an address you can use simultaneously in my other projects by either combining functions on one board or using a multiple bus ex-

tension cable, available from some suppliers. The jumpers to the 74LS138 select the address range of the 8255A. (See Table 2 for possible address ranges.) I assume the address range 10-13 hexadecimal (hex) here and in my program (see the Program Listing).

When you build the DAS board, handle the integrated circuits (ICs), especially the AD7501 MUX, carefully. Because the multiplexer uses CMOS technology, it's susceptible to static destruction. It's best to be grounded when handling these ICs.

The jumper on line 15 of the A/D converter, as mentioned earlier, selects unipolar or bipolar operation. If you want the option of changing the operating mode of the A/D converter at different times, put a removable jumper on the board, as I did. If you intend to use the A/D converter in one particular operating mode, you can either ground the pin or leave it open, as necessary.

Using terminal blocks seemed to be the most convenient way to get external real-world analog signals to the MUX, and thus to the A/D converter. I used two Radio Shack terminal blocks as my external connection interface (see the Photo). An eight-position terminal block allows access to the eight respective MUX inputs. A two-position terminal block gives external instruments or devices a place to connect to common ground, if necessary.

While the parts list (see Table 1) specifies the MUX part AD7501KN, you can use the similar part AD7501-JN, as I did. The only difference between these two devices is their acceptable input high voltage threshold (VIH). The former specifies a minimum VIH of 2.4V—standard TTL,

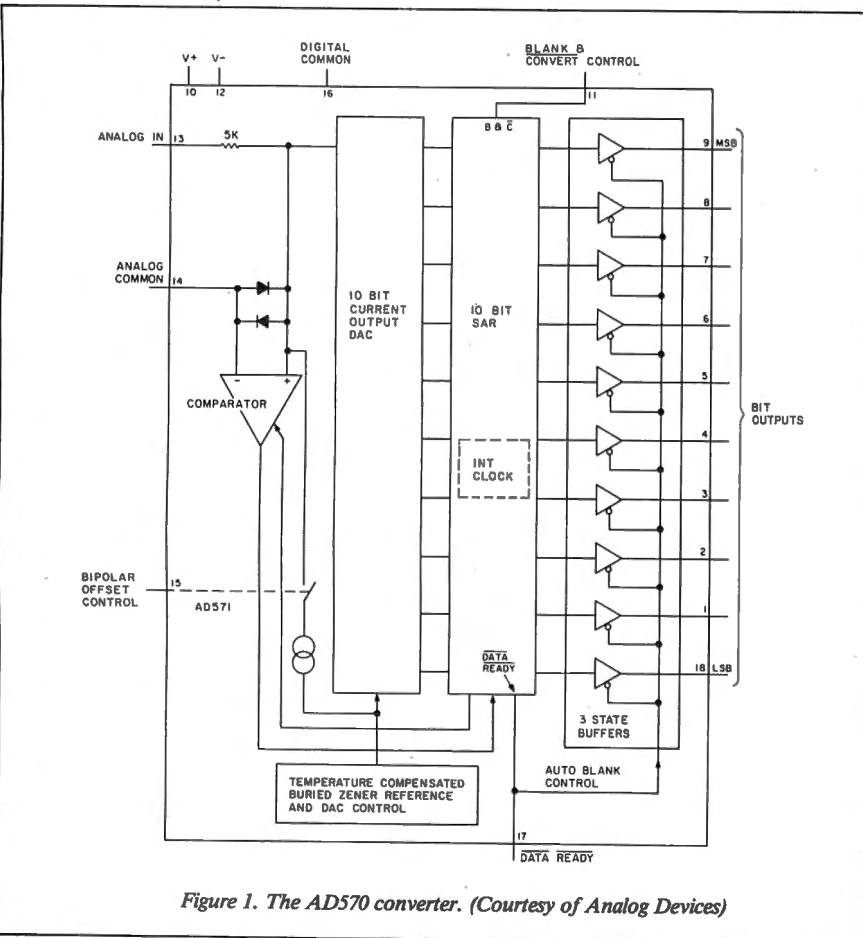


Figure 1. The AD570 converter. (Courtesy of Analog Devices)

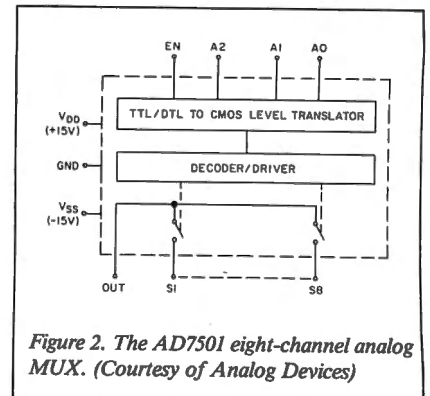


Figure 2. The AD7501 eight-channel analog MUX. (Courtesy of Analog Devices)

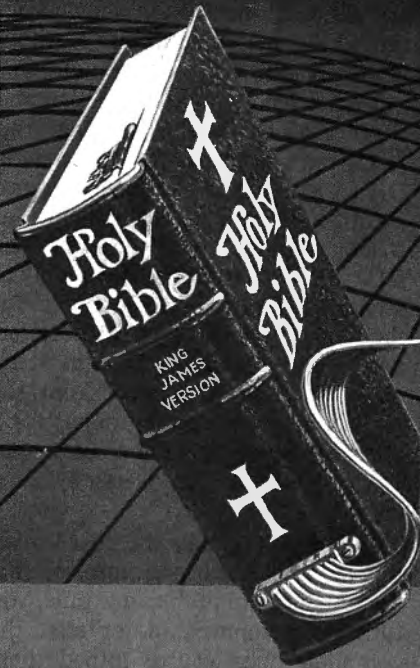
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making it the better choice for this design; the latter specifies 3.0V—standard CMOS (though you can use it in this design). If you use the AD7501-JN, simply change the three pull-up resistors on lines 1, 4, and 16 from 4.7k to 1k.

The board requires three power supplies: +5V (at 150 milliamperes [mA]), +12V (at 15 mA), and -12V (at 1 mA).

Signal-Grounding

When connecting the board to other devices, remember that its design requires that all analog input voltages share a common ground. Instruments can share a common ground, for example, through your building wiring (when three-prong ac plugs are used); if this is so, don't connect another point in the instrument (except the instrument's ground) to the ground block on the DAS board.

If the board and the external device

don't share a ground, use any point as a ground, so long as the analog voltage to be measured remains within $\pm 12V$ of the chosen ground.

With a slightly modified design and another MUX, you can change this DAS to a four-channel differential DAS, letting the analog reference point be different for each channel, as well as from the board's ground. The AD7502 MUX switches two inputs at a time, one for the reference, one for the analog voltage. Switch the reference signal to the A/D converter's analog ground (separated from the A/D converter's digital ground) for a reference point, and the analog input voltage to the A/D converter's analog input.

Before you operate the board, reset the 8255A's hardware: turn on the board before, or at the same time, you turn the computer on, or reset the computer once you've turned them both on. Because of bus-loading prob-

lems, the former choice is preferable.

When you've reset the computer, all 24 8255A input/output (I/O) lines become inputs. To specify them as inputs and outputs to meet this system's needs, send a configuration command word to the 8255A (port 19 decimal, 13 hex). For this application, the command word 152 (98 hex) configures port B and the lower half of port C as outputs, and all other lines as inputs.

The B&C line, which, as already explained, controls the operation of the A/D converter, must initially be high before a conversion can take place. The B&C line is connected to bit zero of the 8255A's port C; since all output lines on the 8255A go low when its control word is received, send a 1 to the 8255A port C (port 18) immediately after the control word.

After the 8255A has been set up, and the B&C line is high, select the appropriate analog input channel (1-8) by writing a value to port B (port 17). This value is one less than the desired channel number; to select channel 3, for example, write a 2 to port B.

Once you've chosen a channel, you're ready to make a conversion. Write a zero to port C, bringing the B&C line low. At this point, the DR line goes high, indicating that a conversion is in progress, and that data is

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Table 1. Parts list and ordering information.

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A5/	A6/	50-53 hex
A5/	A6	10-13 hex
A5	A6/	70-73 hex
A5	A6	30-33 hex

Table 2. Address range for the 8255A programmable peripheral interface.

```

10 OUT 19,152
20 OUT 18,1
30 OUT 17,0
35 CLS
40 FOR I=1 TO 8
42 OUT 17,I-1
44 GOSUB 50
46 PRINT@(I-1)*64,A
48 NEXT I:GOTO 40
50 OUT 18,0
60 A=INP(18) AND 16
70 IF A > 0 THEN 60
80 A=INP(16)
100 OUT 18,1
110 RETURN
    
```

Program Listing. Sample program.

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PROJECT 80

not ready to be read. When the conversion is over, the DR line goes low, telling the computer that it can now read the data. The B&C line must remain low until the data has been read, at which point you should raise the B&C line again by writing a 1 to port C.

If you're using an Assembly-language program to access the DAS board, the program should monitor the DR/ line by reading in port C (12 hex) bit 4. When this bit goes low, the data can be read. If you're running a Basic program, you probably don't need to look at the status bit because of the AD570/1's fast conversion speed. (Since a Basic statement can't execute in fewer than 40 microseconds, the DR/ status bit would be unnecessary.)

Once the conversion is complete and the B&C line is still low, the computer can read the digital result. If you're reading an 8-bit result (for the AD570 or the AD571), only port A

(port 16) needs to be read. If you want the full 10 bits of accuracy (for the AD571 only), you must also read in port C; the upper 2 bits of port C contain the 2 low-order conversion bits. In Assembly-language programming you can shift the 10-bit result using bit-shift instructions.

After the data has been read and the B&C/ line returned high, you can select a new channel and repeat the process.

Analog Signals

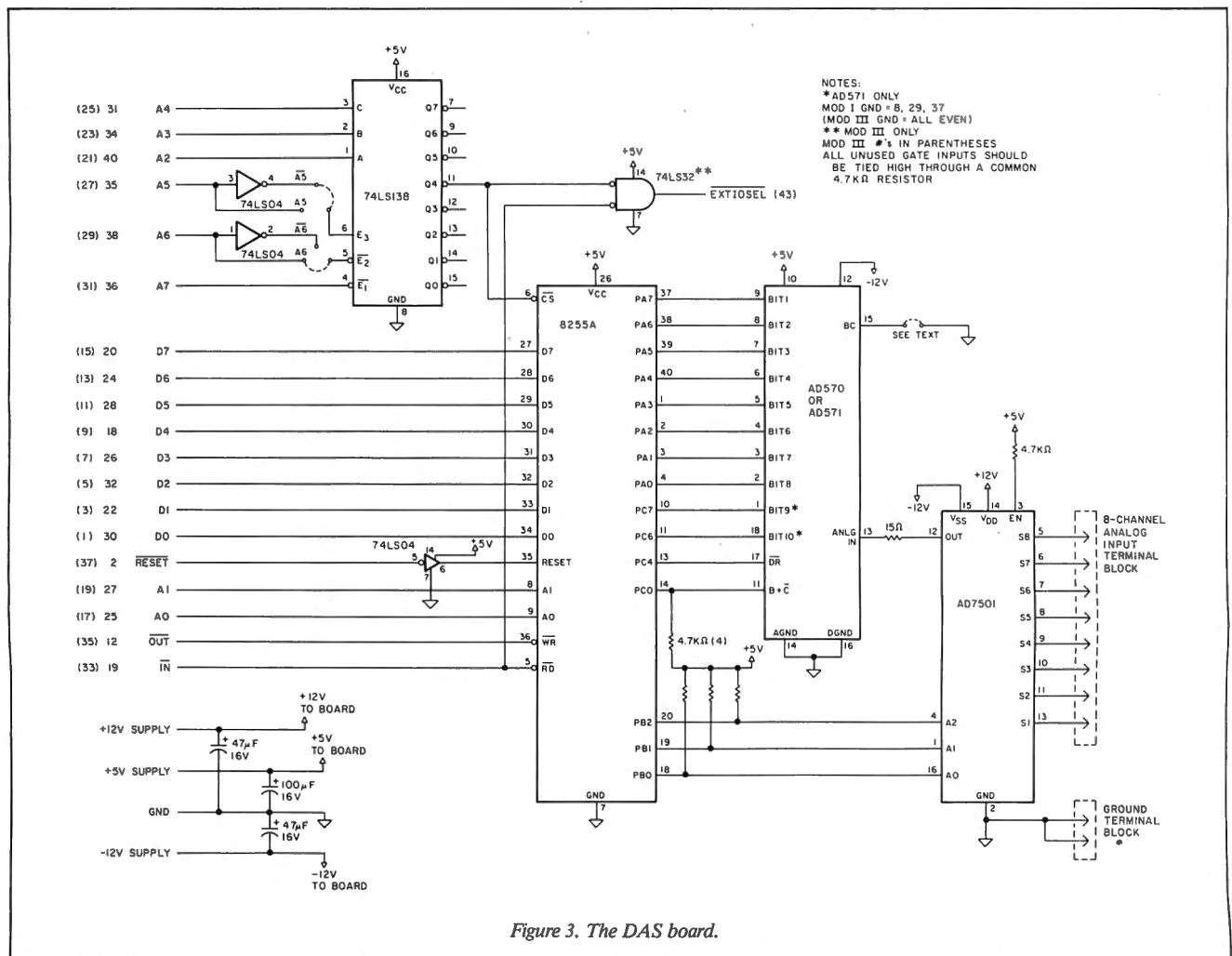
The sample-and-hold block, common to many data acquisition systems, is missing from this one, which transfers the analog input voltage to the A/D converter. If the input voltage changes during conversion, you'll probably get improper digital results. A sample-and-hold block would overcome this problem by sampling the input voltage at a specific moment and holding that voltage (usually with minimal leakage or "skew") until the

conversion is complete.

My sample Basic program (see the Listing) continually performs a conversion on each of the eight input channels and displays the decimal results in individual columns on the display. As the input voltages change, the corresponding values on the display change proportionately. Even though the program is running in Basic, it checks the DR status bit, ensuring it is zero before reading the digital data. ■

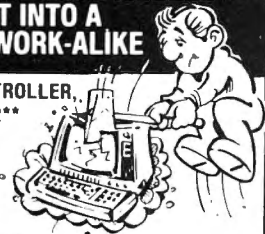
Model III/4 users, please note: For this and for the February-April projects in this column, you must send a 10 hex (16 decimal) to port address 0ECH to enable the I/O bus; otherwise, it will not respond.

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Move Over Basic, Here Comes Pascal

There are four reasons why the Pascal language will undoubtedly become popular with TRS-80 programmers. First, Radio Shack's release of enhanced Alcor Pascal makes it possible to program real, utilitarian applications with the language.

Second, despite some limitations, Pascal has real advantages over Basic.

Third, many colleges and universities now teach Pascal rather than Basic—leaving many people likely to program in Pascal after leaving college.

Fourth, since advanced placement tests now use Pascal exclusively, high schools are teaching the language.

Given the increasing popularity of Pascal and its increasing use in real-world applications, I will write a monthly column describing the techniques involved in programming with the Pascal language.

A Structured Language Of Modules

Basic is an unstructured language, so Basic programs can be difficult to read and debug. You *can* write structured and clean programs with Basic, but Basic doesn't force you to write that way.

Pascal, on the other hand, is a structured language—it forces the programmer to write code in a certain, standardized manner. For instance, a good Pascal programmer doesn't use GOTO statements. Rather than using jumps throughout a program, you write the program in modules (procedures or functions). The main program calls these modules to perform specific tasks, and these modules, in turn, call other modules. Program logic, therefore, is clear, definitive, and easy to follow.

This requisite structure makes even complicated programs easy to debug since you can write and test them one module at a time. For instance, when I began my job as a systems and appli-



cations programmer, I started on the tail end of a project written in about 15,000 lines of Pascal. Writing and debugging a program of that size in Basic would have been almost impossible, but with Pascal it was relatively painless.

One of the major advantages of Pascal is that each module can have its own variables, known as local variables. These local variables aren't the same as the variables used by other modules, even if they have the same name. The advantage, of course, is that changing the value of a local variable in a program module doesn't alter the value of variables with the same name elsewhere in the program.

Consider the Basic program in Program Listing 1. This program runs in an infinite loop because the subroutine at line 100 decrements the looping variable I. Since the subroutine alters the variable used by line 10, the terminating condition for the For loop (I=10) is never met. In a large program, this type of variable side effect is difficult to trace. Pascal lets you

protect the global variables from such problems.

Another advantage to Pascal's structure is that you can easily create a library of often-used modules for use in future programs. Naming variables in these modules isn't a problem since Pascal passes values among modules regardless of the names of other local variables.

Pascal Data Types

Unlike Basic, Pascal lets you create and destroy variables during program execution through use of an advanced data type, the pointer. Pointers are a good means of memory management during program execution, and they let you use simple coding of various types of data structures such as stacks, queues, linked lists, and trees (I'll cover these in future months).

One of the best things about Pascal is its powerful data structures. Programming in Basic limits you to certain data types—integers, single- and double-precision reals, strings, and arrays of these elementary data types.

PASCALCULATIONS

Pascal lets you define your own elementary data types and use predefined data types—Boolean (true/false), integer, real, string (an enhancement in Alcor Pascal) and arrays of same.

Further, Pascal lets you define your own structured (complex) data types with the record statement. Pascal records are a generalization of the array concept. Whereas arrays are collections of data of the same type (integers, for example), records are collections of data without restriction to type (integers, strings, and reals). Records are useful in many applications.

A Basic program to manage customer records with names, addresses, totals, and inventory item numbers requires several arrays for the data types used—strings for names and addresses, reals for totals, and integers for item numbers. With Pascal you can easily declare all of these types:

```
CustomerRecord = Record
  Name       : String;
  Address    : String;
  Total      : Real;
  ItemNumber : Integer;
END;
Customers = ARRAY (1..100) OF
CustomerRecord;
```

The variable CustomerRecord has fields of Name, Address, and so on. The Customers variable is an array of

```
10 FOR I=1 TO 10
20 GOSUB 100
30 NEXT I
40 END
100 REM subroutine follows...
110 I=I-1
120 PRINT I;
130 RETURN
```

Program Listing 1. Basic sample.

100 customer records. In Pascal, you can easily manipulate these variables and arrays, simplifying programming.

In the months to come, I'll introduce you to the elementary as well as the advanced features of Pascal—from outputting results with the write statements to pointers and record types. So don't worry if this is a bit much to swallow all at once. For now, work at understanding that Pascal has many useful features, and as the column progresses you'll begin to feel at home with most of them.

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Getting Started: Your First Lesson

The Alcor Pascal package includes a full-screen text editor in which you can create programs. You can use any standard word processor that produces straight ASCII codes. (Newscript, for example, doesn't put in hidden codes, whereas Scripsit does.) I use Newscript, but you should use whatever tools you prefer. The Alcor manual describes the use of its text editor in detail, so I won't discuss the details here.

Pascal programs have two sections:

```
PROGRAM sample1;
VAR
  a,b : REAL;
  i    : INTEGER;
  name : STRING;
BEGIN
  (*program body here*)
END
```

Program Listing 2. Pascal sample 1.

a declaration section and a code section, or body. The declaration section physically precedes the code section in a program and describes the program's variables and constants. You must list all variables in a program in the declaration section and declare each as a given type. Examine the simple Pascal program in Program Listing 2.

All Pascal programs must start with the key word, Program, followed by the name of the program. (The Pascal compiler is case-blind; it interprets "NAME" the same as "name.") Use the key word, VAR, to start the variable declaration section of the program, and end it with the key word Begin. The actual body of the program falls between the Begin and End key words.

The VAR section lists all variables and defines variable types. Listing 2 defines a and b as real variables (single-precision variables identical to Basic's single-precision real). The program declares i as an integer type (also the same as Basic's integer variable).

Name is declared as a string variable (similar to Basic's string). You can declare more than one variable in the same statement as long as you separate them by commas. Use the colon to separate the variable from its type.

You'll notice an abundance of semicolons in Pascal programs, since most statements must end with a semicolon. There are a few situations when you don't end a statement with a semicolon, but for now use them at the end of every statement.

You can make comments anywhere in a Pascal program except in the middle of a number, variable name, or Pascal key word. Delimit comments using braces ({ }) or parentheses and asterisks (see comment in Listing 2).

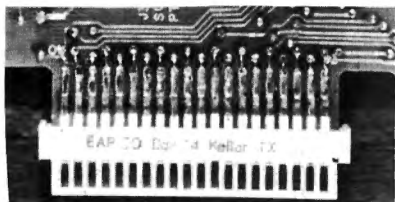
The Pascal compiler/interpreter ignores all comment lines. As in Basic, you use them only to clarify the meaning of program statements for later reference. You can place a comment on its own line, or on a line preceding, following, or in the middle of a Pascal statement in either the VAR section or the program body. I recommend that

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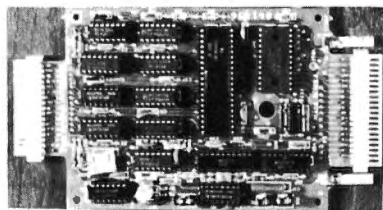


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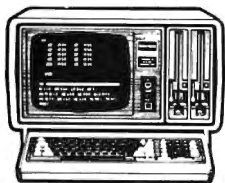
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you explain each variable immediately following its declaration.

Using the Write and WRITELN Statements

Listing 1 has no program body—there are no executable statements between the Begin and End key words. Let me introduce some Pascal statements so you can begin to execute an actual program. Let's start with the write and WRITELN statements. These function much like the print statement in Basic. Consider Program Listing 3.

The write statement, like the Basic print statement followed by a semico-

lon, triggers no carriage return after displaying the data; the WRITELN statement does. Therefore, the output of Listing 3 looks like:

This is how the write statement works.
This is on the second line.

The first write statement displays the data, and the second WRITELN statement continues its output on the same line, then executes a line feed (carriage return). The third statement, WRITELN outputs its data and makes a carriage return/line feed. Notice that you delimit data strings with single quotation marks rather than double quotation marks as in Basic.

Use commas to separate more than one item in a write or WRITELN statement. For example:

```
WRITELN('This has ', 'two string constants.');
```

```
WRITELN('The answer is ', 134);
```

produces

This has two string constants.
The answer is 134

Using the write and WRITELN statements, you can output Boolean, integer, real, string, and array-of-character data types. I'll cover Boolean (true/false) and character data types in a future column.

You can truncate the output of a write or WRITELN string using a colon. WRITELN('123456789abcdefghi jklm':11); produces 123456789ab. The colon and number following tells Pascal to output 11 characters. It truncates extra data, and pads the output with blanks if there is less data than the specified number.

```
WRITE('This is':20); WRITELN('a string constant.');
```

gives you

This is a string constant.

This approach of controlling the width of the output works for numbers as well as strings. An integer, such as 1234, normally fills an output field of eight spaces. Any integer uses eight spaces with the write or WRITELN

PROGRAM Sample2;

BEGIN

```
WRITE('This is how the ');
```

```
WRITELN('Write statement works.');
```

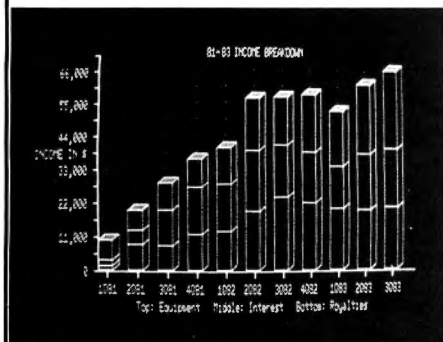
```
WRITELN('This is on the second line.');
```

END

Program Listing 3. Pascal sample 2.

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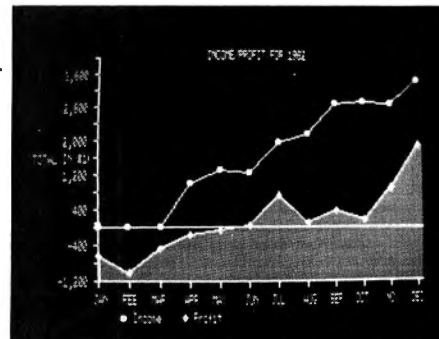
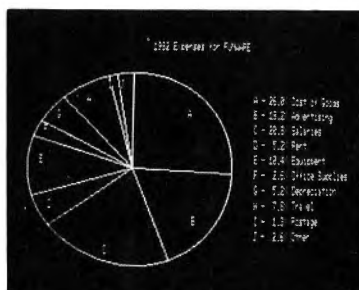


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PASCALCULATIONS

statements unless you indicate otherwise. If the integer only fills four spaces, then the remaining four appear as spaces. Notice that the extra spaces are to the left of the number (in contrast to strings which pad to the right of the output data).

If the number of spaces you specify can't hold all the digits of the integer, Pascal uses as many as it needs (this is again in contrast to spacing with string variables). You can use this to your advantage to get neat results such as using `WRITELN('The total is ',TOTAL,' dollars.')`; to get:

The total is 13 dollars.

But if you specify the output field to use one space, and since any integer output has at least one digit, you always get a perfectly spaced output. So, `WRITELN('The total is ',TOTAL:1,' dollars.')`; produces:

The total is 13 dollars.

Remember that although the total, 13, uses more than one space, Pascal automatically allows as many spaces over the specified amount as needed. Keep this method in mind when we cover Pascal variables in more detail. It works for dynamic strings, arrays of characters, and string constants.

Fixed-length field specifiers are

```
PROGRAM TEST;
BEGIN
  WRITE(1); WRITE(2); WRITELN(3);
  WRITE(4); WRITE(5); WRITELN(6);
  WRITE(7); WRITE(8); WRITELN(9);
  WRITE(10); WRITE(11); WRITELN(12);
END.
  1  2  3
  4  5  6
  7  8  9
 10 11 12
```

Figure. Pascal routine (top) that prints table of values, and the output (bottom).

handy for printing tables. The default length of eight spaces leaves at least two spaces between the numbers printed, since an integer type can only have a maximum of five digits (the range is -32768 to 32767) plus a place for the positive or negative sign. See the Figure for a routine that prints a table of values.

Real numbers are normally printed in exponential notation, such as "1.234 E + 01" which is the same as "12.34." Pascal uses this format unless you specify differently using field specifiers. There are two field-length specifiers for real numbers; the first indicates the total number of digits to print including one for the decimal point. The second number specifies

only the number of digits to print right of the decimal point.

For example, `WRITELN(1/3:6:4)`; appears as 0.3333. The 6 indicates that the number uses six spaces, and the 4 indicates that four of those spaces will hold digits right of the decimal point. Therefore, `WRITELN('.....',20/2:8:3)`; outputs: 10.000. Pascal puts the extra spaces in the field to the left of the number.

Notice that another way that the write and `WRITELN` statements are similar to Basic's print statement is that expressions can appear in the data list. This holds true for all data types that the write statement allows in its parameter list.

You should now have an idea of what Pascal programming is like and its general format. We have explored the write and `WRITELN` statements in some detail—but there's still more to learn. For instance, you can use the write statement to write to files, but that's an advanced topic better left to another time.

Join me next month when I introduce the predefined (elementary) Pascal data types, the assignment statement, the read statement, and the compiling programs. ■

Write to Bruce Powel Douglass c/o 80 Micro, 80 Pine St., Peterborough, NH 03458.

Tidbit #6

If you need a backup of a Model III TRSDOS disk but can't remember its password, don't despair. When Backup asks for a password, you can fool it into thinking you know the password by following these steps:

- Enter BACKUP from TRSDOS Ready.
- Insert a TRSDOS disk with a known password into drive zero.
- Insert another Model III disk with data (programs or files) on it into drive 1.
- Enter source and destination drives with zero and 1.
- Enter the password to the disk in drive zero. Backup compares the passwords, and if they match, continues.
- Backup checks the destination disk for data. If data is present, it asks you for a Y or N. Don't enter anything yet.
- Remove the disks from the drives.
- Insert the disk you want to copy into drive zero. (Use a write-protected disk.)
- Insert the disk you want to copy to in drive 1. (This disk cannot have a write-protect tab.)

- Answer the continue query with a Y.
- Answer the format query with a Y.
- Backup proceeds and makes the copy.

This method works with most TRSDOS disks unless you've previously zapped them to prevent normal copying.

Another method involves changing the password:

- Insert a TRSDOS disk with a known password into drive zero.
- Press the reset key.
- Enter PROT (PW) from TRSDOS.
- Answer the password query with the known password.
- Replace the disk in drive zero with the disk with the unknown password.
- Enter the new password and the PROT program copies it onto the disk.

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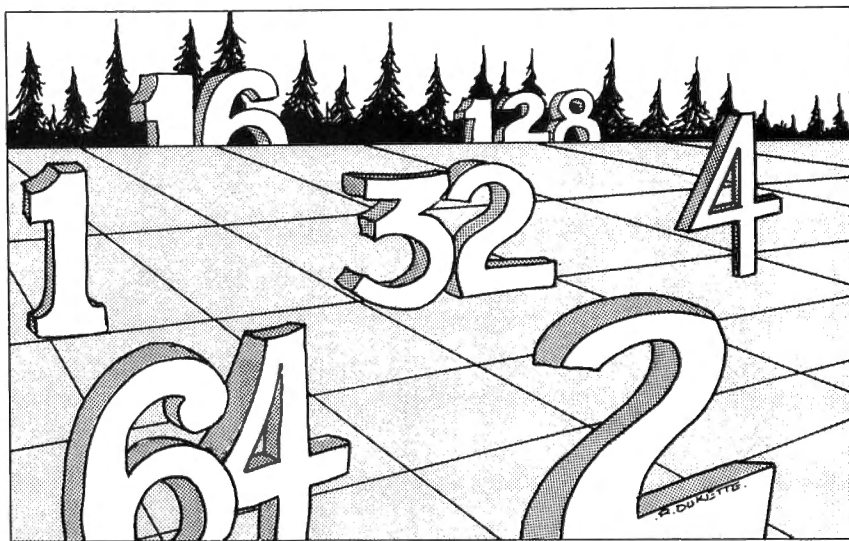
If you do a lot of math work on your TRS-80, no doubt you've been frustrated by the limitations of your ROM Basic interpreter's two math modes, integer and floating-point math. Integer math is accurate but limited to values between -32768 and $+32767$; floating-point math can handle a much wider range of values (from approximately $+/-1.7E-38$ to $+/-1.7E38$), but it can be inaccurate.

You can overcome these limitations by using a different kind of arithmetic, one that produces absolute accuracy regardless of the size or range of your numbers. It's called binary coded decimal math (BCD).

Every 8-bit memory location in your computer can hold a value of between 0000 0000 and 1111 1111 binary (00-FF hexadecimal [hex]). In BCD form, however, a single decimal digit represents each 4-bit nibble or hex digit. In hex form, values in a single memory location range from 00-99 hex, representing the decimal values 0-99. (Hex digits A-F are never allowed as legitimate values.) In this way, decimal values are coded, digit by digit, into hybrid internal forms.

Three special Z80 instructions manipulate BCD to make it accurate. They are DAA (decimal arithmetic adjust), RRD (rotate right decimal digit), and RLD (rotate left decimal digit). Since they control BCD, these instructions are unlike other Z80 arithmetic instructions that handle binary values. I'll explain how each of these handles BCD later in the column.

At the machine-language level, the Z80 processor only "knows" how to perform a few arithmetic operations. It can increment, decrement, add, and subtract single bytes or 2-byte values. It can also perform rotate and shift operations on single-byte values, and you can use these operations in dedicated arithmetic routines. If you have



to multiply a lot of numbers by 12, for instance, it's easier (and faster) to use a dedicated "multiply-by-12" routine than a more general routine to "multiply two numbers."

Instead of converting numbers between decimal and hex or binary, you could use BCD math. Here's an example of how BCD differs from true binary representation:

$$\begin{aligned} 59D &= 3BH = 0011\ 1011B \text{ (true binary)} \\ 59D &= 59H = 0101\ 1001B \text{ (BCD)} \end{aligned}$$

In true binary representation, the computer considers the total value of the decimal number while converting it into binary. The computer reads the true binary representation of 59D as $0*128 + 0*64 + 1*32 + 1*16 + 1*8 + 0*4 + 1*2 + 1*1$.

However, when converting a decimal value into BCD form, your program must consider the decimal digits separately. Each digit fits neatly into four binary bits (one nibble). The BCD form of 59D shows that the first digit is 5 (0101 binary) and the second is 9 (1001 binary).

If you code a value in BCD form, you (and the computer) must consider

each nibble separately. If you read a BCD value as if it were true binary, you will almost always get an inappropriate answer. For example, reading the BCD representation of 59D as true binary results in a value of 89D.

When the Z80 adds 2 bytes together, it doesn't know what they represent. They could be true binary values, BCD values, ASCII characters, or almost anything else. Often, when the computer adds and subtracts BCD values, it gets erroneous results. For example:

$$\begin{array}{r} 34D \quad 34H \text{ (BCD)} \quad 0011\ 0100B \text{ (BCD)} \\ +28D \quad +28H \text{ (BCD)} \quad +0010\ 1000B \text{ (BCD)} \\ \hline 62D \quad 5CH \text{ (???) } \quad 0101\ 1100B \text{ (???)} \end{array}$$

Your program, however, will (or should) know what each byte represents. And it can use the Z80 instruction DAA, which automatically corrects the results of BCD arithmetic, and the C flag, which indicates whether the result is too large to fit in a single byte.

If DAA immediately follows a 1-byte arithmetic operation, the Z80 interprets the previous operands as binary coded decimal, and corrects the

THE NEXT STEP

Program Listing 1. BCD demonstration routine. The field overflow error in line 850 is a result of a quirk in Apparat's EDTASM and is not a programming error. If you use another assembler, you won't get an error.

```

00100 ;*****
00110 ;*
00120 ;* Basic / BCD Demonstration Routine *
00130 ;*
00140 ;* Call from Basic: *
00150 ;* A$ = USR (B$) *
00160 ;* with B$ having the form: *
00170 ;* "0" + "n1" + "," + "n2" *
00180 ;* "n1" and "n2" are equal *
00190 ;* length strings of decimal *
00200 ;* digits. *
00210 ;*
00220 ;* Routine is relocatable. *
00230 ;*
00240 ;*****
00250 ;
FF00 00260 ; ORG 0FF00H ;PICK ANY ADDR YOU WISH
00270 ;
FF00 CDF40A 00280 CALL 0AF4H ;CHECK FOR STRING ARG.
FF03 2A2141 00290 LD HL,(4121H) ;HL=>STRING VARPTR
FF06 0100FF 00300 LD BC,0FF00H ;SET -- MAX. LEN. = 255
FF09 CD682A 00310 CALL 2A68H ;COPY/MOVE STRING TO
00320 ; ;STRING STORAGE AREA
00330 ;
FF0C 2A2141 00340 LD HL,(4121H) ;GET VARPTR IN HL
FF0F 7E 00350 LD A,(HL) ;STRING LEN. IN A
FF10 0F 00360 RRCA ;DIVIDE LEN BY 2
FF11 DA4A1E 00370 JP C,1E4AH ;FC ERROR IF REMAINDER
00380 ;
FF14 77 00390 LD (HL),A ;MAKE STRING 1/2 LEN.
FF15 23 00400 INC HL ;HL=> STRING ADDR.
FF16 5E 00410 LD E,(HL) ;GET LSB OF ADDR
FF17 23 00420 INC HL ;HL=>MSB OF STRING ADDR
FF18 56 00430 LD D,(HL) ;GET MSB OF ADDR
FF19 EB 00440 EX DE,HL ;HL=>STRING
00450 ;
FF1A 47 00460 LD B,A ;1/2 LEN IN B
FF1B 7E 00470 LD A,(HL) ;GET 1ST CHARACTER
FF1C FE30 00480 CP '0' ;TEST FOR "0"
FF1E C24A1E 00490 JP NZ,1E4AH ;FC ERROR IF NOT
FF21 78 00500 LD A,B ;GET 1/2 LEN AGAIN
FF22 85 00510 ADD A,L ;ADD LENGTH TO HL
FF23 6F 00520 LD L,A ;AND SAVE
FF24 3001 00530 JR NC,$+3 ;SKIP IF NO CARRY
FF26 23 00540 INC HL ;BUMP IF CARRY
00550 ;HL=> " ,"
00560 ;
FF27 7E 00570 LD A,(HL) ;GET CHARACTER
FF28 FE2C 00580 CP ' ' ;TEST FOR " ,"
FF2A C24A1E 00590 JP NZ,1E4AH ;GO IF NOT
00600 ;
FF2D 2B 00610 DEC HL ;HL==>LAST OF ASCII n1
FF2E E5 00620 PUSH HL ;SAVE ADDRESS AND
FF2F E5 00630 PUSH HL ;TRANSFER TO
FF30 D1 00640 POP DE ;DE REGISTER
FF31 C5 00650 PUSH BC ;SAVE 1/2 LEN
FF32 78 00660 LD A,B ;GET 1/2 LEN
FF33 85 00670 ADD A,L ;ADD TO HL ADDR
FF34 6F 00680 LD L,A ;AND SAVE
FF35 3001 00690 JR NC,$+3 ;SKIP IF NO CARRY
FF37 23 00700 INC HL ;BUMP IF CARRY
00710 ;HL==> LAST OF ASCII n2
00720 ;
FF38 E5 00730 PUSH HL ;SAVE ADDRESS
FF39 CB38 00740 SRL B ;1/2 LEN OF n2
FF3B C5 00750 PUSH BC ;SAVE LOOP COUNTER
FF3C E5 00760 PUSH HL ;TRANSFER ADDRESS TO
FF3D DDE1 00770 POP IX ;IX REGISTER
00780 ;
FF3F DD7E00 00790 LOOP10 LD A,(IX) ;GET CHARACTER
FF42 D630 00800 SUB 30H ;CONVERT TO BINARY
FF44 ED67 00810 RRD ;PUT IN TOP OF (HL)
FF46 DD2B 00820 DEC IX ;IX==> NEXT CHAR.
FF48 DD7E00 00830 LD A,(IX) ;GET CHARACTER
FF4B D630 00840 SUB 30H ;CONVERT TO BINARY
FIELD OVERFLOW
FF4D FEFC 00850 CP ',-30H ;IS IT A COMMA?
00855 ; NOTE-LINE 850 YIELDS ERRONEOUS FIELD OVERFLOW ERROR IF
00856 ; YOU USE APPARAT'S EDTASM.
FF4F 2001 00860 JR NZ,$+3 ;SKIP IF NOT
FF51 AF 00870 XOR A ;A=0
FF52 ED67 00880 RRD ;PUT IN TOP OF (HL)
FF54 2B 00890 DEC HL ;BUMP POINTER
FF55 DD2B 00900 DEC IX ;AND THIS ONE
FF57 1DE6 00910 DJNZ LOOP10 ;REPEAT FOR ALL OF n2
00920 ;
FF59 DD7E00 00930 LD A,(IX) ;GET NEXT CHARACTER
FF5C FE2C 00940 CP ' ' ;IS THIS THE COMMA?
FF5E 2002 00950 JR NZ,$+4 ;SKIP IF NOT
FF60 DD2B 00960 DEC IX ;IX ==> LAST OF ASCII n1
FF62 C1 00970 POP BC ;GET LOOP COUNTER AGAIN
FF63 E5 00980 PUSH HL ;SAVE THIS ADDRESS
00990 ;
FF64 DD7E00 01000 LOOP20 LD A,(IX) ;GET CHARACTER
FF67 D630 01010 SUB 30H ;CONVERT TO BINARY
FF69 ED67 01020 RRD ;PUT IN TOP OF HL
FF6B DD2B 01030 DEC IX ;POINT TO NEXT
FF6D DD7E00 01040 LD A,(IX) ;GET CHARACTER
FF70 D630 01050 SUB 30H ;CONVERT TO BINARY
FF72 ED67 01060 RRD ;PUT IN TOP OF HL
FF74 2B 01070 DEC HL ;BUMP BOTH
FF75 DD2B 01080 DEC IX ;POINTERS

```

Listing 1 continued

result accordingly. It does so by examining the result value in the A register, the H flag (which shows whether a carry occurred between nibbles), and the N flag (which shows whether the previous operation was an addition or subtraction). The code in Table 1 shows the value of the A register after each operation, and the effects of DAA.

In other words, any 1-byte arithmetic operation can operate on BCD values as long as the DAA instruction immediately follows the operation. As used here, immediately means before another operation changes the H, N, or C flag. Operations that don't affect these flags may occur before the DAA. If a carry occurs out of the left digit after the computer performs the DAA correction, the computer sets the carry flag.

Trading Memory For Accuracy

Because BCD arithmetic handles decimal digits directly, it can be absolutely accurate. BCD operations never result in round-off errors or any of the other peculiarities of Basic's floating-point routines.

However, you pay a major memory penalty when using BCD arithmetic. Basic can store its approximation of a 36-digit number in 4 or 8 bytes, depending on whether it interprets the value as single or double precision. You need 18 bytes to store the same value in BCD form. A table of BCD numbers, such as the variable tables that Basic creates, would also have to include additional pointer bytes to each value since each value would have a different length.

The TRS-80 uses floating-point math to store more variables in fewer bytes. Also, math functions such as SIN, SQR, LOG, and exponentiation are much more difficult to perform on

BCD Values	DAA Effects	
LD	A,34H	
ADD	A,28H	A = 34H
DAA		A = 5CH
		A = 62H

Table. Here's the BCD value of the A register after each operation, and the effects of DAA.

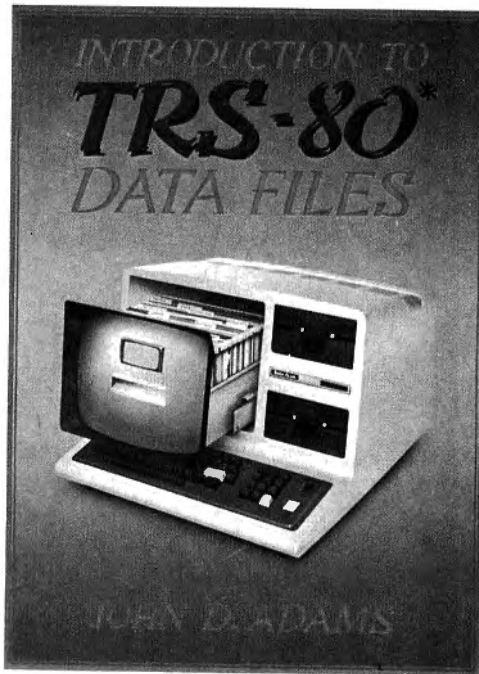
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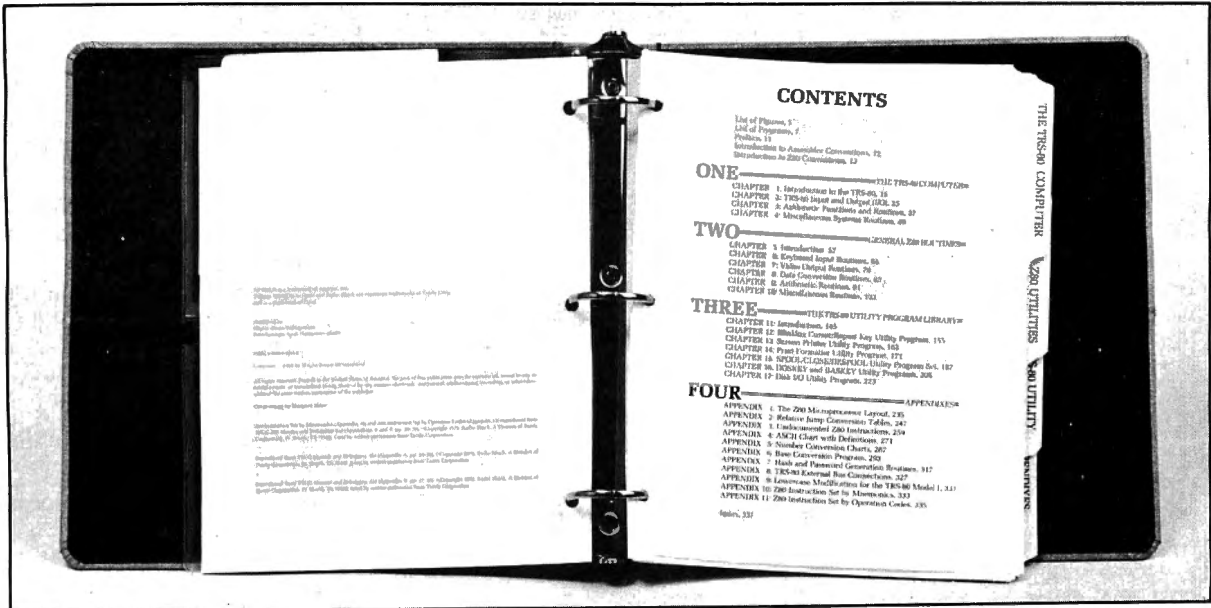
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THE NEXT STEP

Listing 1 continued

```

FF77 10EB 01090 DJNZ LOOP20 ;LOOP UNTIL n1 CONVERTED
          01100 ;
FF79 D1 01110 POP DE ;DE=>LAST OF BCD n1
FF7A E1 01120 POP HL ;HL=>LAST OF BCD n2
FF7B C1 01130 POP BC ;B = 1/2 LEN OF ORIG
FF7C E5 01140 PUSH HL ;SAVE ADDRESS AGAIN
FF7D CB38 01150 SRL B ;B = B/2
FF7F C5 01160 PUSH BC ;SAVE LOOP COUNTER
FF80 AF 01170 XOR A ;CLEAR CARRY FLAG
          01180 ;
FF81 1A 01190 LOOP30 LD A, (DE) ;GET ONE VALUE
FF82 8E 01200 ADC A, (HL) ;ADD OTHER VALUE
FF83 27 01210 DAA ;ADJUST FOR BCD
FF84 77 01220 LD (HL), A ;AND SAVE
FF85 2B 01230 DEC HL ;BUMP BOTH
FF86 1B 01240 DEC DE ;POINTERS
FF87 10F8 01250 DJNZ LOOP30 ;LOOP UNTIL DONE
          01260 ;
FF89 C1 01270 POP BC ;B = LOOP COUNTER
FF8A E1 01280 POP HL ;HL=>END OF ASCII n2
FF8B D1 01290 POP DE ;DE=>END OF ASCII n1
FF8C F5 01300 PUSH AF ;SAVE CARRY FLAG
          01310 ;
FF8D AF 01320 LOOP40 XOR A ;A = 0
FF8E ED67 01330 RRD ;BOTTOM DIGIT IN A
FF90 C630 01340 ADD A, 30H ;MAKE INTO ASCII
FF92 12 01350 LD (DE), A ;SAVE IN STRING
FF93 1B 01360 DEC DE ;DE=> NEXT POSITION
FF94 AF 01370 XOR A ;A = 0
FF95 ED67 01380 RRD ;TOP DIGIT IN A
FF97 C630 01390 ADD A, 30H ;MAKE INTO ASCII
FF99 12 01400 LD (DE), A ;SAVE IN STRING
FF9A 1B 01410 DEC DE ;BUMP BOTH
FF9B 2B 01420 DEC HL ;POINTERS
FF9C 10EF 01430 DJNZ LOOP40 ;REPEAT UNTIL DONE
          01440 ;
FF9E F1 01450 POP AF ;GET BACK CARRY FLAG
FF9F 30B2 01460 JR NC, S+4 ;SKIP IF NO CARRY
FFA1 EB 01470 EX DE, HL ;HL=> ORIG "0"
FFA2 34 01480 INC (HL) ;CHANGE TO "1"
FFA3 C9 01490 RET ;RETURN TO BASIC
          01500 ;
0000 01510 END
00001 TOTAL ERRORS
31279 TEXT AREA BYTES LEFT
    
```

BCD values than on floating-point ones, and would result in inaccuracies in any case.

However, you can use BCD arithmetic when you're willing to trade memory for accuracy. This month's programs demonstrate how you could write and use the routines for adding integers of up to 126 digits each. The Basic program combines both values into a string, adds a 0 at the beginning of the string, and separates the numbers with a comma. Then a USR routine sends the string to the machine-language routine.

For example, suppose you used the routine to add 1234 (which I'll call n1) and 5678 (or n2). The Basic program would combine the numbers into the single string: "01234,5678".

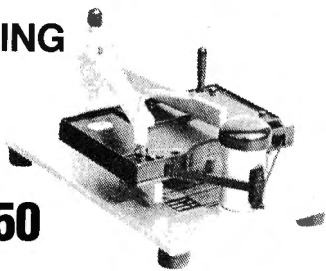
The machine-language routine uses the following algorithm:

1. Copy the string to a new location in string memory:
"0" "1" "2" "3" "4" " ," "5"
"6" "7" "8"
2. Set the length byte in the string's VARPTR so only the first half of the

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THE NEXT STEP

string returns to Basic.

3. Convert n2 to BCD and store it on top of the last half of the original n2:

```
"0" "1" "2" "3" "4" "5"
```

```
"6" 56H 78H
```

4. Convert n1 to BCD and store it on top of the first half of the original n2:

```
"0" "1" "2" "3" "4" "5" 12H
```

```
34H 56H 78H
```

5. Add the two BCD numbers together and store the result on top of the last half of the original n2:

```
"0" "1" "2" "3" "4" "5" 12H
```

```
34H 69H 12H
```

6. Convert the result to ASCII decimal and store it on top of the original n1:

```
"0" "6" "9" "1" "2" "5" 12H
```

```
34H 69H 12H
```

7. Change the leading "0" to a "1" if a carry occurred out of the left-most digit.

8. Return the leading "0" or "1" and the rest of the result to Basic as a string.

```
"06912"
```

The process should be clear as you study Program Listing 1.

How the Programs Work

The first section of the program, lines 280-310, checks to be sure the USR routine passed a string argument instead of a numeric one. Then the program copies that string, using the ROM routine at 2A68 hex, into a new location in the string storage area. So far, the program is identical to that in my February 1984 column (p. 220).

The second program block checks the length of the string by loading the length into the A register and performing a right-rotate into the carry flag. If the string contains an odd number of characters, the last bit in the length byte is a 1, and the Z80 shift instruction RRCA sets the carry flag. If and when that occurs, the routine ends by jumping to Basic's Illegal Function Call routine.

If the string has an even number of characters, the A register will contain a count of one-half the original length after the RRCA. This is the length of the string the program returns to Basic. The program loads the half-

length into (HL), which changes the VARPTR of the string, but the VARPTR's address remains at 4121 hex, Basic's accumulator.

If the program were to return to Basic after line 390, the first half of the original string would be sent back to Basic. But, since everything is set for the return, the program gets on to the business at hand.

Lines 400-440 load HL with the address of the string. Line 460 stores the half-length of the original string in B, and then tests the first byte of the string to be sure that it begins with a 0 character. That character is necessary to assure that room exists for a leading 1 if the addition of the two strings requires a carry out of the left-most column.

By adding the half-length to HL in lines 510-540, the program points HL to the location that should contain a separating comma. If the comma isn't there, the routine is lost and returns to Basic through an FC Error. The program then saves the address of the fi-

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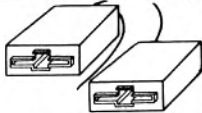
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THE NEXT STEP

nal digit of the first number both in DE and on the stack, and it adjusts HL to point to the end of the total string, which is also the end of the second original number.

Next, by dividing the value in B by 2, the program calculates how many bytes it needs to hold the BCD representation of each original number. The BCD values are written in memory on top of n2 and, possibly, the comma.

Finally, starting in LOOP10, the program translates each digit into BCD and stores it back on top of the string. Notice that the program uses the rather unusual Z80 command, RRD, to transfer the BCD nibbles into memory.

RRD takes the lower nibble of A, puts it into the top half of the byte to which HL points, shifts the upper nibble of (HL) down to the bottom of that byte, and moves the bottom nibble of (HL) into A. The Z80 instruction set includes the RRD command, and its companion RLD, to help handle BCD conversions.

After LOOP10 converts n2 into BCD, LOOP20 performs a similar conversion for n1. Then LOOP30 performs the actual BCD additions. LOOP40, which includes more use of RRD, reconverts the resulting BCD sum into ASCII digits and stores those digits back on top of n1 in the string that will return to Basic. The routine ends by incrementing the leading "0" character to "1" if the addition ended with a carry.

After loading and protecting Listing 1, use Program Listing 2 to test it. Of course, if you're using tape Basic you

must load the address of the routine into 16526 and 16527 instead of using the DEFUSR command. Other than that, the program should work for any Model I or III. Listing 1 doesn't check to be sure that the original strings are composed entirely of numeric digits. You might like to try typing in alphabetic characters to see how it will handle them. Can you figure out why they act that way?

Brainteaser

As a final problem about the oddities of BCD math, you might like to try this puzzle. Assume that the A register holds a value between 00 hex and 0F hex. Now perform the following four operations:

```
ADD A,90H
DAA
ADC A,40H
DAA
```

This code converts a hex digit (one nibble) into its ASCII equivalent in 6 bytes! But how? (No, this isn't a contest, except perhaps between you and your understanding of your computer.) I didn't write this code; I first saw it in William Barden's "Assembly Line" column (*80 Micro*, August 1981, p. 42). He got it from a reader who didn't know its origin, either. ■

Readers who subscribe to CompuServe may ask questions or take part in discussions of topics covered by "The Next Step." GO PCS-117 to the Software and Authors' SIG and leave your questions addressed to me on Section 0 of the message board. Feel free to join in discussions started by others.

```

10 *****
20 '*
30 '* Test and Demonstration Program *
40 '* for BCD Addition Routine *
50 '* *
60 '* Assumes BCD routine is stored *
70 '* at 0FF00H. *
80 '* *
90 *****
95 '
100 CLS: CLEAR 1000
110 DEFUSR=&HFF00
120 INPUT "First number ";X$
130 INPUT "Second number";Y$
140 IF LEN(X$)<>LEN(Y$) THEN PRINT "Numbers must be the same len
gth":PRINT:GOTO 120
150 Z$="" + X$ + " " + Y$
160 A$=USR(Z$)
170 IF LEFT$(A$,1)="" THEN A$="" +RIGHT$(A$,LEN(A$)-1)
180 PRINT "The sum is "; A$
190 PRINT: GOTO 120

```

Program Listing 2. Test program for BCD addition routine.

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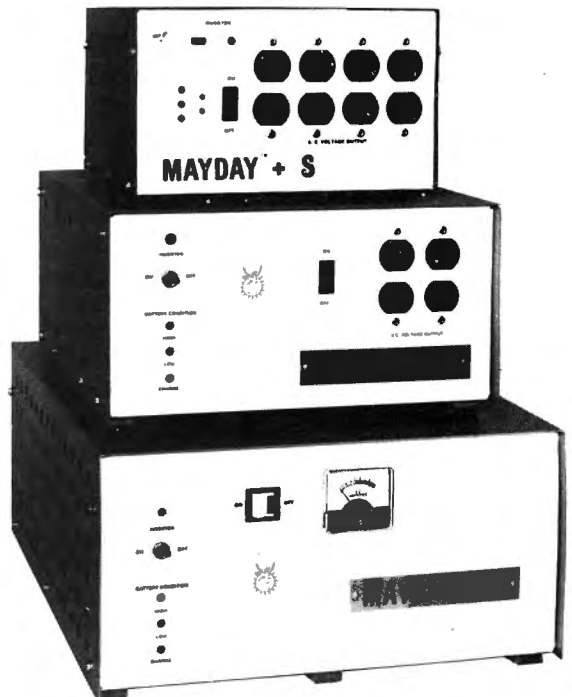
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Continued from p. 40

text on the screen and increased text processing speed.

Documentation

The WordStar documentation is typical for LSI. It's packaged in a binder that also contains the documentation for LSI's smal-LDOS. smal-LDOS is a reduced-size version of LDOS 5.1.4.

In order to make WordStar operate with LDOS, LSI had to consider two methods of implementation: rewriting the program to operate under LDOS or writing a shell to convince the program that it was operating in a CP/M environment. LSI chose the latter method to keep errors to a minimum.

Consequently, all file communications with WordStar must be in CP/M format (D:FILENAME.EXT), and the program won't find files that don't reside on the currently logged drive. Also, the disk drive names must conform to the CP/M convention of naming drives (the first drive is A:).

The WordStar documentation comprises mostly the original MicroPro manual with the necessary changes for the TRS-80 implementation. It also states the operational limitations of this WordStar implementation and the restriction on file-naming conventions.

The remainder of the manual contains a section explaining the procedures for installing WordStar, the reference manual section covering operation of WordStar and MailMerge (you must purchase MailMerge separately), an appendix of commands, and an index.

Gripes

WordStar's method of implementation for the TRS-80 is not always pleasing. Logging in disk drives and restricting file names to CP/M conventions is confusing.

Also, due to the implementation method, WordStar fails to make full use of the available text display speed. CP/M conventions force the main program to use the Basic disk operating system (BDOS) calls to be compatible with other CP/M implementations. Because of this restriction, WordStar talks to the TRS-80 video

through a communications protocol, and it's slow.

Like most LSI products, this package is well implemented. The most annoying problem I've found involves keyboard mapping. The documentation provides an errata sheet for keyboard mapping to revise the proper keystrokes required to select various functions.

I selected the WordStar keyboard mapping for use with KI/DVR installed. WordStar interferes with the normal KI/DVR key assignments. All the keystrokes defined in the appendix errata sheet are correctly assigned, but WordStar alters the other KI/DVR key selections (for example, clear-< no longer produces the left bracket).

One WordStar feature not currently available for the TRS-80 is concurrent printing and editing of text. The memory size of the Model I/III is not large enough to allow this feature.

I gave WordStar a three-star performance rating primarily due to the restrictions on printer support. WordStar can manipulate almost any printer and does a good job with the ones it controls, but it's designed to fully handle only a few printers.

Two key Radio Shack printers—the Daisy Wheel II and the DWP-410—aren't supported. You can use both printers with WordStar, but they operate in monospaced justification mode and are limited to fixed-pitch operation. In fact, this WordStar implementation does not support microjustified proportional text on any printer.

A serious limitation to WordStar's ease of use is the complexity of WordStar commands and the non-associative command key designations. WordStar has many commands to process text efficiently, but the command mnemonics are poorly selected.

The character-delete function is control-G instead of control-D, and you select the insert text mode with control-V instead of control-I. While command prompts are displayed on screen and help is easily available, who remembers control-J as the prefix for selecting Help instructions?

This command difficulty and the complex installation procedure make this text processor extremely difficult for all but the most accomplished users. Those experienced with LDOS and WordStar should have marginal difficulty with this system.

Conclusion

It's virtually impossible to select one word processor that implements every feature you'd like to have. However, WordStar is the most popular and most widely used word processor available. No other product for the TRS-80 has yet provided such portability and flexibility.

I recommend WordStar as a serious candidate for addition to your software library. In conjunction with the other products in MicroPro's software line, it's a formidable word processor capable of meeting the most complex and demanding needs. ■

Contact LSI (414-335-5454) for current product status and availability.

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by Mark D. Goodwin

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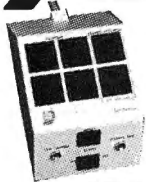
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tion. PMOD6's disk-related modes support modification of hard disks as well as floppy disks.

Once you enter the desired mode of operation, PMOD6 enters the paging mode to display a disk sector, a file sector, or 256 bytes of memory. See Fig. 1 for a typical PMOD6 display. PMOD6 displays the data in hexadecimal (hex) and ASCII formats. While in the paging mode, this utility lets you use the arrow keys to move rapidly through the sectors, the file, or memory.

You must enter PMOD6's modification mode to modify data. This mode features dual cursors that you move with the arrow keys and other control keys. You can perform the actual modifications in ASCII, binary, decimal, octal, and hex formats.

PCHECK6 checks the integrity of a disk directory. You can examine directory entries for all files or a single file. Table 1 presents a list of the error messages PCHECK6 displays during directory examination.

Once you locate directory errors

```

0A00.0421 DB0B 07CB 432B 013C 4F06 0009 7E18.D!.HG.C(A<DFE!~X
HEX0A10.02EE 20FE 8020 0821 7C00 CB66 2801 17DD.B. . . H!i@.f(AW.
MEM0A20.CB0A 4E2B 0E57 CBAF D641 FE1A 7A30 02EE..JN(NW...A.Zz0B.
0A30.20F6 80CB 432B 19FE 9F28 13FE 2020 16DD. . . .C(Y..(S. V.
0A40.CB0B 462B 103E 2021 7400 AE77 1806 EE80..HF(P> !t@.wXF..
0A50.FE9F 2001 AFDD 7700 016E 03CD 0005 3A2C... A..w@AnC.@E:,
0A60.00DD 8602 DD77 01DD 7E00 B7CA 8809 CB53.e..B.wA..~@...I.S
0A70.3720 043F CB7F CBF5 21F1 08CB BF01 5B05.7 D?..!..H..AIE
0AB0.3001 05BE 2812 EE10 BE28 0BEE 1023 0C10.OAE.(R.P.(K.P#LP
0A90.F2F1 380A BFC9 CBE9 F179 30F8 E61F BF37...8J.....y0..._7
0AA0.C921 4D0B 36FF 381D 281B 79FE 032B 7E3C..!MK6.8J(Ly.C(~<
0AB0.2013 CD1B 0821 01F4 0608 7EFD 7700 FD23. S.[H!A.FH~.w@.#
0AC0.CB15 10F6 C9E5 237E 23BE 281C ESSE 2316..UP...#~#. (\.^#V
0AD0.0019 460E 40E1 34F2 DCOA 3600 7E2B BECC.@YFNe.4..J6@~+..
0AE0.320B E136 00C5 F1C9 CD53 09E1 3600 C9F1.2K.6@...SI.6@..
0AF0.0A3A 6D00 E602 CB21 4D0B 7EB7 C023 ES21.J:m@.B.!MK~..#..!
    
```

Figure 1. A typical PMOD6 display.

with PCHECK6, you can use PFIx6 to correct the bad entries. PCHECK6 and PFIx6 are extremely fast and thorough.

PREFORM6 reformats a disk by reading each cylinder's data into memory, formatting the cylinder, and rewriting the data back to the disk. This utility is particularly useful for correcting CRC and Not Found errors.

Providing the disk isn't at fault, PREFORM6 corrects any CRC errors without any data loss. It also corrects Not Found errors, but you lose data in the offending disk sector.

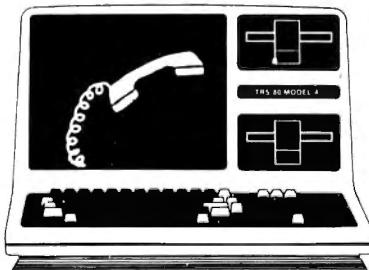
PVU6 is a disk verification utility that reads every sector on the disk. If a sector reads without error, PVU6 assumes that the sector is OK. This utility is quite useful for verifying disk

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format and tracking down bad disk sectors.

You use PCLEAR6 to clean up a disk. You can clear all unused directory entries, clear all unassigned disk sectors, or clear a disk file. You can also instruct PCLEAR6 to set sectors and files to either numeric or string values.

For example, you can tell PCLEAR6 to use Mark Goodwin when clearing the sectors. After this operation, all the unassigned sectors would be filled with Mark Goodwin. PCLEAR6 is handy for removing traces of killed files and preallocating specific values for disk files.

PSS6 is a sector status utility. By specifying the drive, cylinder, and sector numbers, it displays the sector's current status. If the specified sector is unassigned, PSS6 displays pertinent information for the associated disk file.

More Tools

You use PMAP6 to map either an entire disk or a specified disk file.

When mapping a disk, PMAP6 displays whether each disk granule is free or assigned. When mapping an individual disk file, PMAP6 displays every cylinder and sector number assigned to the file.

Cylinder xxx has an invalid GAT byte
Hit byte at xxH invalid or extraneous
File name contains non-ASCII characters
End of file sector beyond allocated sectors
No terminator for extent field
Directory links to record not linking back to it
Track assigned that is beyond disk boundary
Extension assigned before end of extents
Forward link to inactive entry
Forward link to nonextension entry
Extension record not assigned to any files
Multiple files assigned to single granule
Directory record has invalid Hit byte
Directory record has a zero Hit byte
Extended directory record has invalid Hit byte
Extended directory record has a zero Hit byte

Table 1. PCHECK6 error check list.

You can also send the output from PMAP6 to a printer. However, I found a problem with the PMAP6 printer output. When mapping an entire disk, PMAP6 displays a graphics character to indicate an assigned granule and sends a graphics character to the printer. While graphics characters don't cause display problems, many printers interpret them as control codes. The PMAP6 printer output might not print properly.

PASSGO6 removes the passwords from a disk. You can also instruct PASSGO6 to remove the passwords for a particular class of files or a specific file. This utility can be handy for accessing, copying, and removing protected disk files.

PKILL6 is a multiple-file removal utility, the most versatile purge utility I've ever seen. You can instruct PKILL6 to purge files by class or by file name. Furthermore, PKILL6 supports a very flexible wild-card system.

PCOMPAR6 compares disk sectors or files. This utility does a complete byte-to-byte comparison for the speci-

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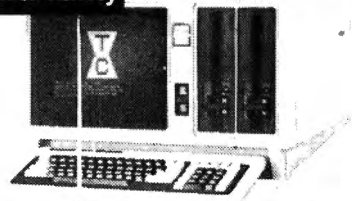


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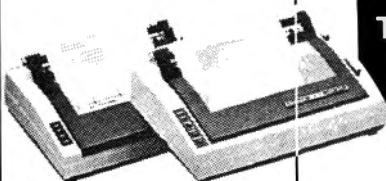


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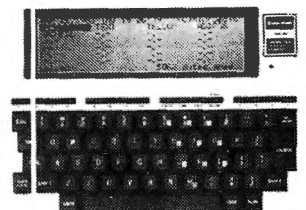


MODEL 12

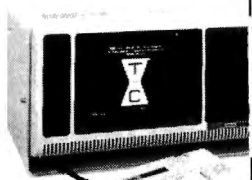


DOT MATRIX PRINTERS
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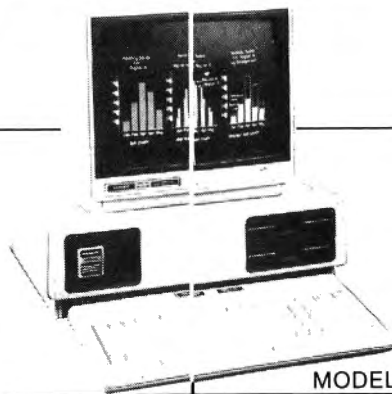
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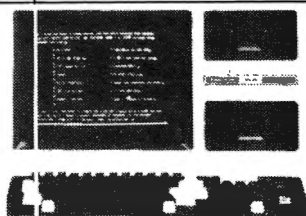
MODEL 100



MODEL 4-P



MODEL 2000



MODEL 4

REVIEWS

fied sectors or files. If any mismatches occur, PCOMPARE6 displays or prints an appropriate message.

PFIND6 is a string search-and-replace utility that does memory searches, disk sector searches, and disk file searches. String searches can be case dependent or independent. PFIND6 also supports wild-card characters within the strings. The utility can search for specific bytes and 16-bit words.

PMOVE6 is a multiple-file copy utility. You can also instruct PMOVE6 to produce more than one copy of an individual file. This utility is much faster and more flexible than the normal TRSDOS 6.X copy utilities.

PERASE6 erases a disk by completely formatting it with zeros. The utility is fast and removes all traces of data effectively.

You use PDIRT6 to display a Model III TRSDOS 1.3 directory without leaving the TRSDOS 6.X environment. This utility is useful for locating files you wish to convert. Furthermore, PDIRT6 saves time sorting

disks by operating system.

PEX6 moves a disk drive head to a specified cylinder. This utility is useful for realigning the disk drive and comes in handy when you clean a drive.

PFILT6 is a user-definable conversion filter for input or output devices. To use PFILT6, you must first save the conversion parameters as an ASCII text file. You create this ASCII text file with the TRSDOS 6.X Build command or a suitable text editor. PFILT6 uses the file to create a filter that is automatically relocated in high memory.

Documentation

While the Toolbelt manual explains each utility satisfactorily, it's not written for the novice. However, the manual states at the outset that it assumes familiarity with the TRSDOS 6.X file and directory structures.

This is a reasonable assumption because the Toolbelt utilities are written for an advanced programmer who is probably familiar with TRSDOS 6.X.

Conclusions

Simply put, Toolbelt is a superb software package. Except the PMAP6 printer problem, all the Toolbelt utilities are well written and appear to be bug free. This software package would be an excellent addition to any Model 4 owner's software library. ■

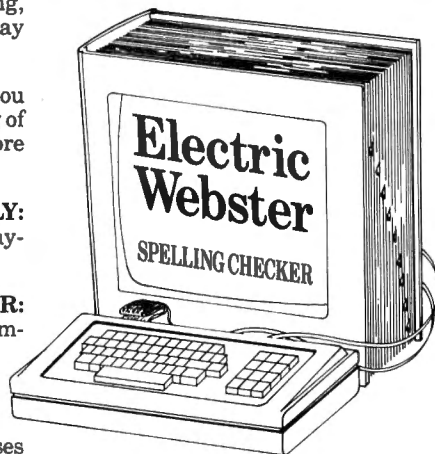
PowerMail Plus: Mailing List Muscle

by David L. Engelhardt

If you're looking for a Model 4 mailing list program, I highly recommend Powersoft's PowerMail Plus. This package contains a set of programs that uses the overlay principle to manage your mailing list.

Program capabilities include adding, editing, deleting, sorting, printing, and many special features. PowerMail Plus is menu driven and can handle a theoretical maximum of 524,288 records at one time.

- **DISPLAYS CORRECT SPELLINGS:** If you don't know the correct spelling, EW will look it up for you, and display the dictionary.
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Start-up

The disk you receive from PowerSoft contains six programs and excludes Model 4 TRSDOS 6.0. You must create a 6.0 system disk, then remove the extraneous files from it, retaining Format/CMD, Backup/CMD, Boot/SYS, and DIR/SYS. Use the Copy command to transfer the PowerMail programs to the newly created system disk.

Figure 2 shows the main menu with its commands. On the second line, a short advisory message indicates what function of PowerMail Plus you are currently using. Several lines beneath the bottom frame contain status messages and menus that change according to the functions you're invoking.

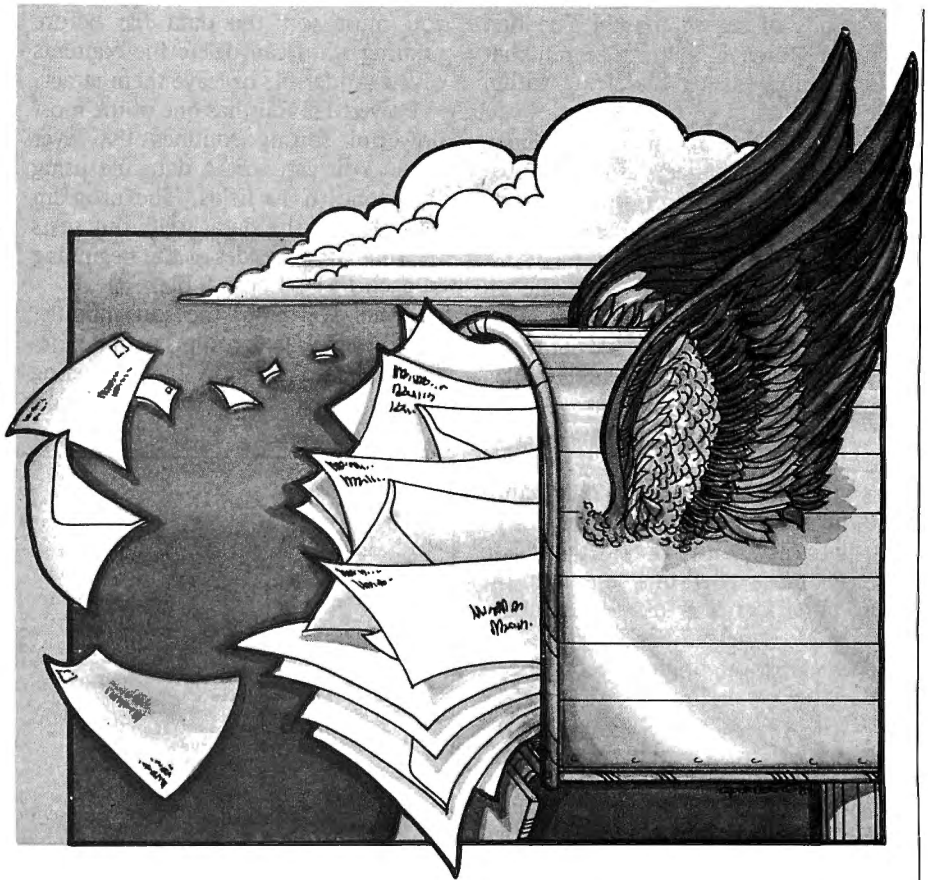
Some Main Menu Options

You start this program by executing PMAIL to see if any data files already exist on any of the drives. If none exist, you have to open files with a designated drive number (option 1 on the main menu).

Two files, PMAIL/ADD and PMAIL/DAT, maintain labels. PMAIL/ADD is an all-purpose holding file for entering new names, separating existing files, and converting other mailing lists to PowerMail's format.

PMAIL/DAT holds the label records. Its first part contains the index you use to locate specific labels. Each data file is named PMAIL/DAT and only one can exist on a disk.

You can give each file an identifica-



tion line of up to 16 characters. PMAIL opens existing data files and indicates how many records you've entered and how many are currently available.

You can review all opened files at any time. On the Model 4, this feature works on up to four drives.

Option 2 on the main menu allows addition of new labels or records. You enter these new labels into the Adder holding file, which protects the main data file from power problems. PowerMail Plus denies access to the labels in the Adder file until you merge it into the main data file.

Option 3 lets you locate and edit labels and flags. Each of PowerMail Plus's 24 available flags represents an on/off condition. You use the flags for features such as selective printing. You define each flag with a label of up to eight characters. To save the flag definitions to disk, hit the break key or define all 24 flags.

You can also set or reset any of the 24 flags to create an optional flag mask. Instead of setting each record individually, you use the mask to automatically set flag numbers on all applicable records for you. This means

that you can separate out labels that have specific flags set. The flag mask overrides any previous flag setting.

After you create the labels and set the flags, you can use PowerMail's editing feature to correct errors. Some mailing lists require that you retype all the field information, but PowerMail Plus supports full line editing.

Editing capabilities include expanding the string for insertion, deleting a character, and deleting all characters right of the cursor. Pressing the break key brings the cursor to the flag portion of the screen for setting or resetting of flags.

You can cancel the new label or return to the submenu at any time. Hitting the ESC or shift/up-arrow keys terminates data entry and lets you save, edit, or cancel the label. You return to the submenu after the program saves the label to the Adder file. The program also displays the number of labels in the Adder file.

To edit existing labels, you must provide a string search mask that consists of a string within one of the 10 label data fields. You use the search mask to locate and display labels.

PowerMail Plus allows three differ-

PowerMail Plus



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- Easy to use? ★★★★★
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- Bug free? ★★★★★
- Does the job? ★★★★★

REVIEWS

ent kinds of search masks. The first type of search is a string search that must match exactly the string within the label files.

The second search mask contains a question mark that acts as a wild card. The length of the search string must be the same as the string you are trying to find.

The third search mask uses the asterisk. The program ignores all characters beyond the asterisk and this type of search has no length limits. You can use this search mask to locate all fields beginning with a specified letter.

PowerMail Plus's key commands let you maneuver and search through the data file. Control keys let you skip to the next label that matches the mask, the first and last sorted labels, the sorted label adjacent to the one displayed, or the original record located by the search.

Preparing to Print

After you use option 5 (utilities) to merge the Adder file with the data file,

you must sort the data file before printing. You can delete the contents of the Adder file or leave them intact.

PowerMail Plus has one of the most powerful sorting routines I've ever used. You can sort a data file using from one to 10 fields. The program doesn't sort the data itself, but sorts the index that resides at the beginning of each PMAIL/DAT file.

When you enter the sort module, PowerMail Plus prompts you to define the sort hierarchy by numbering the label data fields on which you

want to sort. The program ignores any field without a number. Once you've defined the sort hierarchy, you can begin, edit the fields, or clear the screen to redefine the hierarchy.

The Sort routine also prompts you to flag duplicate labels for deletion. The last prompt asks you to designate a drive number to hold temporary files.

Printing Labels

The heart of any mailing system is printing labels and PowerMail Plus

```

** PowerMAIL PLUS ** by Kim Watt ** Version 2.00/M4 **
Copyright (C) 1983 Breeze/QSD, Inc. - (( Main Menu ))
.....
. Last :           | First :           | Data1 :           |           |
. Company :         |           |           |           |
. Address1 :        |           | Address2 :        |           |
. City :           | State :           | Zip :           |           |
.....
. Flags: 01= 02= 03= 04= 05= 06= 07= 08=
. Flags: 09= 10= 11= 12= 13= 14= 15= 16=
. Flags: 17= 18= 19= 20= 21= 22= 23= 24=
.....
(1) Initialize Files           (5) Utilities
(2) Add Records               (6) Mount New Disks
(3) Find/Edit Records/Flags  (7) Exit Program
(4) Print/Count Records      Choice ? _

```

Figure 2. PowerMail Plus main menu.

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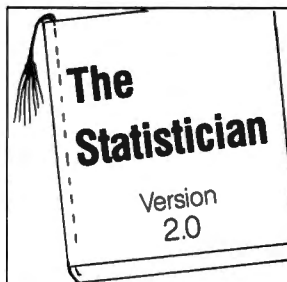
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contains many different options. You can set up any print format to print on any style of label.

The type of printer you use limits the print boundaries. The program prompts you for the number of labels across, the label width, the label length, the repeat count for each label, and the type of label print format.

You can supply a condition mask for selective printing. You enter this mask as a string in the label data fields and/or while setting flags in the special flag region. For example, you can use this feature to print labels with last names that begin with an E and that have flag 4 set.

You can also designate an action mask to specify what action you want applied to the labels. The action mask lets you set or reset the designated flags once you've printed the label. You can use it to print a label once instead of several times.

When you're ready to start, you can print a test pattern to check label alignment. If adjustment is necessary, you go to the submenu and reenter the format values.

You have three options when printing labels. You can elect to print them one at a time, skip some, or print them continuously. You can stop printing at any time or quit the routine by pressing the appropriate keys. The program keeps track of the labels printed and skipped and displays them on the screen.

You can send commands to your printer for specific set-ups and enhancements. This feature lets you change print sizes or go to correspondence-quality mode, instead of performing the same function from Basic. You can also send ASCII text to use for titles.

Before you print any labels, PowerMail Plus lets you determine how many would be selected and printed on a specific condition mask.

In order to change or update labels, you need a master report listing. PowerMail Plus prints the master list on either 80- or 132-column printers. Specify this value before you print the list.

The master list provides all the labels' information, including flag de-

scriptions. You can choose to print all or part of each label's data information.

If you need to create subdata files or new files from existing ones, you can use a flag mask to select specific labels and then write those labels to a new PMAIL/DAT file. You can use this feature to reorganize label files.

PowerMail Plus also has the ability to convert some existing label files created by other mailing list programs. It inserts the labels into the Adder file. You might have to edit some of the labels slightly after you merge them into PMAIL/DAT.

The Manual

PowerMail Plus's manual is high in quality, content, and workmanship. Each section contains a summary of steps. If one of the steps is unclear, you can refer to the text for that procedure.

The back of the manual contains quick reference guides to all PowerMail Plus's menus. These guides contain brief explanations of each com-

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mand. A short Basic program in the back of the manual shows you how to convert labels for SuperScript.

The manual was a little vague about the use of flags in conjunction with condition and action masks. I'd like to see more examples.

Conclusion

Overall, I am impressed with PowerMail Plus's capabilities and features. The commands were easy to use and remember.

However, I do have a few complaints. I am disappointed that the program uses so few of the new Model 4 features, specifically inverse video, sound, and function keys. Also, the cursor blinks so rapidly that it's distracting.

Some commands indicate drive entries from zero to 7 while no more than four can exist on the Model 4. It seems that PowerMail Plus retains some of the commands used on other TRS-80 computers. Powersoft should have removed these commands and redefined them for the Model 4.

The method to enter the edit mode for label data fields is inconvenient. It would be easier to press a control key for entry instead of typing the first character of the field.

It would also be helpful to redefine only the required print values when setting up the print formats. As it is, you have to remember the previous settings and insert them along with the changes.

Minor complaints considered, I highly recommend PowerMail Plus for the Model 4. This system incorporates many label handling features and is versatile enough to handle most mailing tasks. ■

two useful utility programs for the Models I, III, 4, and 4P (the last two machines must be in Model III mode). The Analyst and The Collector are designed to help the programmer write faster-running Basic programs. Both

**The Analyst
And The Collector**

by Jerry L. Latham

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REVIEWS

utilities do their job well.

The Analyst determines the frequency of use of program variables; by placing them in order your program runs faster. The Collector handles string collection more efficiently in your program.

The MSA programs come on 35-track, single-density, Model I disks. You can easily transfer the programs to a Model III disk since they require no program changes to operate in Model III mode. The documentation for both programs is adequate for almost any user.

The Analyst

You run The Analyst while you develop your Basic program. At any point during development, you can request information from The Analyst about variables and constants used in your program and it gives you that information in one of several forms.

You can send this report to either the screen or your printer. You can request that the report be by frequency of use or by order encountered in the program. Also, you can request the same information for the various lines of code in your Basic program. The Analyst divides the report into sections on defined functions, single-element variables and constants, arrays, and line numbers.

The generated reports are accurate and well presented. When I request output to my DMP-2100 while using the LDOS printer filter, the format becomes less readable because of some unknown quirk in using these two together. Everything looks great on my MX-80, however.

This program works great, is reasonably priced, and has adequate documentation. Now, why do you need it? The TRS-80 Basic interpreter builds tables of variables names as it encounters them in the program, and seeks subroutines beginning from the start of a program. Whenever a variable or constant is referenced, the interpreter starts looking for it from the beginning of the appropriate table.

Obviously, if you locate the most-used subroutines early in your program and define your variables in the table according to frequency of use, your program should run faster. I've used a rival program, Faster from Prosoft (Dept. C, Box 560, N. Hollywood, CA 91603) for some time now

and have achieved dramatic improvement in program performance. So how does The Analyst stack up?

If you already have a similar program, I'd advise you not to buy The Analyst. The only feature this program has that Faster doesn't is the ability to report on line use in the program. However, if you don't already own such a utility and want a relatively simple way to run your Basic programs up to 40 percent faster, I highly recommend the program. It's a good buy.

The Collector

The Collector is designed to deal with what's known as string collect-

The Collector



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Easy to use? ★★★★★☆
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Does the job? ★★★★★★

ing, garbage collection, or dead time on the machine. This program is more memory efficient and less expensive than Prosoft's Trashman.

The Collector loads into high memory where it protects itself (it's relocatable code). You activate the program from Basic with a DEFUSR state-

ment. In addition to the amount of memory required for the program itself, some 498 bytes, it requires 2 bytes of memory for each active string variable in your program. Trashman uses 578 bytes of memory plus these same 2 bytes for each string variable, and sells for \$39.95.

Table 2 shows the relative improvements you achieve by using this type of utility. You noticeably reduce the time wasted waiting on garbage collection, especially in programs requiring a large number of string variables.

Paying the price for these programs lets you use the utilities in your private applications. Both Trashman and The Collector have a commercial license available for purchase. You can license Trashman for use in any application anywhere for a fee of \$500.

You can license The Collector for a one-time use for \$60. MSA provides you with a unique copy of The Collector for this purpose. If you have a second commercial application, you need another \$60 license. The break-even point is between eight and nine commercial programs.

Summary

The Analyst and The Collector work as advertised, are reasonably priced, have adequate documentation, and provide a good method for overcoming two of the deficiencies of your Basic interpreter.

Judging from MSA's response to my phone calls and letters, user support looks very good. I found one bug in version 1.0 of The Analyst; MSA promptly fixed it and released version 1.1.

If you already have utilities that do these jobs, spend your money somewhere else. However, if you think you need these programs (and every serious Basic programmer working with these computers needs such utilities), your best buy is from MSA. ■

Number of strings	Standard	Trashman	The Collector
100	2.0 sec	0.3 sec	0.3 sec
250	10.5 sec	0.7 sec	0.8 sec
500	40.1 sec	1.5 sec	1.5 sec
750	88.9 sec	2.2 sec	2.5 sec
1,000	157.0 sec	3.3 sec	3.2 sec
1,500	349.7 sec	4.9 sec	5.3 sec
2,000	621.4 sec	6.9 sec	7.0 sec

Table 2. Comparing string-gathering speed.

Investing in The Model 100

by Carl Oppedahl

Given Investment Analysis's rather steep \$69.95 price tag, it's only suitable for those Model 100 owners who buy and sell a lot of stocks or

REVIEWS

stock options. Because this program is hard to understand and use, you would benefit from it only if you spent some time working with it and could use it every day.

Investment Analysis simplifies three investment calculations: determining the yield of a fixed-income security, calculating a brokerage commission, and evaluating the points at which a stock option makes or loses money.

Investment Analysis doesn't evaluate your portfolio daily by obtaining stock prices over the telephone or analyze the trading history of a selected stock to predict pending changes in stock price. Nor does it let you make financial transactions over telephone lines.

Fixed-Income Security Evaluator

The fixed-income security evaluator (FISE) program lets you determine the effective annual yield of a fixed-income security, an investment such as a government or corporate bond, for which you know the interest rate and term of investment in advance. It takes into account whether or not the security is taxable.

Results appear on the screen, and you can print them by using the Print function key. A typical printout appears in Fig. 3.

A yield at maturity of 20 percent is translated to an after-tax yield of 10 percent. This assumes a marginal tax rate of 50 percent, not shown in the printout (which you can change in the program).

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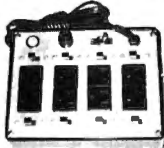
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The above execution times assume error-free operation of the disk system. But if there are errors, the Rapid Disk Duplication Program attempts recoveries and displays complete error messages.

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Commission Calculator

Since 1975, stockbrokers have been free to charge any commission they wish for stock transactions. Despite this freedom, many brokers base their commissions on the New York Stock Exchange (NYSE) schedule that was in effect when the fixed-rate commissions were abolished.

Given the type of transaction (purchase or sale of stock or stock options), and the number and price of shares involved, the commission calculator (COMM) calculates the brokerage commission based on that NYSE schedule.

The results appear on the screen, and you can print them by means of the print key. A typical printout appears in Fig. 4. It shows that the money paid to the broker in buying 88 shares at \$56 is \$4,995.95: \$4,928 for the stock and \$67.95 as a broker's commission.

Option Strategy Evaluator

The option strategy evaluator (OSE) helps a potential investor figure out what effect future changes in the price of a stock or commodity would have on the profitability of a particular option contract.

You can analyze contracts that range from simple put and call contracts to spreads (contracts composed, for instance, of two or more puts and calls).

The program prepares a graph showing the amount of money that

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Maturity	Coupon	9.1	
Price	Yield Mat	20.16328	
Call Date	Call Price		
Accr'd Int	Curr Yld		
Yield-Tax	Yield Call		
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Figure 3. Fixed-income security evaluation.

you will gain or lose as a function of the stock price at the end of the option period. You can see the graph on the screen (plotted using the PSET and PRESET commands), print it on any conventional printer, or plot it on a Radio Shack CGP-115 color graphics printer.

A typical printout appears in Fig. 5. It assumes you have bought a call option that gives you the right to buy 100 shares of the stock on some future date at \$120.

The value of the option varies depending on the market price of the stock on that date. The option is obviously worthless if the market price turns out to be below \$120.

Stock	Buy	Accum Qty	88
Quantity	88	Wt Avg Prc	56
Price/shr	56	Cents/shr	77.22
Reg Comm	67.9536	Cents/shr	0
Diac Comm	67.9536	% Diac	0
Ant Diac	0	Net Monies	4995.953
SEC Fee	0		New M100
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Figure 4. Commission calculation.

You'd expect that the option would make money if the stock price turns out to be above \$120, but the option shows no overall profit unless the price rises to at least \$128.63. The amount of money you make by buying at \$120 then selling at the market rate must cover the price of the option (\$8.375) and the broker's commission (\$0.25).

Overview

Each of the three programs in the Investment Analysis package is written in Basic and makes use of the function keys. Because the programs are in Basic, it's easy to modify lines to accommodate, say, changes in the capital gains tax rate.

The program makes no provision for storage of history or other data from the programs. Each time you run a program you must type in any user information (stock prices and so on) again.

The owner's manual rather lamely states that if you want to save user information in a Basic program you must turn off the Model 100 without exiting the program. Of course, this doesn't let you go to another program, and later return to the original program and information.

The owner's manual also states that Investment Analysis requires at least 16K RAM. The storage size of the three programs is as follows: FISE requires 7,466 bytes, COMM requires 4,886 bytes, and OSE requires 7,240 bytes. In fact, each program requires



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REVIEWS

more memory due to the variables and arrays involved.

Each program is pretty fully error-trapped, so it's difficult to enter invalid information. Because none of the programs stores up information or communicates with any outside device, not much harm can result from an invalid entry anyway; the stakes just aren't that high.

Documentation

The 81-page owner's manual separates the documentation for each program into three sections: instructions, examples, and appendices. When you use a program, you must often thumb through all three sections to try to find a particular paragraph.

I often test a new program by trying to run it without benefit of the manual. I found the programs in this package, however, completely impenetrable. Even after reading the instructions several times, I often was unclear about which button to push next.

This difficulty was exacerbated by the fact that often the function key label row (at the bottom of the screen) listed functions for function keys that I couldn't use at that moment. The label line should change whenever the permissible menu choices change.

Neither the program nor the user's manual explains any of the investment terms used by the package. For example, OSE uses such terms as butterfly spread and covered write. It would be impossible to proceed unless you had

substantial prior knowledge of options, or a comprehensive introductory text.

Operation

In all fairness, these programs do

calculate what they are advertised to calculate. Someone who wants to know the effective yield of a tax-exempt security or a sales commission, or the money-making price of an option, will be able to do so after sub-

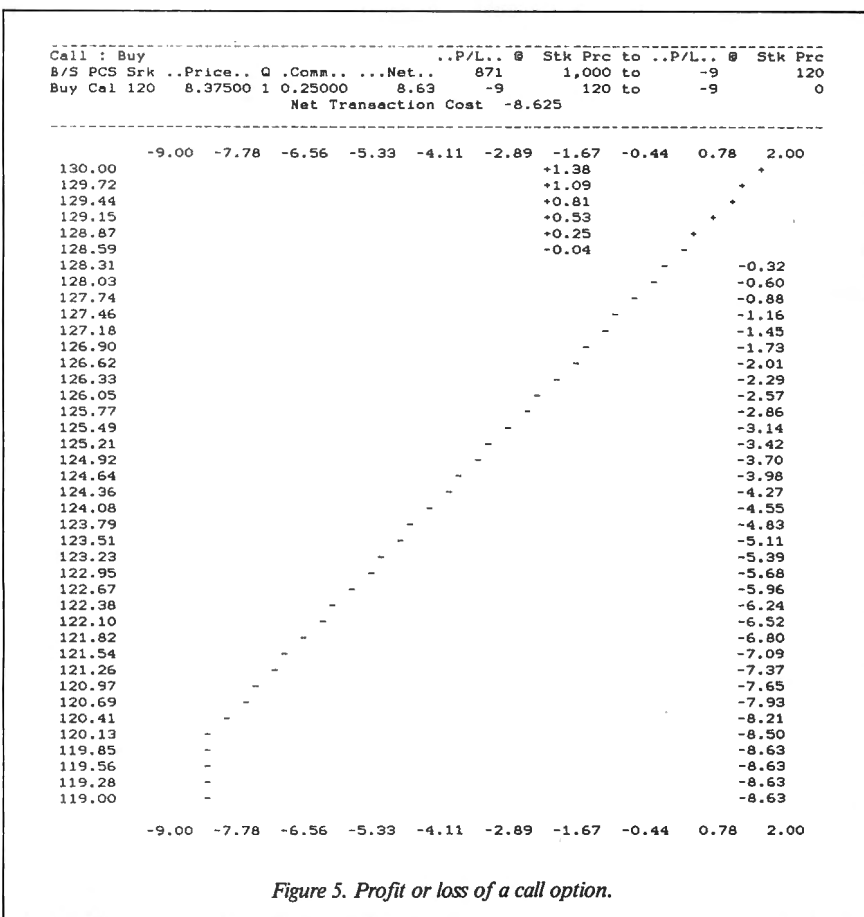


Figure 5. Profit or loss of a call option.

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stantial study. Indeed, someone who uses the programs every day would grow accustomed to them and would have no difficulty using them.

While you could accomplish everything in the Investment Analysis package with a programmable business calculator, the package, after you master it, is probably more convenient. ■

Directory Access With Toolkit

by William J. Schauert

Toolkit is a collection of disk directory utilities for Model III TRSDOS. It lets you access any file on any TRSDOS disk, even those that are password protected or invisible on your directory.

One command even lets you remove all file protection including limited back-up attributes. If you have any disks that have programs with protected files you need to access, Toolkit will save you time and trouble.

Toolkit comes on a disk that includes TRSDOS 1.3. The utility portion of the disk consists of two main programs: INTROTK and Toolkit. Since TRSDOS is on the disk, all the standard TRSDOS utility programs are available.

INTROTK

INTROTK performs "one specific operation," according to the user's manual. It appears that TRSDOS itself uses a special password encryption scheme with which the Toolkit utility is not compatible.

INTROTK provides compatibility so Toolkit can decode all passwords. The manual does not make it clear whether you need this scheme only on the disk that contains the utility or whether you must invoke it on every disk you want to use with Toolkit.

To use INTROTK, enter the utility name from the TRSDOS command line. Once loaded, the utility asks if you want to disable the special password feature, enable it, or quit. You must enter a D, E, or Q, then hit the enter key. The utility then either installs or removes itself from the disk.

If you enter one of the correct option letters and then hit the break key,

the command operates anyway. If you hit the clear key, the screen clears and you can't recover the menu except by rebooting the disk or remembering what you were supposed to enter and then hitting the enter key.

Toolkit

Toolkit contains 13 subcommands that let you perform various disk directory modifications. To use the utility, type in TOOLKIT from the TRSDOS command line. The program loads and displays a menu of all available commands. All subcommands return to this menu so you



don't usually need the manual to run the program.

As in INTROTK, the clear key clears the screen. However, in Toolkit, the break key aborts any command in progress and restores the main menu. You execute all subcommands by entering a single letter (see Table 3 for a list of the commands).

In general, every command operates the same way. You enter the desired command letter and hit the enter key. The utility asks you which drive the desired disk is in (zero to 3), then performs the functions.

A nice feature is that each time a command is about to execute, the utility asks whether you want to go on by letting you enter a Y, N, or Q. This feature lets you reconsider before you change something.

Also, after each command, Toolkit asks if you want to save the changes to disk. This gives you one last chance to review your changes before anything happens.

Commands

Command A lets you change the

name of your disk. Most disks have the name TRSDOS, but you can assign a new name with this command.

Commands B, C, and D all work with file passwords. You can operate on either the update or access passwords. The B command displays each file and asks if you want to remove the password. You can answer yes, no, or quit to each one.

The C command operates in a similar manner except you can enter a new password as it displays each file. The D command only decodes and displays each file's password. D does not display the original password, but the simplest four-letter combination that matches the hash code for the original password. For example, if the password is PASSWORD, the program decodes it as ABKL; this combination allows you full access to the file.

The E and F commands are similar to the above file operations, except that they change or display the disk master password. Again, these commands display only a four-letter hash code equivalent, but it works fine for copying and accessing the disk.

In TRSDOS, all files can have a level of protection ranging from zero to 7. These allow access only for Read, Execute, and so on. Toolkit commands G and H let you modify these protection levels. The G command asks if you wish to remove (set to zero) the protection on each file. The H command displays the current level and lets you set it to a new one.

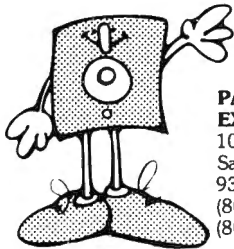
You can remove or assign system attributes with the I and J commands.

A	Change disk identification name
B	Remove file passwords
C	Change file passwords
D	Decode file passwords
E	Change disk password
F	Decode disk password
G	Remove protection levels
H	Change protection levels
I	Remove system attributes
J	Assign system attributes
K	Copy directory (PRI/DUP)
L	Remove all protection
M	Sort primary directory
Q	Quit program, go to DOS

Table 3. Toolkit subcommands.

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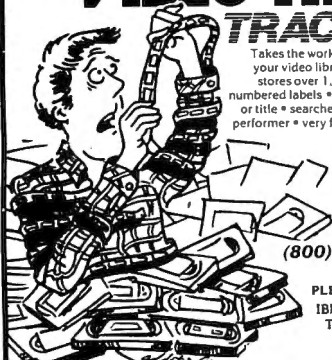
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TRSDOS does not show system files when you look at the directory, even if you use the INV option. You must also use the SYS option to view files with system attributes. A typical system file is the program Basic.

Toolkit command K lets you create a copy of your directory in a safe place on the disk. This is handy if you're working on the directory with this or some other utility and have a chance of blowing it. If you perform a directory copy, you can always restore the original directory from the copy.

To remove protection from all your files in one step, use the L command. It removes all file protection attributes, system attributes, passwords, and limited back-up attributes.

When you display your TRSDOS directory, the files don't appear in any useful order. Toolkit's M command sorts the directory into ascending alphanumeric order. This makes finding programs on the disk easier. Only the primary directory is affected by this or any command.

The Q command allows a graceful return to TRSDOS Ready.

Documentation

Toolkit's 14-page manual is adequate but not extensive in its explanations of each command. In addition, it provides no information on how the programs work or technical information on how the directory is struc-

Toolkit

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tured. And its light blue ink makes reading difficult.

Conclusions

Toolkit contains useful directory access and protection level modification programs. You'll need it if you've forgotten the master password for a disk or any file on a disk.

The only feature missing from the program is the ability to display the directory from within the utility. You must exit the program to display the directory in its normal form.

The programs all work without errors and allow you enough chances to

change your mind before any changes take place. ■

Assistance for The Investor

by Alan Neibauer

Computer-Assisted Investment Handbook is a collection of 50 short Basic programs that make a cursory analysis of stock market data. The book contains a listing of each program suitable for entry into a TRS-80 along with, in most cases, a sample run.

From a programming standpoint, this handbook is solid. However, I question the practical value of the programs and the degree of expertise required by the user. In general, the market novice needs a large dose of education and experience to gain any practical insights from the programs.

The early chapters deal with general statistical measures. They discuss and provide programs for computing averages, variations, and moving averages of a set of data.

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REVIEWS

such as treasury bills and bonds, soybean crush spread, options, and puts and calls. The final chapters deal with stock index futures and forecasting stocks.

Evaluation

The strong point of this book is the number of programs presented. For someone interested in statistical analysis or quite knowledgeable about investment, the programs might provide an important tool. He would have the expertise to adequately evaluate program output.

However, the novice investor would have problems. Most programs require user input of market or corporate data. The discussions give little clue to where you can obtain such data.

Also, many of the sample program runs don't use appropriate illustrative data and do not make it clear what real data you should use. A program to calculate a monthly seasonal index uses the numbers 1-12 as monthly stock averages. Because the input data

Computer-Assisted Investment Handbook



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does not reflect a real-life situation, the resultant annual percent changes have little value.

With most programs, the author provides no evaluation of program output or discussion of its application

in trading decisions. A careful evaluation of program results would serve as a useful instructional tool.

For example, in the discussion and program for exponential smoothing for forecasting, you'd expect that using this forecast lets you make a decision regarding buy, sell, or hold options. The introduction to the program claims that the method might indicate a sell or buy signal. But the author never explains where to get the appropriate input data or how to evaluate output data.

Wrap-up

Except for one error in a program to find the median, in which the author uses an L for the number 1, the programs are logically correct and quite simple.

If you are knowledgeable about the market, *Computer-Assisted Investment Handbook* presents a number of potentially useful analysis tools. If you are a novice, let your broker earn his commission by supplying adequate investment advice. ■

REVIEW DIGEST

TRS-80 Model 2000, Tandy/Radio Shack, One Tandy Center, Fort Worth, TX 76102, \$2,999 (128K, two floppy-disk drives).

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Dynax DX-15, Dynax, 5698 Bاندینی Blvd., Bell, CA 90201, \$599 (parallel interface); \$649 (serial interface).

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MCMS Bulletin Board System, Lakeland Electronics, 401 W. Hawthorne, Round Lake, IL 60073, Models I and III (48K, two disk drives), \$49.95.

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PFS:File, Tandy/Radio Shack, One Tandy Center, Fort Worth,

TX 76102, Models III and 4, \$124.95.

"PFS:File is a limited data base management program which is aimed at the non computer-oriented business person who needs a basic (and easy-to-learn) way to store and retrieve records, but doesn't need to manipulate those files in any way other than searching by any of the fields and printing simple reports.

"The program has a number of limitations—the most serious being its inability to access more than one disk drive." *Basic Computing*, March, p. 64.

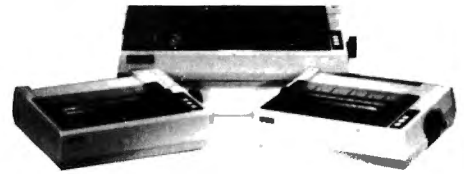
Subterranean Encounter, Toucan Software, 4024 Canonero Court, Fair Oaks, CA 95626, Models I and III (48K, tape or disk), \$22.95.

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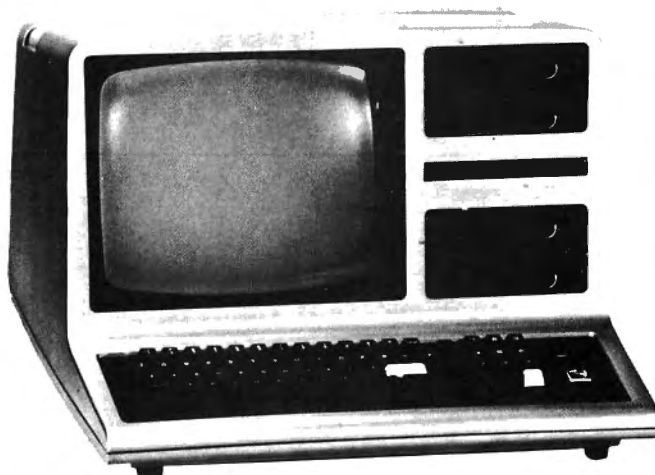
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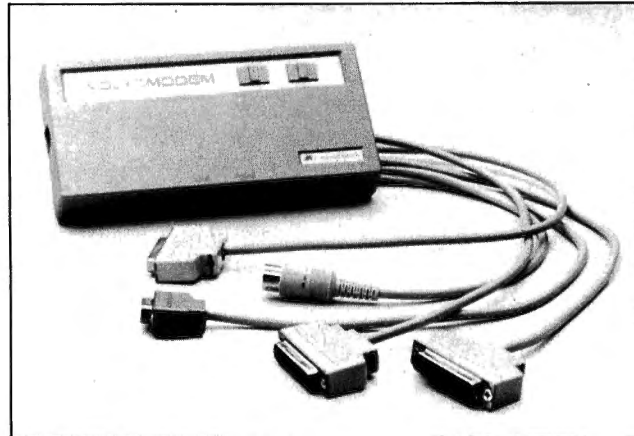
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The Volksmodem, backed by a lifetime limited warranty, comes with a free subscription to the information service, The Source. For more information contact Anchor Automation Inc., 6913 Valjean Ave., Van Nuys, CA 91406, 818-997-6493.

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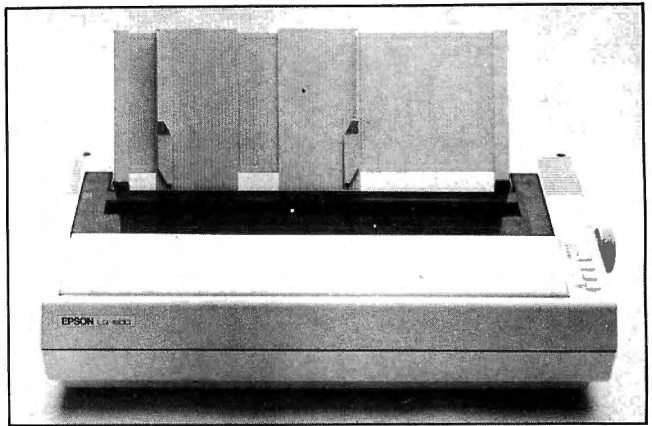


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Epson's LQ-1500 24-pin dot matrix printer has three speeds.

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Both a 16K version and a 32K version (transferable to disk) come on cassette from Spectacular Software, P.O. Box 363, Mansfield Center, CT 06250. Add \$1.50 shipping and handling fee.

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dBase II Coding Guide

The dBase II Coding Guide helps TRS-80 software writers formulate their own data base standards. The 46-page reference presents standards and examples of how to construct top-down programs that are structured, testable, and easily maintained.

The guide sells for \$22 from Associated Technology Co., Box 448, Estill Springs, TN 37330, 615-967-9159.

Reader Service ✓ 561

Epson Does It Again

Epson America Inc. (Computer Products Division, 3415 Kashiwa St., Torrance, CA 90505, 213-539-9140) has come out with a 24-pin dot-matrix printer that prints in three modes—draft, letter-quality, and graphics—at up to 200 characters per second.

Epson describes the LQ-1500's letter-quality mode as approaching daisy-wheel

quality, and the graphics mode as close to half-tone photos.

Features on the LQ-1500 include a single-sheet feeder, multiple character fonts, logic seeking, bidirectional printing, and a parallel, serial, or IEEE interface. Options include tractor and cut-sheet feeders. It sells for under \$1,500.

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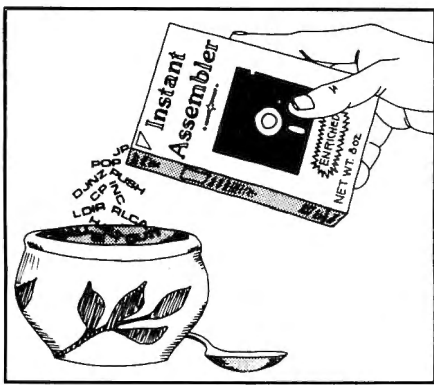
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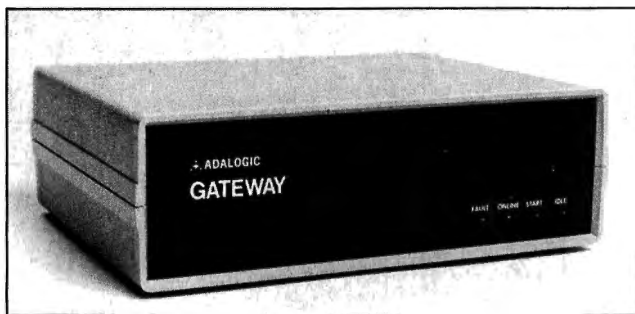
A journal-specific end-of-volume index is available annually for from \$5 to \$12 each. (The 1983 *80 Micro* Microindex is available for \$10.)

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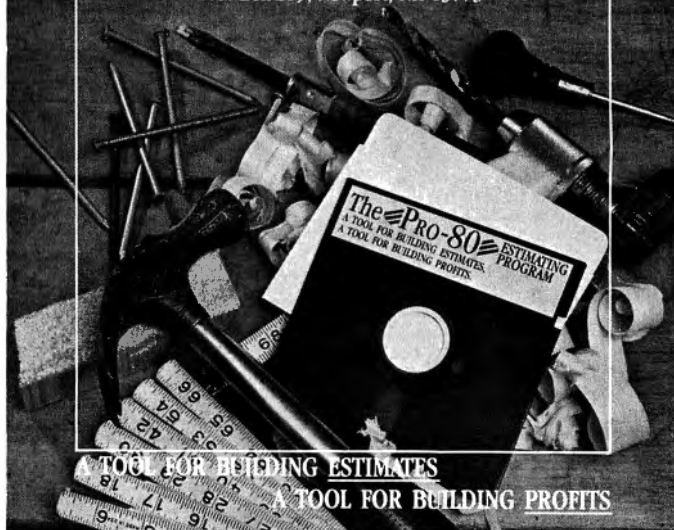
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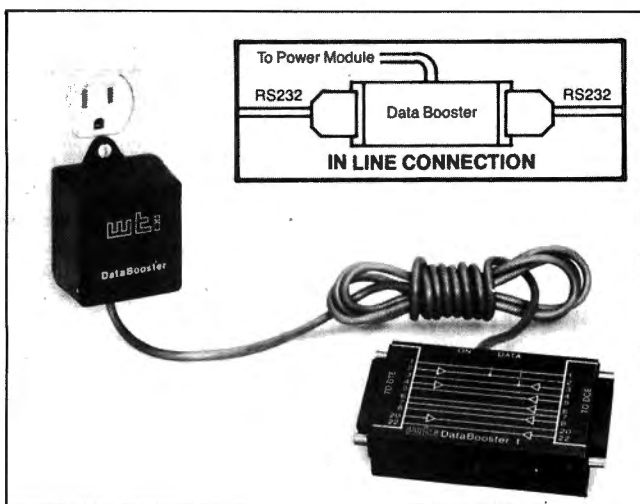
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Getting More Out of Your MC68000

The MC68000 Development System (\$795) from Educational Microcomputer Systems (P.O. Box 16115, Irvine, CA 92713, 714-553-0133) is a hardware/software package to help you develop and debug MC68000 programs using your TRS-80 Model III system.

The hardware consists of a stand-alone M68K single board computer with a 6MHz or 10MHz M68000 CPU, 20K bytes of fast static RAM, 16K bytes of EPROM space, two RS-232 serial ports, 16-bit parallel port, five 16-bit counter/timers and an expansion



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The software includes a M68KXAS macro cross assembler, which assembles source files created by local editors or word processor

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The M68K on-board mon-

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 - 3. Model III
 - 4. Model 4/4P
 - 5. Model 16
 - 6. Model 100
 - 7. Model 2000
 - 8. Pocket Computer
 - 9. Color Computer
- E. Do you plan to purchase a (another) Model 2000 within the next 6 months?**
- 1. Yes
 - 2. No
- F. Do you feel that the program listings in 80 Micro's Model 100 section are useful?**
- 1. Yes
 - 2. No
 - 3. Doesn't apply
- G. What type of program would you most like to see on LOAD-80?**
- 1. Music/Sound
 - 2. Graphics
 - 3. Games
 - 4. Utilities
 - 5. Education
 - 6. Home/Personal
 - 7. Science
 - 8. Business
 - 9. Other
- H. What is your age?**
- 1. 12 or under
 - 2. 13-20
 - 3. 21-25
 - 4. 26-35
 - 5. 36-45
 - 6. 46-55
 - 7. 56-60
 - 8. 61-65
 - 9. Over 65
- I. What is your annual household income?**
- 1. Under \$20,000
 - 2. \$20,000-\$40,000
 - 3. \$40,000-\$60,000
 - 4. \$60,000-\$80,000
 - 5. \$80,000-\$100,000
 - 6. Over \$100,000
- J. What is your occupation?**
- 1. Professional
 - 2. Engineering
 - 3. Data Processing
 - 4. Business
 - 5. Education
 - 6. Technician
 - 7. Government
 - 8. Student
 - 9. Other
- L. Which of the following columns do you read? Please rate them on a scale of 1 (seldom read) to 5 (always read).**
- | | | |
|---|---|--|
| <input type="checkbox"/> 1. Side Tracks | <input type="checkbox"/> 5. The Next Step | <input type="checkbox"/> 9. Reviews |
| <input type="checkbox"/> 2. Feedback Loop | <input type="checkbox"/> 6. Project 80 | <input type="checkbox"/> 10. Pulse Train |
| <input type="checkbox"/> 3. Reader Exchange | <input type="checkbox"/> 7. New Products | <input type="checkbox"/> 11. Input |
| <input type="checkbox"/> 4. Pascalutations | <input type="checkbox"/> 8. C + Notes | <input type="checkbox"/> 12. The BBS Express |
- M. If you are not a subscriber please circle 500.**

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29 34 39 44 49	179 184 189 194 199	329 334 339 344 349	479 484 489 494 499
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104 109 114 119 124	254 259 264 269 274	404 409 414 419 424	554 559 564 569 574
105 110 115 120 125	255 260 265 270 275	405 410 415 420 425	555 560 565 570 575
126 131 136 141 146	276 281 286 291 296	426 431 436 441 446	576 581 586 591 596
127 132 137 142 147	277 282 287 292 297	427 432 437 442 447	577 582 587 592 597
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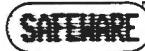
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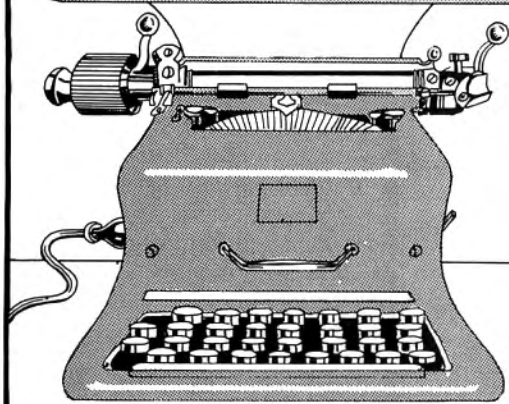
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Continued from p. 225

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The HP 2225C is sold through authorized Hewlett-Packard dealers and sales representatives. For more information call 800-FOR-HPPC.

Reader Service ✓ 579

CP/M Explained

Getting Started With CP/M (\$12.95) is a step-by-step introduction to CP/M-80 2.2 for the novice computer user, from Hayden Book Co. (10 Mulholland Drive, Hasbrouck Heights, NJ 07604).

Authors Rob Patten and Paul Calandrio give an

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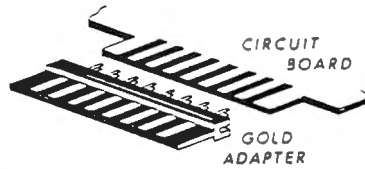
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overview of how CP/M operates and detailed descriptions of CP/M's structure and function. They introduce CP/M commands for storing and retrieving data, loading programs, and naming files, as well as presenting a summary of all operating system commands.

A glossary and pull-out reference card supplement the 97-page paperback.

Reader Service ✓ 576

Your TRS-80: Part of the Furniture

Remember how neat and homey your house was before you bought that micro-computer? Then came the printer, the disks, the manuals, the printer paper, the modem, the reference books, and all those issues of *80 Micro*. Before you knew it they had taken over your entire living room.

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The software verifies data stored in a file by accessing user definitions of valid data for any field in a Profile data base. It provides 13 functions to define eligible data, and it checks the range of values in a field or the field's data type (alphabetic, numeric, or alphanumeric). A separate function checks zip codes and states.

DataProbe self-checks operator input with the verification system. It includes a run-time module and tutorial/reference manual.

Reader Service ✓ 562



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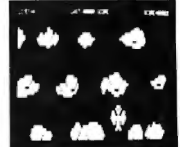
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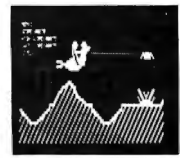


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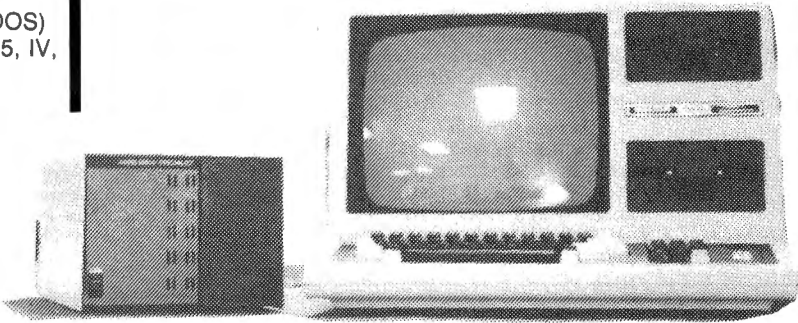
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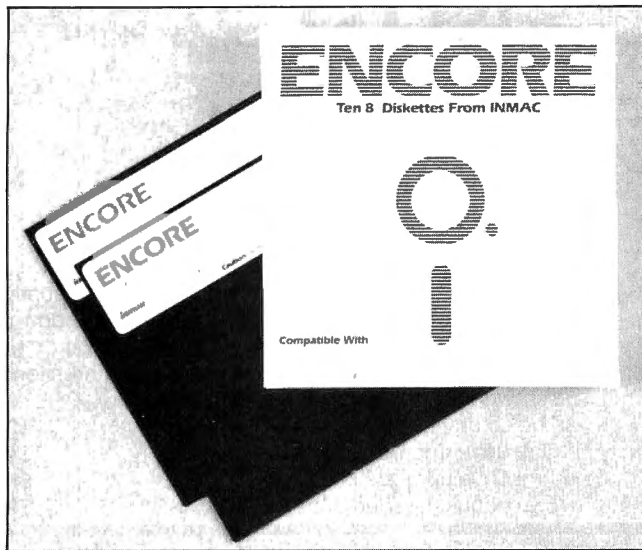
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The package, or a demo disk with user's guide (\$50), is available from Financio-metrics Inc., P.O. Box 1788, Lafayette, CA 94549, 415-376-9455.

Reader Service ✓ 560

Eight-inch disks are available in either single-sided, single-density or single-sided, double-density configurations and range in price from \$1.99 to \$2.69.

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Reader Service ✓ 555

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Ultra Term Version 2 is the most powerful communications programs available for the TRS-80. The Ultra Term package includes a full featured terminal program, a self relocating host program, and hex conversion utilities for bulletin board downloading, all at prices far lower than competing programs with less features. Ultra Term supports auto dial modems with an easy to use dial menu, and supports any modem that accepts dial commands from the RS-232 port or by pulses on the RTS line or cassette port. This includes Radio Shack Modem 2, Hayes Smartmodem, or the Lynx auto dial. Ultra Term Version 2 is the only terminal program for the TRS-80 that has a true prompt controlled auto logon feature. This feature, when used in conjunction with our auto dial feature allows the user to issue a single command to select a telephone number, set RS-232 parameters, dial the number, wait for prompts from the system being called, and answer multiple questions to sign the user onto the system being called. No other TRS-80 terminal program available offers this power and versatility. Ultra Term is the only program that offers a direct to disk file transfer mode that allows full control from the transmitting computer, and unattended operation at the receiving computer. This gives you the ability to transfer multiple files or an entire disk with no one present at the receiving computer. Ultra Term has an exclusive split screen feature that allows simultaneous two way communications from terminal mode and supports line printers with a 1K print buffer. Ultra Terms universal ASCII format file transmission supports delays between characters or between lines, as well as prompt controlled transmission for compatibility with virtually all systems. A counter continuously displays the amount of free memory remaining whenever the buffer is in use. Ultra Term will run on a Model 1, Model 3 or Model 4 TRS-80 disk system with any TRSDOS compatible operating system (RS-232 and Modem required).

Ultra Term Version 2 retail price: \$79.95

Upgrade for current Ultra Term Version 1 owners: \$24.95 (For Upgrade, you must return your original version 1 disk.)

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The INFORMATION EXchange bulletin board system contains all the software necessary to set up your own bulletin board service or message center. The Infoex-80 software automatically answers phone calls, displays a logon message or bulletin, allows callers to enter and retrieve messages, and lets users chat (type) directly to the system operator. Infoex-80 supports uploading and downloading in both universal ASCII format and Ultra Term disk file transfer format for accurate and fast file transfer. Infoex-80 allows users to apply for individual passwords: so private password protected messages can be left for any user. The system also keeps track of the number of times each user has accessed the system, as well as the highest message each user has read, and advises each user when messages have been left for them. The programs requires a TRS-80 Model 3, Model 4 or Model 1 with double density adapter, 2 disk drives, 48K ram, RS-232 interface, an auto-answer modem and a DOS that supports the CMD "Doscnd" from BASIC (Any DOS but TRSDOS).

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TRS-80 Cash Register

The Point of Sale Inventory Control program for the Model III acts as a cash register and updates your inventory as you make sales.

The inventory portion of the program has 14 fields for keeping track of item number, vendor code, vendor stock number, description, cost, retail price, on-

hand supply, on-order supply, minimum and maximum quantities, number sold to date, date of last sale, taxable item, and a flag to alert you to items in short supply.

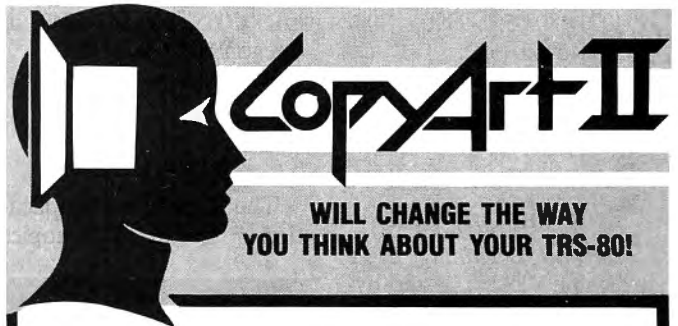
The cash register portion keeps track of over 3,000 line items or 1,500 transactions per day. It handles up to 35 employees and 200 different vendors. You can access it from the inventory mode in order to update inventory during working hours.

The program is available in three sizes. Cash2 (\$399) uses two drives for inventories of up to 2,500 items, Cash3 (\$499) uses three drives for inventories of up to 5,000 items, and Cash4 (\$599) uses four drives for up to 7,500 items.

For more information contact K & L Software, P.O. Box 39093 Northridge

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The book contains 33 programs, including utilities such as screen dumps and error-traps, designed for the Model I (Level II) and Model III.

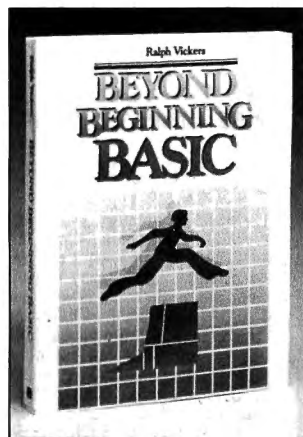
The 220-page book sells for \$14.95 through Dilithium Press, 8285 S.W. Nim-

bus, Suite 151, Beaverton, OR 97005, 800-547-1842, in Oregon 503-646-2713.

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and verifies a 40-track double-density disk in 26 seconds. Format, back-up, and verification procedures take 42 seconds each.

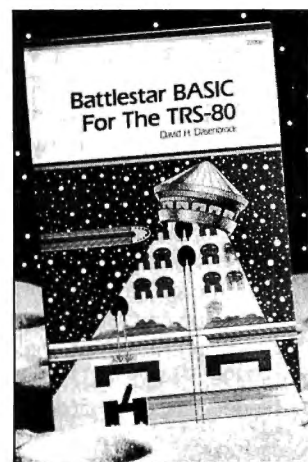
The 48K program uses the operating system RAPIDOS that reads or writes an entire disk track in a single revolution. Versions of RAPIDOS are file format compatible with Model I TRSDOS 2.3, Model III TRSDOS 1.3, and Model 4 TRSDOS 6.0.

The program and manual are available from Rapidynamic Software Inc., 14358 Dyer St., Sylmar, CA 91342.

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The COMPLETE DEVELOPMATE 81, for Model I, with software, power supply, emulation cable, TRS-80 cable, and "universal" personality module \$329

DEVELOPMATE 83, Model III/4 version, same as above \$329
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Written for users of the Model I/III/4, the book is available for \$12.95 from Howard W. Sams & Co. Inc., 4300 West 62nd St., Indianapolis, IN 46268, 317-298-5400.

Reader Service ✓ 578

Be a Sorcerer Apprentice

Belboz the Necromancer, the most powerful of all Enchanters, has vanished. You

must rescue the kingdom and find him by using magic spells and potions you acquire along the way.

Sorcerer (\$49.95) is the second release in Infocom's Enchanter series of adventures in the mystic arts. The Model I/III game understands a vocabulary of more than 1,000 words—nearly 50 percent more than any other form of interactive fiction. For more information contact Infocom Inc., 55 Wheeler St., Cambridge, MA 02138, 617-492-1031.

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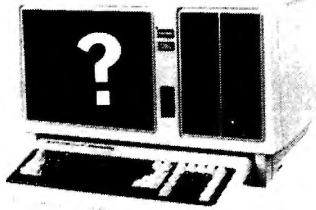
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simple touch of a key. It prints a full month's calendar for any year, and sorts and displays a current day's appointments.

Time Machine is available from EVS Engineering Co., 9528 Suite 35, Miramar Road, San Diego, CA 92126, 619-695-1385. Include \$2 shipping and handling on orders.

Reader Service ✓ 567

A Board to Call Your Own

Lary L. Myers shows how you can design and implement a computer bulletin board system for your own application in *How To Create Your Own Bulletin Board*.

The 224-page book examines how CBB systems work, the needed hardware, and the step-by-step tech-

niques of designing a host communications network program. As well as listing over 275 CBB systems and telephone numbers, the author analyzes and critiques the Apple, TRS-80, and Commodore 64 computers as CBB terminals. It includes TRS-80 programs for two CBB applications and two smart terminals, and lots of tips.

The book is published by Tab Books Inc., Blue Ridge Summit, PA 17214, 717-794-2191, and comes in hardcover (\$19.95) and paperback (\$11.95).

Reader Service ✓ 558

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The 10-ounce mug comes in two other versions—"Computer nut on/off duty" and "Programmer on/off duty." Each mug costs \$8.95 plus \$2 shipping from Sweet Gum (15490 N.W. 7th Ave., Miami, FL 33169, 800-237-9338, in Florida 305-687-9338). Their free catalog features many other computer-related novelty items.

Reader Service ✓ 580

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The two-disk Model I/III system requires 48K RAM. For more information, contact Citation Systems, Cumberland Road, Atlanta, GA 30306, 404-881-6328.

Reader Service ✓ 551

Math and Schematics Software

AlphaBit Communications Inc. (13349 Michigan Ave., Dearborn, MI 48126,

313-581-2896) announces two new programs for Models I, III, and 4.

VPM Math Pak (\$69.95) is for the Z80 Assembly-language programmer who wants to incorporate floating point variable-precision math routines. It includes routines to convert ASCII strings to binary floating point storage and vice versa, a binary floating point numeric comparison, a 255-string comparison, binary to integer conversion, and binary to fraction conversion. The math is accurate to 37 decimal digits and accommodates a 16-byte mantissa. The code is fully commented.

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circuits on disk. You can add to the symbol set and create custom circuit designs. A special version of Electrofont prints alphabet fonts from the Lazy Writer word processor.

Reader Service ✓ 559

Xenix Word Processor

UniPress Software Inc. (1164 Raritan Ave., Highland Park, NJ 08904, 201-985-8000) has announced the Gosling EMACS screen editor and the LEX86 word processing system for the Model 16 using the Xenix operating system.

EMACS (\$395 for binary/\$995 for source code) is a full-screen text editor with multiple windows, built-in MLISP programming language, search and replace commands, and programming aids. EMACS communicates directly with Xenix, letting you access system commands and programs from within the EMACS window.

LEX86 (\$750), a menu-driven word processor system, also contains a mass mailing data base and a 100,000 word spelling system.

Reader Service ✓ 564

New Products listings are based on information supplied in manufacturer's press releases. 80 Micro has not tested or reviewed these products and cannot guarantee any claims.

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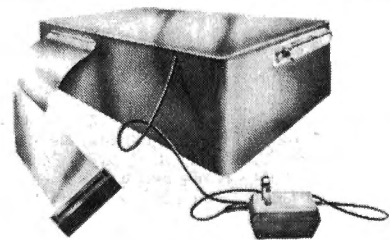
The UPI interfaces are completely self contained and ready to use. A 34 conductor cable and connector plugs onto the parallel printer port of the Model I expansion interface or onto the parallel printer port on the back of Models II and III. A DB25 socket mates with the cable from your serial printer. The UPI interfaces convert the parallel output of the TRS-80 printer port into serial data in both the RS232-C and 20 MA. loop formats.



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ADVANCED COMPUTING

522

a magazine for business, scientific, and professional users of microcomputers, features in-depth reviews of:

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Advanced Computing, for those who use micros in their livelihood, doesn't contain articles for the hobbyist. Its advertising is limited to less than 40% of the magazine.

Advanced Computing is successor to **two/sixteen** magazine, published bi-monthly since May, 1982. Subscriptions are \$30/year (\$36 first class: US, Canada, and Mexico); \$50/two years (\$60 first class); other foreign is \$67 per year, air mail. VISA/MC may be entered by phone at (717) 397-3364.

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Load 80

On the April 1984 Load 80 cassette, TEXT2A (Bugs from Outer Space) has a line change. Line 1090 should read as it does on p. 84 of the April issue.

If you have questions about the programs on Load 80, call Keith Johnson at 603-924-9471.

If you have problems with your Load 80 subscription, write to Lori Eaton c/o 80 Micro, Rte. 101 & Elm St., Peterborough, NH 03458.

May 1984 Load 80 Directory

Article	Page	Cassette File Spec	Disk File Spec	Comments
Side A				
—	—	A	TITLE/BAS	Basic
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Smart Talk	50	MPHC	MPH/CMD	System
Shorter Sorts	62	D	VCSORTER/BAS	Basic
Plotting Along	68	E	EQUAPLOT/BAS	Basic
Side B				
Basically Better Graphics	104	F	DEMO/BAS	Basic
Bugs from Outer Space	108	TEXT3A	TEXT3A/SRC	Ed/Asm
Bugs from Outer Space	108	TEXT3B	TEXT3B/SRC	Ed/Asm
Bugs from Outer Space	108	TEXT3C	TEXT3C/SRC	Ed/Asm

*This program is not available on the cassette.

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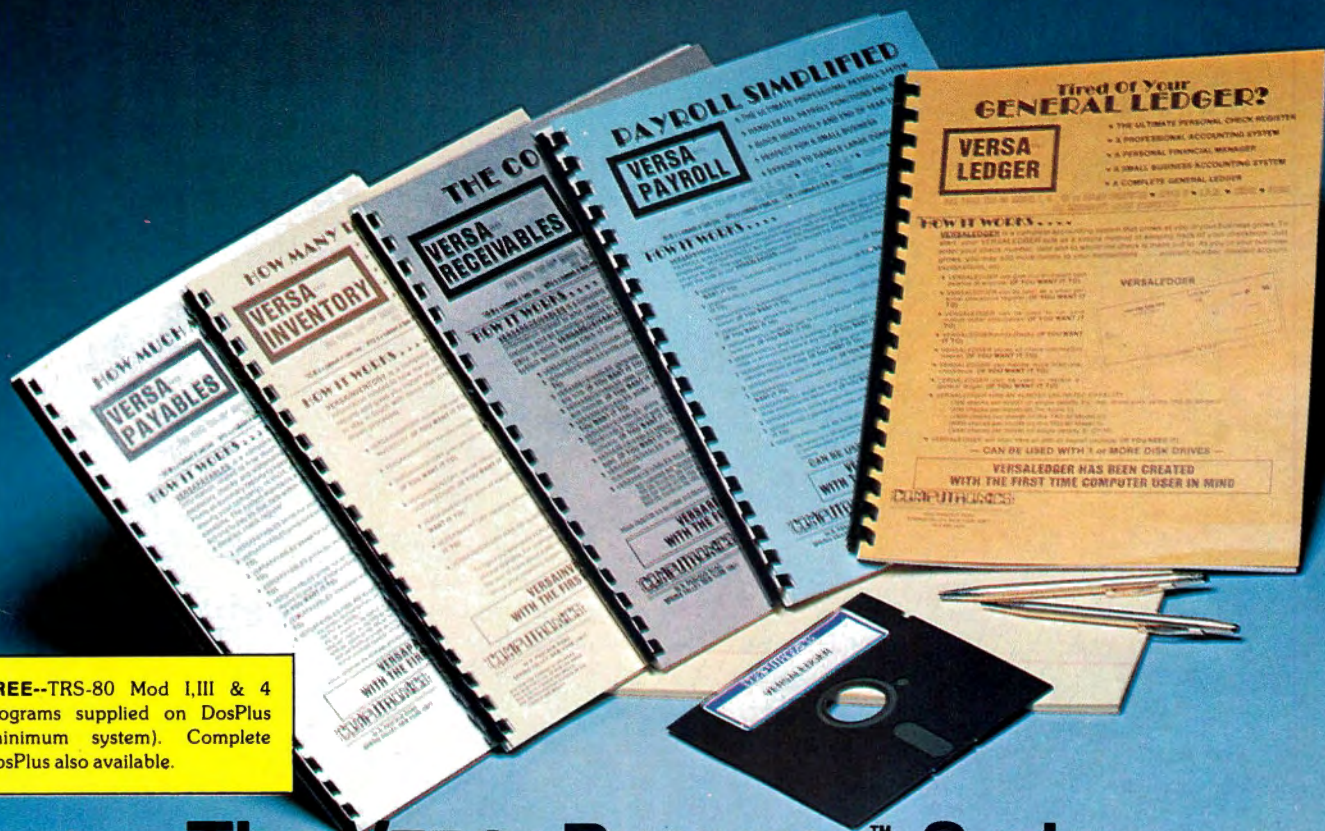
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controllers for 5¼" and 8" floppy disks (single/double sided, single/double density, up to 4.5 Megabytes capacity), the LNW80 2 also gives you the unique ability to read and write diskettes from a greater variety of other popular computers than does any other microcomputer. So regardless of how big you grow, you will never end up with thumb-twiddling down time while you expand to a more powerful system. The LNW80 2 will always have enough muscle to handle your biggest and toughest jobs.

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