80 micro

the magazine for TRS-80* users

SEPTEMBER 1985
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A CWC/I PUBLICATION

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- Supercross/XT
- Supermod4
- Little Brother
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JMG

Top of the list for this month are the great specials we have for Model 4 owners: check out the incredible packages we've been able to put together on T/Maker and Dosplus IVa. Also, for you Infocom fans we have the newest release, CUTTHROATS (for Model 3 mode only, folks). Plus our regular assortment of top quality stuff for the TRS-80 Models I, III and 4. Coming next month: new hardware to allow monitoring of dairy farms; yes folks, we're talking cow chips here.

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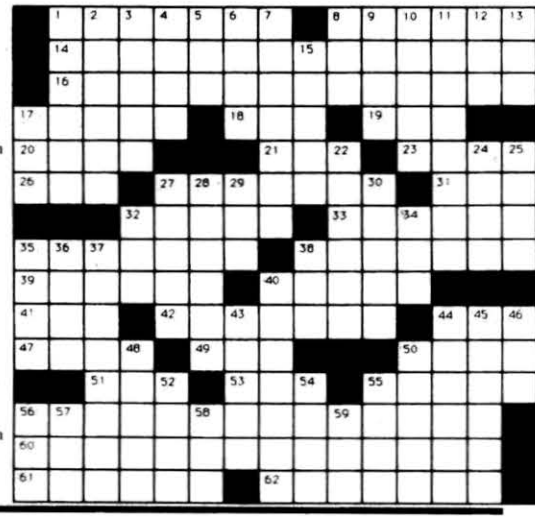
"2001"

ACROSS
1 – Horton the elephant ended here
8 – Mrs. Robinson's daughter
14 – A villain in "2001"?
16 – Parts of a computer's makeup
17 – It means wedge
18 – Witness
19 – "2001" computer
20 – Cultural pursuits
21 – Have dinner
23 – Preoccupied
26 – Contest in the country
27 – Elevator operator, in England
31 – Confucian virtue
32 – It means dust
33 – Pick from the pack
35 – Computer type
38 – _____ find (searches line by line)
39 – Solver's route?
40 – Young calves
41 – Zodiac type
42 – "2001" earth communication links
44 – San Francisco Airport: Abbr.
47 – Part of HEW
49 – Little one
50 – Computer _____: "2001" plug-in module
51 – Emulate Xanthippe
53 – B'way hit sign
55 – Highest ratings from Lloyd's
56 – Used to identify an operand
60 – Certain electronic components
61 – Type of circuit or thoroughfare
62 – "Come and get it!"

DOWN
1 – No two ways about it
2 – Nothing, in Naples
3 – Highest points
4 – Tom, Dick and Harry
5 – Fabulous bird
6 – Collection of Greek poems
7 – The nephew in Donizetti's "Don Pasquale"
8 – Old French coin
9 – Walesa of Poland
10 – "_____ Is Born"
11 – Employs a trouble-shooting technique
12 – Word in the Postman's Creed
13 – Bitter vetch
15 – Small theater in ancient Greece
17 – Bandleader Calloway
22 – A computer language
24 – Agreement
25 – In _____ (all): Lat.
27 – _____ Luck of "Tumbleweeds"
28 – How some golf clubs come
29 – Part of a light bulb: Abbr.
30 – Oscar-winner Patricia et al.
32 – AFL affiliate
34 – Banks' business: Abbr.
35 – Roy's wife
36 – Chilled
37 – _____ a halt
38 – Nemo's milieu
40 – Hatred
43 – Walden on "Lou Grant"
44 – Bernhard of "The King of Comedy"
45 – Most liberated
46 – _____ bodkins!
48 – Hitter Rod
50 – Australian cry
52 – Actress Rowlands
54 – Exclamation from Down Under
55 – Totals: Abbr.
56 – Quick
57 – NYSE name
58 – Eyesore or eye sore
59 – Understand, as a joke



System requirements: 48k—TRS-80* I, III, & IV; IBM* PC or compatible (e.g., Tandy 1000*) Apple*IIs; Commodore*; Atari*.

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MPA ABC

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

Article submissions from our readers are welcomed and encouraged. Inquires 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.

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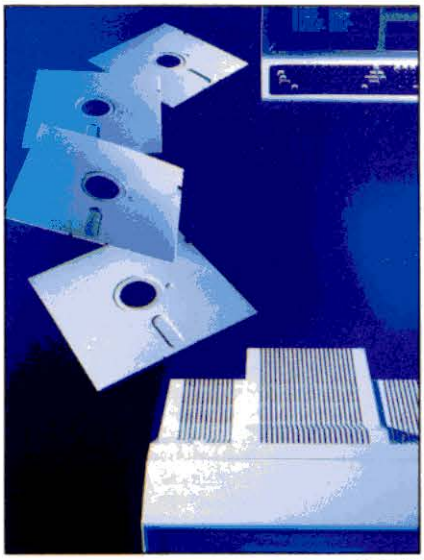
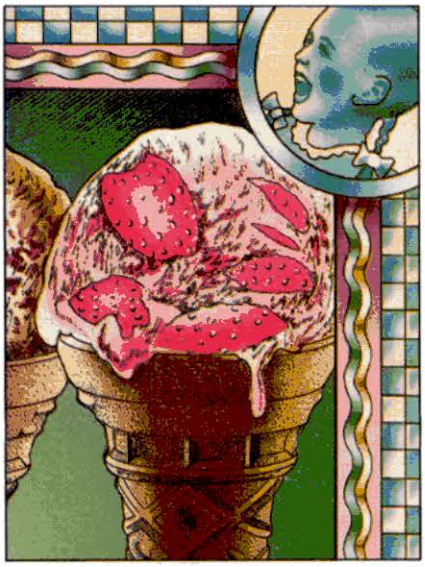
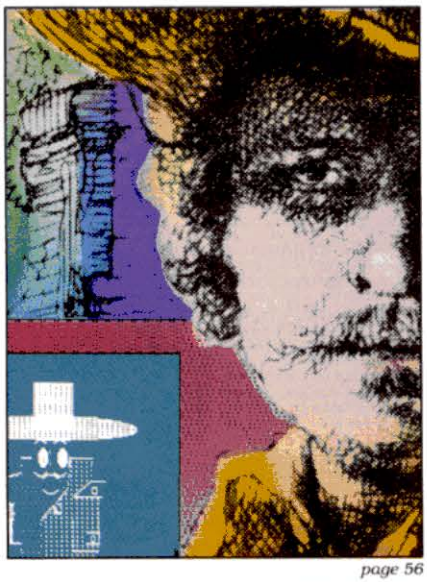
September 1985 80micro



page 36



page 48



page 56

Features

36. **You *Can* Get There from Here**
by Bradford N. Dixon
What it takes to transfer files from one computer to another.

41. **The Perfect Host**
by Bennett Shulman
Step-by-step instructions for using Memdisk to transfer data at high baud rates.
(Model 4)

48. **My 10 Favorite Assembly-Language Subroutines**
by Hardin Brothers
The author serves up an assortment of input and screen-handling routines to merge with your Basic programs.
(Models III and 4; Load 80)

56. **Drawing in Detail**
by Jim Abbassian and Glen E. Sparks
Draw on our MacPaint-style graphics editor for classy high-resolution designs.
(Models III and 4; Load 80)

66. **A Basic Programmer's Best Friend**
by Raymond Pelzer
Debugging is less of a bore with this cross-reference utility.
(Model 4/4P; Load 80)

Departments

6. **Load 80 Directory**
8. **Side Tracks**
by Eric Maloney
12. **Input**
14. **Feedback Loop**
by Terry Kepner
21. **Pulse Train**
by Bradford N. Dixon
25. **Reader Exchange**
29. **Reviews**
edited by Ryan Davis-Wright
Supercross/XT
Accounts Receivable
Little Brother
Teach Your TRS-80 To Program Itself
Brainstormer
76. **Project 80**
by Roger C. Alford
82. **Dave's MS-DOS Column**
by Dave Rowell
86. **Basic Takes**
by Richard Ramella
90. **The Next Step**
by Hardin Brothers
94. **Spreadsheet Beat**
by Doug Peterson
102. **Express Checkouts**
The Offix Personal Office System
IDEA!
HomeworD
Inside CP/M Plus: A Guide for Users
112. **Tidbit #27**
118. **New Products**
edited by Mare-Anne Jarvela
125. **MS-DOS New Products**
edited by Mare-Anne Jarvela
128. **Ask Tandy**

LOAD 80

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

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

If you have any questions about the programs, call Keith Johnson at 603-924-9471. Yearly subscriptions to Load 80 are $199.97 for disk, or $99.97 for cassette. Individual loaders are available on disk for $21.47 or on cassette for $11.47, including postage. To place a subscription order, or to ask questions about your subscription, please call us toll free at 1-800-343-0728 between 9 a.m. and 5 p.m. Or, you can write to Load 80, 80 Pine St., Peterborough, NH 03458.

Directory

Subroutines
Article: My 10 Favorite Assembly-Language Subroutines (p. 48).
Systems: Model III, 32K RAM; Model 4, 64K RAM.

Ten input and screen-handling subroutines.
Languages: Disk Basic, Assembly.
Cassette filespecs: B, C, LIST4, D.
Disk filespecs: LIST1/BAS, LIST2/BAS, LIST3/SRC (source code), LIST4/SRC (source code), LIST5/BAS.

Crosscheck
Article: A Basic Programmer's Best Friend (p. 66).
System: Model 4/4P, 64K RAM.

A Basic cross-reference program.
Languages: Disk Basic, Assembly.
Cassette filespec: E, CROSS.
Disk filespecs: CROSSCHK/BAS, CROSS/SRC (source code), CROSS/CMD (object code), KEYWORDS/ASM (source code).

Rembrandt
Article: Drawing in Detail (p. 56).
System: Model III, 64K RAM; Model 4, 64K RAM; high-resolution board.

An icon-driven graphics editor.
Language: BasicG.
Cassette filespecs: F, G, H, I, J.
Disk filespecs: REMBRAN3/BAS, REMBRAN4/BAS, SCRNGRID/BAS, HEXAGON/BAS, COMPUTER/BAS.

Line
Article: The Next Step (p. 90).
Systems: Models I and III, 32K RAM, Radio Shack EDTASM.

A line-drawing subroutine and sample Basic program.
Language: Disk Basic, Assembly.
Cassette filespecs: LINE, K.
Disk filespecs: LINE/SRC (source code), LINE/BAS.

Report Card
Article: Spreadsheet Beat (p. 94).
Systems: Models I and III, 48K RAM, VisiCalc.

Calculate students' grades based on tests, assignments, and classwork.
Disk filespecs: RPTCARD/VC.

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On Piracy, Scripsit, and the Model 4P

I see by my directory that my Side Tracks disk is filling up with lots of little 1.5K files. Time to chain them together and clean up this mess.

Piracy—No Longer an Issue?

Ah, to be young again. Remember those hot and furious days when copy protection was *the* issue in the TRS-80 community? When the mere mention of the words would give users and vendors apoplexy?

That was back in late 1982 and early 1983. In the eye of the storm was Powersoft's SuperUtility Plus, a program that would unprotect disks but was itself copy-protected. *80 Micro* kicked off the fuss when we asked readers whether we should publish the address of a reader who wanted to offer a way to unlock SU.

We received more mail on the subject than on any other in our history. On one side were consumers who felt they had a right to copy disks for their own use. On the other were manufacturers who argued that protection was the only reasonable way to stop piracy.

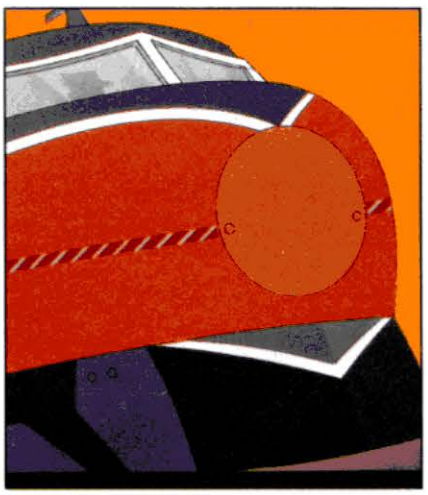
Now comes the news that Powersoft has decided to remove the protection from SU. The company is not protecting its new IBM PC version of SU and could not justify protected and unprotected versions of the same product.

I suspect that Powersoft's move will prompt little comment from the TRS-80 community. While protection remains a volatile topic in other markets, it stimulates about as much debate among TRS-80 users as last week's weather.

Perhaps copy protection is no longer necessary. Perhaps all the pirates moved on to Commodore, IBM, and Apple machines. Or perhaps the manufacturers have given up, choosing to trust consumers and hope their trust is rewarded.

When You're Number 3. . .

I see from an Infocorp. study published in *InfoWorld* that Scripsit was the third best-selling word processor on the market in 1984. It sold 150,000 units, surpassed only by Applewriter (254,000) and Wordstar (290,000), and accounted for 13 percent of worldwide word processing sales. Among the packages it beat out were PFS:Write, EasyWriter, Multimate, and Perfect Writer.



If nothing else, the study points to the TRS-80's invisible but significant presence in the microcomputer industry. It also indicates how important such reports can be in giving a product credibility. Too bad Tandy is so reluctant to give out sales figures on its computers and software; such editorial coverage goes further than advertising and word of mouth ever could.

So Long to the 4P

I liked the Model 4P. It was a classy piece of hardware, with a clean design and nice feel. When Tandy discontinued the machine in May at $650—half-price—it gave consumers the best bargain they've ever gotten from a major computer manufacturer. Many shoppers apparently agreed; by the end of May, you couldn't find a 4P to save your life. It's unfortunate that more people didn't discover the machine sooner.

But while the demise of the 4P is lamentable, it's easily explained. To begin with, Tandy never really marketed the machine. The company seemed instead to sneak it into Radio Shack stores in the dead of night. In fact, some people in The Towers didn't even know the machine existed until they saw it in the catalog.

But the chances are that the 4P's life would have been short even if Tandy hadn't orphaned the computer. Transportables simply don't have much of a market niche. They're neither fish nor fowl; they don't have the full capabilities of a desktop, but aren't as manageable as a true portable.

Tandy's experience with the 4P proves once again that a good product doesn't necessarily translate into good sales. You need potential customers and you need to market it aggressively.

As for all you new 4P owners, congratulations. You got a deal, the kind you probably won't find again for a while.

More on Word Processing

Last month I discussed some of my reservations about word processing. I have several other comments that didn't make the editorial cut, these from an editor's, rather than a writer's, perspective.

I've noticed a disturbing trend among some writers to use their word processors as a smoke screen to hide mediocre writing. Their manuscripts will be impeccably produced on letter-quality printers, with proportional spacing, justified type, boldface and italics, and centered heads. They will even include, in the upper right-hand corner, the exact number of words in the article.

The manuscript looks and feels great, until I start reading it. Then I discover that it's full of muddy prose, poor grammar, spelling errors, and incorrect punctuation. These people should have invested in remedial writing lessons instead of daisy-wheel printers and fancy word processors.

Then there's the case of the query I got recently from a would-be author who had obviously merged a mailing list with a form letter, adding my name and "*80 Micro*" where appropriate. The results included such seductive lines as "Thank you, Eric Maloney, for the opportunity to write for your publication: *80 Micro*."

Needless to say, this was one opportunity the writer will never enjoy.

The IBM Influence

Here's an interesting fact gleaned from recent *80 Micro* surveys: Somewhere between 20 and 25 percent of our readers own or use an MS-DOS machine. This puts IBMs and compatibles fourth behind the 4/4P, III, and I. Many of these MS-DOS systems are used by people who also own TRSDOS machines, showing IBM's influence even in the TRS-80 world. Vendors of TRS-80 products would do well to note the potential here to expand into new markets, if they haven't done so already. ■

80 MICRO JUNE, 1985
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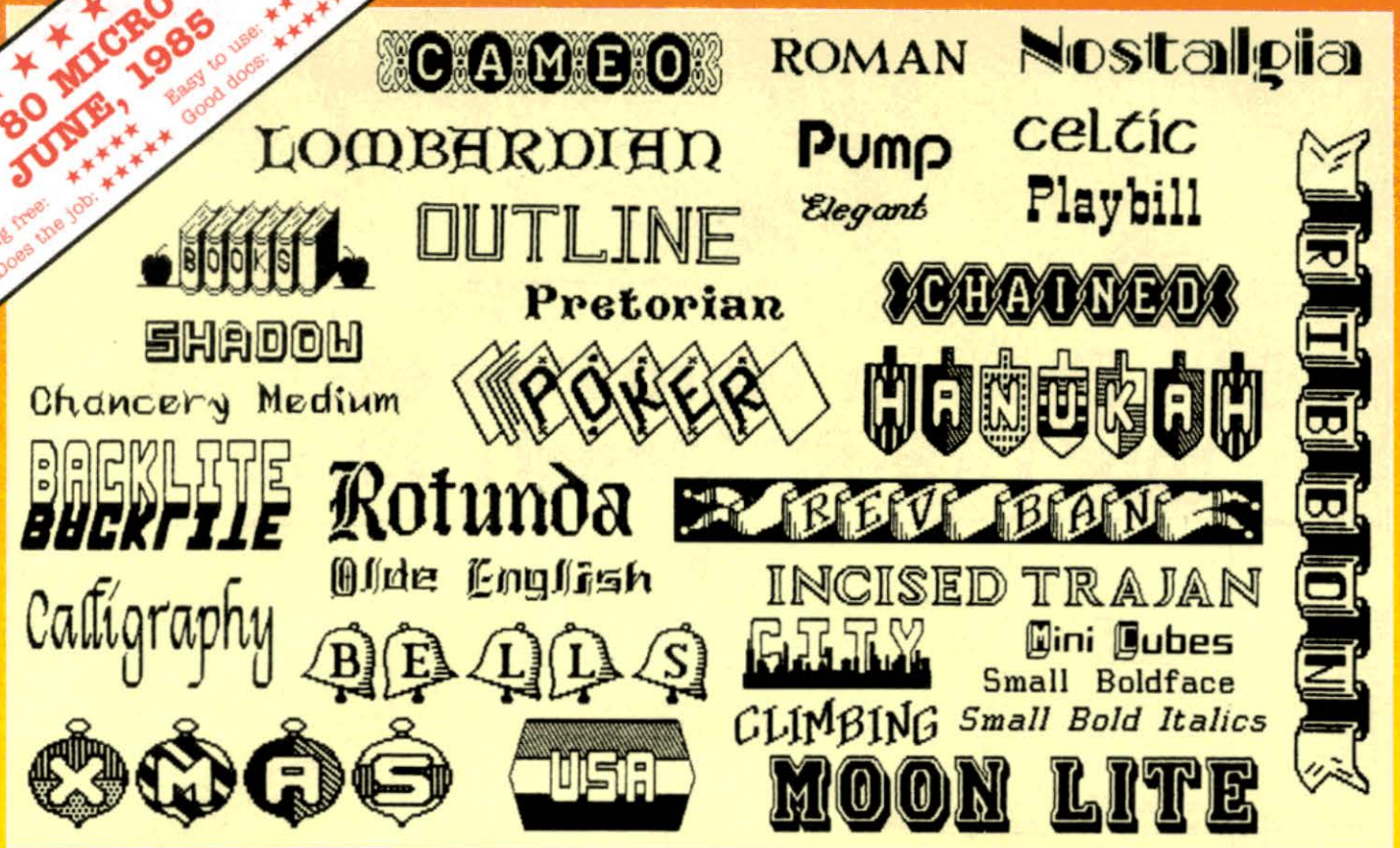

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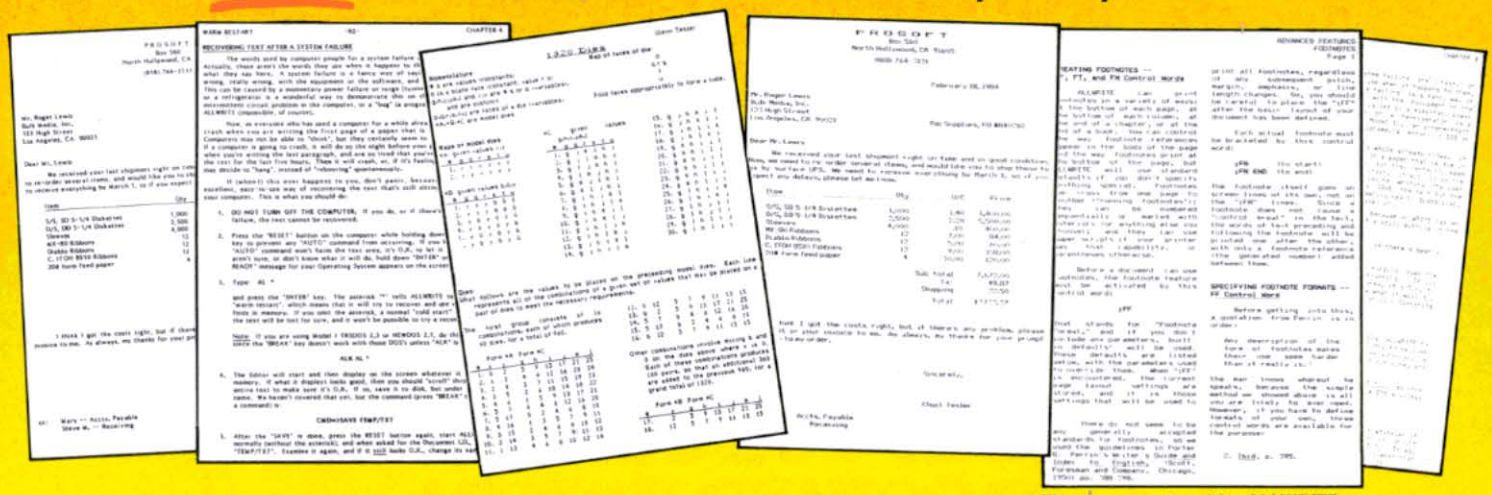

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Change text width at any time; wide lines shift left and right as you type. ALLWRITE preserves double-blanks between sentences, uses the entire screen for text, and displays a complete Status Screen at the touch of a key. Scroll by line, partial screen, full screen, to top or end of file, or to any marked point. Move cursor by character, word, tab, line, or screen.

You can set and change on-screen tabs and store them on disk. The print-time tabbing features are incredibly versatile: they allow left, right, and centered tabs, and even line up your decimal points.

ALLWRITE shows you where you forgot to turn off underlining, boldface, italics, or double-width. Special on-screen Preview feature shows page breaks and page layouts . . . including underlining and boldface. In "Summary" mode, ALLWRITE quickly flags formatting errors without wasting time printing all the text. These standard features make document preparation faster and easier than ever!

State-Of-The-Art File Handling

There is no upper-limit on document size with ALLWRITE, because it chains files *backwards* as well as forwards, even across diskettes. Switch from one chained file to another in less than six seconds by pressing two keys. Select portions of other files for inclusion at print time . . . great for stock paragraphs.

ALLWRITE salvages text from bad disks! If a sector goes bad, you won't lose the entire file, because it

TAKES FULL ADVANTAGE OF YOUR MODEL 4.

The model 4 version of ALLWRITE uses **the entire 80-by-24 screen.** On a 64K machine, you can edit **over 34,000 characters** of text. On a 128K machine, you can edit **THREE FILES AT THE SAME TIME!** The second and third files can be over 32,600 characters each, for a total of **almost 100,000 characters** of text in memory.

will skip bad sectors, **read the rest of the file**, and then show you where the lost text belongs. This advanced error recovery turns a disaster into a feeling of profound relief.

User-Definable Soft Keys Reduce Typing Time

You can store **22 phrases or commands at a time into "soft-keys,"** then press just two keys to retrieve them. This makes frequently-used phrases and formatting controls *a snap to use*. You can store these definitions on disk and build a library of hundreds of pre-programmed keys to fit every one of your applications.

Our specially-designed templates fit right on your keyboard to let you see your settings at all times. Each template is also a Reference ("Cue") Card, so it is always right in front of you when you need it, without using up valuable screen space.

ALLWRITE Is Easy To Learn

ALLWRITE's commands and control keys are easy to remember because they use the first letters of common English words: 'CE' stands for 'Center,' 'Search' and 'Replace' do just that, and so forth. The **on-line HELP menu** offers over fifty screens of topics.

ALLWRITE's superb documentation will get you started quickly. Portions of it are designed for beginners, with every feature clearly explained in step-by-step tutorial style. Since you won't always be a beginner, other parts of the book offer advanced topics. There is a cross-reference summary chapter, a 14-page comprehensive index, and a detailed Table of Contents. We've been developing computer programs and manuals for over 23 years, and understand the importance of good documentation.

ALLWRITE works with all major DOS's on Models 1, 3, and 4/4P.

PROSOFT'S On-Going Customer Support

Perhaps the best reason of all for having ALLWRITE is the continuing support we offer you: friendly, expert, direct support that is unsurpassed in the micro-computer industry.

Note to students: with its Footnote, Table of Contents and Index features, ALLWRITE is ideal for your reports and Term papers.

Note to teachers: ALLWRITE makes it very easy to generate multiple-choice exams *and* answer keys. Ask for free instructions when ordering.

"ALLWRITE is a professional system that sets a new standard in word processing. It's powerful and easy to learn and use."
80 MICRO, Nov., 1984

Customer Comments

"This is the best software package I have ever received . . . superb, easy to use, fast, and has more features than the business word-processor at the office." *(E.R.L.)*

"Your company and products have to be one of the strongest factors I can think of for keeping me with the TRS-80!" *(J.R.H.)*

"NEWSCRIPT is the Cadillac of word processors. ALLWRITE is the Mercedes Benz!!" *(B.E.)*

". . . a very readable manual." *(D.S.)*

BENEFITS OF OWNING ★ ★ ALLWRITE ★ ★

If Word Processing is important to you, PROSOFT's ALLWRITE is the best choice you can make. The clean, professional appearance it adds to your letters and reports will make an excellent impression on people. We will be happy to send you free print samples so that you can see for yourself how good ALLWRITE will make you look.

You probably know that quality word processors for CP/M and the IBM-PC sell for $300–500, and they don't have ALLWRITE's capabilities or speed . . . or PROSOFT's proven, on-going support. Now, for a fraction of the cost of a new computer, you can have the most complete word processor of all. And you won't have the headaches of starting all over again with a new, different computer.

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ALLWRITE comes with just about every useful word processing feature . . . standard. Here are some highlights: excellent right-justified proportional printing on most printers having that ability; powerful Form Letter and Mailing Label preparation; Instant counts of words, characters, lines, changes; block Move, Copy, Delete, Putfile, Getfile, and List; delete by character, word, line, sentence, paragraph, or block; insert and one-key insert; great RS-232 printer support; accepts all 256 ASCII codes from keyboard; intermix pitches on same line (printer-dependent); 1.5 line spacing, 6, 7, 8, 12 lines per inch (printer-dependent); does multiple-columns on all printers; perfect alignment of hanging indents; variables, logic statements, conditional printing; wildcard Directories; integrated with Electric Webster and DOTWRITER for Models I, III, and 4 (these are sold separately); "Legal" line numbering; paragraph, list, and figure numbering; supports most popular printers (all "printer drivers" included); compatible with high-memory drivers; fully explains all DOS and ALLWRITE error messages; wildcard search-replace; tabs, search-replace, other settings remembered across files; word reversal; up to nine levels of boldface; flexible page titles; footnotes at bottom of page or end of document; Table of Contents and Index generation; and PROSOFT's unmatched text formatting and printing capabilities.

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Disenchanted With DeskMate

Frankly, I find it just about incomprehensible that any reviewer who had really tried out DeskMate 1.0 could give it a four-star rating (May 1985, p. 31). I bought a Tandy 1000 with 256K of RAM, naturally figuring I could write to a drive-B disk with DeskMate in drive A. This turned out to be impossible, and nobody warned me about the problem.

Since DeskMate is more than 300K large, the only acceptable way to use it is to delete just about everything from the program except the part you're using. Following the instructions in the manual, I tried to get DeskMate and MS-DOS on the same disk, but this, too, turned out to be impossible. Your reviewer, Bradford N. Dixon, didn't mention any of this.

As for the four-star rating in the category "Bug free," you must be kidding. DeskMate 1.0 has more bugs than you can shake a stick at. To mention just one: Changing a file was impossible, with the program merrily jumping between the old and new names ad infinitum.

If "taken together, DeskMate's documentation is the best [your reviewer has ever] seen for any Tandy program," then I shudder to think what the others must have been like. I doubt that the documentation writer clearly addressed himself to the problem of the knowledge level of the intended reader.

In justice to Tandy, I should mention that the revised version (1.1) does, insofar as I have tested it, appear to contain the improvements that you listed under "Late-Breaking News."

I deem it inappropriate to criticize any program for the in- or exclusion of features it wasn't designed for. The real question is how well the programmers of version 1.1 have accomplished the goals they set for themselves and how DeskMate compares with other integrated programs of equal length.

Ralf F. Munster
Decatur, GA

*I stand by my rating. Yes, DeskMate is a long program, but Tandy's instructions for putting it on a bootable disk are simple and they do work. Put an MS-DOS system disk in drive A, a blank disk in drive B, and type in FORMAT B: /S. When the format is complete, put your DeskMate master in drive A and type in COPY *.* B:. Granted, you have only about 12K of disk space left, but you can use drive B to store files, simply by specifying that drive when you type in a file name. I find no bug when changing a file name.*

The documentation is explicit and complete. The tutorial booklet guides the first-time computer user, the DeskMate Reference Manual *gives further explanations of commands, and the* Quick Reference Guide *answers the occasional question a seasoned user might have. What more could you ask?*

—Bradford N. Dixon

His

Congratulations for your stand against the onslaught of lib lingo (Input, June 1985, p. 12). Male pronouns have been used generically for hundreds of years. Nevertheless, on p. 22 of the same issue, you permit "he or she."

Robert N. Pinkerton
San Antonio, TX

Hers

Your response to Betty Burnett's letter regarding the use of "he" versus "she" ended with the sentence, "Fortunately, people generally understand that this is a term of convenience rather than a purposeful bias." This is, unfortunately, wrong. The problem goes beyond trying to avoid being sexist, verbose, or grammatically incorrect.

The use of the male pronoun in writing is a product of, and still very much a part of, our society's history of sex stereotyping. Most people, when reading about doctors, lawyers, or programmers, will do a double take when they come across "she" or "her." This is because it clashes with the mental images they are programmed to invoke when thinking about these vocations. Use of the male pronoun has the insidious effect of shaping expectations. If we do not question it, we will carry sex stereotypes into the next generation.

I admit that *80 Micro* does better than many magazines in dealing with sex stereotypes. Most of your articles speak directly to the reader, using "you" or plurals. And longtime readers will surely remember that Mercedes, the computer whiz-child in the Gamer's Cafe, was female.

This does make it curious that you balked when the question arose. I would suggest that the creative editor should be able to get around the difficulties you mentioned. Or perhaps, better still, go ahead and use "she" (in every other article?). Make a point; shake up our mental images.

Deborah Crocker
Charlottesville, VA

80 Micro's BBS is open 24 hours a day. It offers programs you can up- and download, special-interest groups, and a classified section. You can reach the board at 603-924-6985; UART settings are 300/1200 baud, 8-bit words, 1 stop bit, no parity.

Volks Remedy

In his review of Volkswriter Deluxe in the May 1985 issue (p. 110), John B. Harrell III observes that the Tandy 2000 Volkswriter does not support any non-Tandy printers and that the Tandy 1000/1200 version of Volkswriter does not support any Tandy printers. To take care of this, Lifetree Software's customer service department will supply the additional printer drivers at no charge to any Tandy dealer who requests them.

Regarding the problems Harrell noted with MS-DOS 2.22, it appears that changes in the new RAM BIOS (Basic input/output system) are affecting the video display on the Tandy 2000. We are investigating the problem and hope to resolve it soon.

Vicky L. Boddie
Lifetree Software Inc.
Monterey, CA

SPEECH

fun simple powerful

with the vs-100 voice synthesizer

Check these features:

Talker 2.0 and Talker 4.0 software:

- ☑ Unlimited translation of English text to clear speech.
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- ☑ Can be used in BASIC with 2 new commands: PRINT* "I can talk" speaks any expression. PRINT! "Hello" speaks *and* prints on screen.
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- ☑ Talker relocates itself into available high memory. Compatible with any DOS (not CPM).

The VS-100 hardware:

- ☑ Same performance as very expensive units.
- ☑ Super efficient: About 50 bytes per sentence.
- ☑ Handsome speaker module included.
- ☑ Detailed 48 page manual.
- ☑ Ready to plug in and talk right away.
- ☑ Uses the famous Votrax SC-01 with 4 pitch levels and automatic inflection.
- ☑ Built in audio amplifier with volume control.

See the detailed review in 80-Micro December 1984.

The VS-100 system. (Model I shown)

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Includes:
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Specify Model I, III, 4 or 4P.

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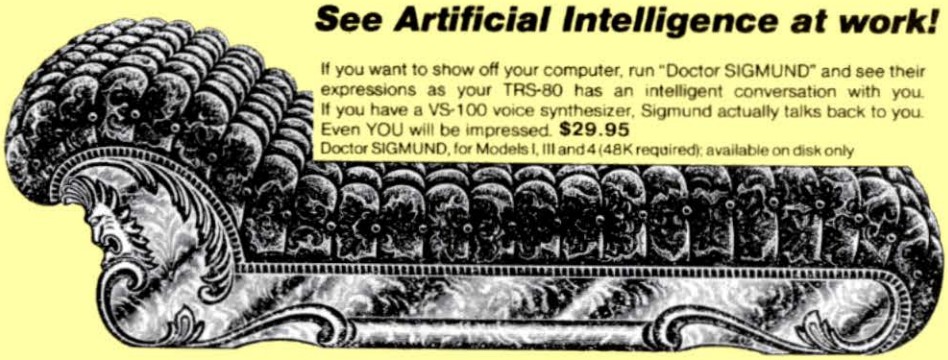
Small Print: ● Model I: unit plugs into keyboard or expansion interface 40 pin bus. ● Model III,4,4P: unit plugs into 50-pin I/O bus. Model III VS-100 works with Model III,4,4P. Use our "Y-cables" (see next page) if your bus is already used.

The VS-100: You've never had so much fun with your TRS-80

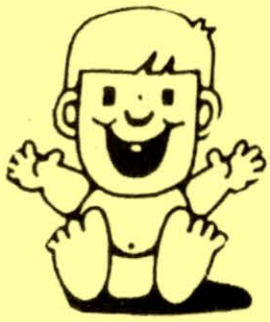
"Doctor SIGMUND" will amaze you!

See Artificial Intelligence at work!



If you want to show off your computer, run "Doctor SIGMUND" and see their expressions as your TRS-80 has an intelligent conversation with you. If you have a VS-100 voice synthesizer, Sigmund actually talks back to you. Even YOU will be impressed. **$29.95**

Doctor SIGMUND, for Models I, III and 4 (48K required); available on disk only



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Send your questions or problems dealing with any area of Tandy/Radio Shack microcomputing to Feedback Loop, 80 Micro, 80 Pine St., Peterborough, NH 03458.

Q: Your answer to Brian Voth's letter in the February 1985 issue (p. 18) regarding an address for Progressive Computer Products was incorrect. That company still exists; however, they're doing business as Micro Mainframe and their address is 11325-E Sunrise Gold Circle, Rancho Cordova, CA 95670.

They no longer directly sell products for the Model III or 4. They do manufacture the controller board that Brian Voth asked about. We at IJK Inc. sell the board as part of our upgrade kits. Micro Mainframe also manufactures floppy and hard disk controller boards for the IBM PC and compatibles including the Tandy 1000 and 1200. *(William O. Jellerson, IJK Inc., Maple Valley, WA)*

A: Thank you for writing.

Q: I bought a TRSDOS 6 Training course from Radio Shack. Every time I try to run it on my Model 4P, I get a disk error. The disk works fine on a Model 4. What's wrong? *(Edward Hitchens, Pufalluf, WA)*

A: Something is wrong with your copy of the program. The training course is supposed to work on both the Model 4 and the Model 4P.

Q: Regarding Chris Candreva's question about using TRSDOS 1.3 with 80-track disk operation: While TRSDOS 1.3 is bug-free and simple to use, extensive modifications such as hard disk drivers and double-sided floppy disk drivers are really not worth it, considering the availability of good and reasonably priced operating systems such as LDOS, DOSPLUS, and NEWDOS/80. However, since Model IIIs and 4's in Denmark come with 80-track single-sided drives as the norm, I have an 80-track version of TRSDOS 1.3.

I'll be happy to send a copy to any interested reader if he or she sends proof of ownership, like an original disk or a photocopy of the Tandy Registration form, and $5 to cover expenses.

Also specify your drives' stepping rate, if you know it, so I can send the system best suited to your drives. I want to emphasize that this is a single-sided version. In fact, if anyone has modified TRSDOS for double-sided operation, I would be interested in hearing from them. *(Nield-Jorgen Biergstrom, E-C Data A/S, Tornevangsvei 88, P.O.B. 116, DK-3460 Birkerod, Denmark)*

A: Thanks for writing and making your generous offer.

Q: In the May 1985 Feedback Loop (p. 16) you told Carlos Matos he wouldn't be able to find a book about Model I double-density operation. The first chapter of the *TAS Programmer's Journal #19* is titled "Everything You Ever Wanted to Know About Model I Doublers," by Paul Snively. And it does just what the title says, if you have the technical savvy to follow along with it. Otherwise it gives you the routines on disk so you can "cookbook" it. The book is available from The Alternate Source, 704 North Pennsylvania Ave., Lansing, MI, 48906.

As for Matos' other questions: NEWDOS/80 1.0 should boot up fine with the doubler in place. I do it all the time. Obviously you'll still be working in single-density, because that's all that 1.0 supports. Matos said NEWDOS/80 V1.0 wouldn't load. Obviously, you can't use TRSDOS 2.8 to load another DOS over itself.

His problem with Edit/CMD is not with the doubler; it's with TRSDOS 2.8. This DOS is incompatible with almost all /CMD programs, even Radio Shack's own! I suggest getting NEWDOS/80 2.0 as your double-density DOS. It comes with the necessary zaps to make Edit/CMD run correctly in double-density format. *(Phil Holden, Richardson, TX)*

A: I think I can be forgiven for not knowing about that one, since the TAS series had a limited circulation.

Q: I have some information that may help James Patterson, who wanted to use Scripsit with Japanese characters (May 1985, p. 17). Radio Shack's LP-VI printer can print the Japanese Kata Kana alphabet as characters 160–223. To make the printer do this, remove the printer case and find the small slide switch (SW1) in the middle of the printed circuit board beneath the platen. Move the switch from "A" to "J." Reassemble the printer and use a word processor to print the characters from 160–223. By the way, if you want an up-arrow instead of a bracket on your printouts, close DIP switch number 4 to select Radio Shack's codes for CHR$(91) to CHR$(95). *(Ed Haynes, Napa, CA)*

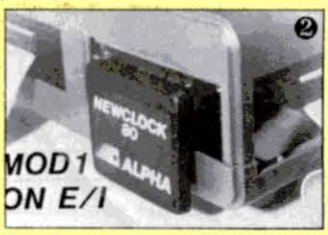
A: I didn't know the LP-VI could do that; thanks for the info.

Q: I'd like to use two 1-megabyte 3½-inch drives as a sort of poor man's hard disk system on my Model 4. Will the TRSDOS 6.2 Device command recognize and properly configure the DOS to let me use them as external drives 2 and 3? The manual doesn't state any limits for disk size or number of cylinders. These parameters are significantly different between 3½-inch and 5¼-inch drives.

Granted, with 20–50 megabyte hard disk drives available, a meager 2 megabytes isn't all that much. But it sure is cost effective (about $300 for two drives, case, and power supply) and requires no extra hardware (hard disk controller/interface) or software! *(Earles L. McCaul, Tucson, AZ)*

A: The only requirement for the 3½-inch drives is that they follow the Shugart drive standard (the Shugart drive connector is the standard for drives just as the Centronics printer connector is the standard for printers). That is, they must be plug-compatible with

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 "TIMESET" once to set the clock. Use "SETCLK" to set your computer's internal clock (at power up) or use "TSTRING" so that the "TIME$" 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.

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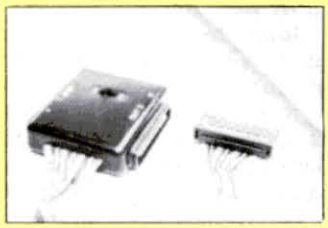

Do you have 2 printers? Get a Printswitch. Stop plugging and unplugging those printer cables. With the Printswitch, you can have 2 printers connected to your computer and you can select either one at the flick of a switch. Works with any printer, plotter, or device that uses the parallel printer port. 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.

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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).

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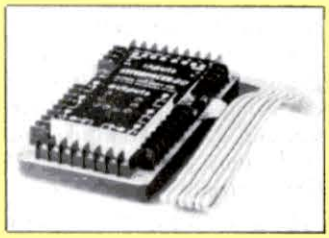
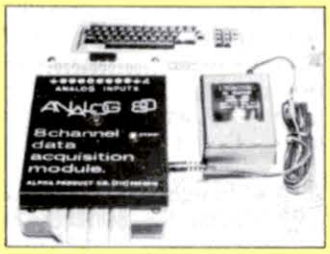


Low cost input and output device. The outputs consist of **8 relays** (rated 2 Amp @125V), easily controlled using "OUT" commands. For example, OUT 0,0 turns all the relays off. Eight LED's show the states of the relays. The **8 inputs** are optically isolated, so it's safe and easy to connect external 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



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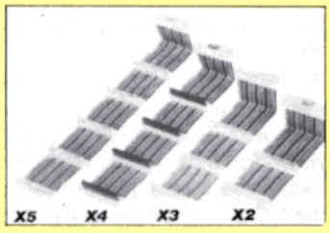
Connection: Model I: 40 pin I/O bus. Model III, 4, 4P: requires 50-pin bus adapter ($39.95). Comes complete with power supply, cable, and manual.

Special Cables



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• For Mod I bus (40-pin)...**C167:**$24 • For Mod 3 & 4 bus (50-pin)...**C169:**$28
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standard 5¼-inch drives. The problem is that I can't find anyone who currently has a mixed set of drives to verify my information, so I can't say for sure if the naked drives are compatible or if the case and power supply for the 3½-inch units contain an adapter for the Shugart drive standard.

In any event, if you get a 3½-inch drive, make sure you also get the technical manual for it so you can configure the drives properly as external drives 1 and 2. If you decide to use a Radio Shack keyed cable (the connector for drive zero doesn't have the teeth for drives 1, 2, or 3 and the connector for drive 1 doesn't have the teeth for drives zero, 2, or 3), then you must make sure that you don't have the 3½-inch drives configured for any particular position. Once you have the drives installed, you just have to tell the DOS the drive specifications.

Q: I heard from an IBM service engineer that their programs that use the Basic ROM will run on compatibles (like the Tandy 1000) if you have Basic on the disk. Is this true?

Also, do you know of any Basic programs that rotate pictures in a circle on the Tandy 1000's screen? I'm trying to work up an animation sequence and this is the only piece missing. *(Charles N. Ezzell, Rocky Mount, NC)*

A: When you are using disk Basic on the IBM, the computer ignores ROM Basic. Since Tandy sells the same version of Basic that comes with the IBM PC, you can move programs between the two computers without trouble. As yet, I haven't run across any programs for rotating pictures in IBM Basic.

Q: I bought a Shugart-compatible Digital RX180AB double-density floppy disk system, which comprises two 5¼-inch floppies and power supply. I want to interface it to a 48K Model I with Expansion Interface. Can you tell me how? *(Ray Olson, Rockford, IL)*

A: You've got two possible solutions, depending on how much work you want to do. First and simplest, buy a Radio Shack Model I drive cable, remove the DB-25 connector at the rear of your DEC RX180AB, run the cable through the slot, remove the internal drive cable of the RX180AB, and plug in the Radio Shack cable. That's it. The RX180AB's drives are standard and have a Shugart-compatible connector. DEC just uses an internal cable to go from the drives (34-connector) to a DB-25 connector. This prevents customers from using anyone else's drives with DEC computers.

Second, you can make your own drive cable by buying a length of 34-conductor ribbon cable terminated at one end with a 34-pin edge-card connector and at the other with a DB-25 connector.

For those interested, the RX180AB is a set of standard 40-track drives. John Meshna Jr. Inc. (P.O. Box 62, East Lynn, MA 01904, 617-595-2275) sells them as surplus in original sealed cartons for $250.

Q: In your June 1985 column (p. 17), you tell Yulee Johns how to use the Device and SYSGEN commands to permanently enable drives 2 and 3. But the SYSGEN routine only adds to the boot-up time and does not appear on disk back-ups.

Here are two patches that will do the same thing. To install the patch for drive 2, at TRSDOS Ready type in PATCH BOOT/SYS.LSIDOS:0 and press the break key. Then type in (D02,84 = C3:F02,84 = C9) and press the enter key. To install the patch for drive 3, type in PATCH BOOT/SYS.LSIDOS:0 and press the break key; then type in (D02,8E = C3:F02,8E = C9) and press the enter key. *(Richard F. Krak, Clifton, NJ)*

A: Thanks for the assistance.

Q: I use SuperScripsit on my Model 4P, and the blinking cursor is driving me crazy. Trying to read what I've just typed with the cursor blinking is like listening to water dripping in the sink. Do you or any of your readers know of a patch? *(Steven A. Melnick, Willimantic, CT)*

A: I haven't seen such a patch yet; has anyone else?

Q: We recently equipped our classrooms with Model 4's (networked) and the faculty offices with Model 4Ps. We're using SuperScripsit but, because it's sometimes cumbersome, we wonder if you recommend any other word processing programs. *(Manny Paraschos, Department of Journalism, University of Arkansas at Little Rock, Little Rock, AR)*

A: You'll find three premium word processors for the Model 4/4P: Lazy Writer (Alphabit Communications, 13349 Michigan Ave., Dearborn, MI 48126, 313-581-2896), LeScript (Anitek, P.O. Box 361136, Melbourne, FL 32936, 305-259-9397), and Allwrite (Prosoft, Box 560, North Hollywood, CA 91603, 818-764-3131). Each has its own strengths.

Capsulizing them would take too much space, so the best I can do is refer you to past reviews: Allwrite in November 1984 (p. 35), LeScript in April 1984 (p. 33), and Lazy Writer in September 1982 (p. 102). The September issue includes an overview of the Model I/III word processing software available at that time. Back issues can be ordered from the Back Issue Order Department, 80 Pine St., Peterborough, NH 03458. *(See also our feature on Model 4 word processors planned for the November issue—*Eds.)

I prefer Allwrite because it gives me certain features I need, such as automatic tables of contents and indexes and proportional printer spacing support.

Q: I have a 16K Model 4 that I upgraded to 64K and Percom Data drives, and have been having a problem with Micro-Systems Software's DOS-PLUS 3.4. When I run Diskzap to copy disks, I sometimes get a "CRC error during read" message. I called Micro-Systems and they said, "Possible head troubles." I called Percom Data and they said, "Cleaning too much will possibly cause head problems."

I got Radio Shack's Disk Drive Analyzer and passed all tests but the write/read test. I don't understand why I can't pass this test but don't get any errors when using all the DOS's functions under normal programming and running. I can copy from drive to drive, use disks formatted on other Model IIIs, and use my disks in other Model IIIs.

My question is twofold: Is there really a problem with my drives, and does the Disk Drive Analyzer have a problem with the read/write portion with different drives? *(George M. Crews, Gurley, NE)*

A: It's possible, but not likely, that the problem is with your drives. First, what kind of disks are you using? A single-density disk in double-density mode will cause a heavy and fast build-up of garbage on the drive head. And the brand of double-density disks makes a difference, too. The coating on the diskette surface varies from manufacturer to manufacturer. Some are very hard and some are very soft. The softer coatings break down and flake off more quickly, with a resulting build-up of trash on the drive head.

Cleaning your drive heads daily or weekly will definitely wear the heads down faster than normal (all cleaning disks are slightly abrasive, some more than others). In a perfect world, the drive heads would never get dirty and never need cleaning, but we all know better. So if you run your drives hard all day long, you should probably clean them once a month. I don't use my drives that hard, and clean them about once every six months to a year, or whenever I start to experience what I think might be head problems (about once a year).

If you must clean your drive heads frequently, use rubbing alcohol and cotton

swabs (Radio Shack sells cotton swabs on 6-inch sticks, long enough to reach the drive head from the drive door without disassembling the case).

Second, have you ever had your disk drives aligned and tested? If the drive head's azimuth or track-to-track centering is somewhat off, you could get intermittent problems like you describe. Another possibility is the drive motor. If it isn't running at a steady pace, you could have problems. Few motors stay exactly on the 300 revolutions per minute that drives are supposed to maintain; a slight drift outside the normal 2 percent variation range will cause CRC problems. Older drives might need their drive belts replaced (the old ones are probably loose and slipping).

Third, the problem could be your drive controller board. An excellent tutorial on disk drive maintenance, "Drive Ways," is on p. 42 of the September 1984 *80 Micro*.

I haven't heard of any problems with the Radio Shack Disk Drive Analyzer, but if the stepping rate used in the tests is faster than the drives can handle, you would get the results you report.

Q: The Model I has a beautiful feature that lets you trace the number of lines your printer has printed at any time. I can easily print what I want at the line where I want it simply by programming a subroutine after every print sequence (see the Program Listing).

I can't locate anything that will do the same on the 4P. FFHARD in the *PR filter or the SYSTEM"TOF" gives me a top-of-form (TOF), but that's not what I want. I must be able to count the lines printed and determine where my next section of print will go without a top-of-form interrupting it because a TOF will destroy the continuation of my output format. I also want to signal my program when a TOF has occurred, so I can print my new page heading related to the next subject. *(Frans de Jong, Chief Surveyor, PRC Engineering Inc., East Hartford, CT)*

A: You can find the number of lines sent to the printer, but only if you've installed the Forms printer filter/driver. TRSDOS 6.X.X doesn't know or care how many lines the computer has sent, but the printer filter does. You need to find the printer filter in memory and count from its beginning to the location where it stores the Lines Printed value. With this information, you can have your program PEEK that location whenever needed. The problem is in finding where the DOS has installed the filter.

You have to use *GETMOD to get this information, preferably before you go into Basic. The TRSDOS 6.X.X *Technical Reference Manual* provides the instructions, as well as the information on the relative location of the Lines Printed value in the printer filter/driver. Good luck.

Q: W.B. Mair's question in April (p. 14) about using each side of a double-sided drive independently is timely, in light of the commentary by Powersoft in the August 1984 issue (p. 27) about using hard disk platters the same way. My system uses double-sided drives as two independent units and I must report excellent success.

The solution proved simple. No special programming, no trace cutting; just plug it in. A switch and a diode are all you need for each drive. Alternately, a single switch and diode will select the back side of all drives in the system at the same time.

The drive select gates are as follows: drive zero equals pin 10, drive 1 equals pin 12, and drive 2 equals pin 14.

These pins are on the circuit board of both the disk drive and the computer and are maintained at +5 volts when the drive is unused. When the computer selects the drive for disk input/output, it connects one of these pins to signal ground and activates that drive. Signal ground pins all have odd-numbered lines and signal select pins all have even numbers.

The side-1 select gate is on pin 32, maintained at +5 volts until the computer wants to write to the reverse side of the disk, when it is switched to signal ground. The trick is to connect signal ground to pin 32 (side-1 select) at the proper time. A simple switch will do. When you connect pin 32 to signal ground (one of the odd pins, preferably pin 31), all drives will select side 1 all the time. But if you have more than one drive in the system and want to selectively use side 1 of any drive, you need a switch for each, and must selectively connect pin 32 (side-1 select) to one of the drive select pins (10, 12, or 14).

For this reason, you use a switching diode to isolate the drive select signals from each other, or else all drives switched to select side 1 would activate simultaneously. You connect the cathode of the diode to the drive select pin (10, 12, or 14), and the anode to the switch. You connect the other pole of the switch to pin 32, one for each drive you want to switch. When the computer selects a specific drive and the switch is closed, the gate at the drive select pin will go to signal ground, clamping pin 32 to signal ground also and giving you side one instead of side zero.

Some words of caution:

You must use a germanium switching type diode. A silicon diode tends to drop too much voltage across its junction. Radio Shack offers 1N34A germanium diodes and small mini- or micro-toggle switches (and small utility boxes to house them).

The easiest way to make these connections is by inserting an extender cable with two male connectors on one end and one female on the other between your computer and drive cable. One of the male connectors goes to the drive cable, the other to your switch box.

This works well with my favorite DOS, DOSPLUS 3.4D. In double-sided double-density operation, this DOS treats the back side of a disk as an extension of the front side and only has a directory entry on side zero. When limiting the number of directory entries while expanding available data space, you can run out of directory space before you fill the disk. When you can select each side independently, you can call directories for both sides. To change to another DOS, flick the switch to normal operation.

You can use the same technique to write-protect any or all disks in the system without fussing with tabs on disk covers. By using a switch with a center-off position, you can write-protect drive zero, drive 1, or none through the hardware. *(Bob Harvey, Medford, NJ)*

A: As you can see, folks, you can use double-sided drives as two drives each, but it does require a bit of hardware work. By using a separate box to control the switching, you won't have to worry about ruining your drives, because all the switching happens before the signals arrive at your drives. ■

```
10000 REM LP=Line Printed, LN=Line Next
10010 LP=PEEK(16425)
10020 FOR J=LP TO LN:LPRINT"":NEXT J
10030 LI=INT(LN/10):LN=((INT(LI))+1)*10
10040 IF LN<50 RETURN
10050 LP=PEEK(16425)
10060 FOR J=LP TO 60;LPRINT"";NEXT J
10070 LPRINT"(bottom title)":LPRINT CHR$(12):POKE 16425,0:RETURN
```

Program Listing. Subroutine to trace number of lines printed.

Terry Kepner is a freelance writer and programmer, and an associate editor of 80 Micro. *He writes monthly columns for* Portable 100 Magazine, Hot CoCo, *and* Under Color. *He's been writing about microcomputers since 1979.*

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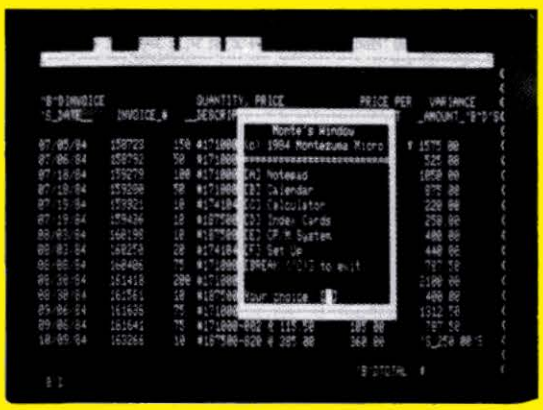

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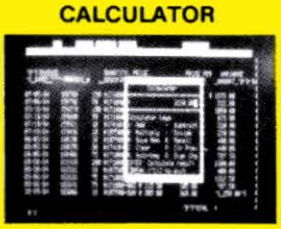

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Hardware Prices: Decline and Fall

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In the fiercely competitive microcomputer market, there's no such thing as resting on your laurels. Just six months after introducing its popular Model 1000, Tandy knocked $200 off the price and introduced a 10-megabyte hard disk drive version, called the Tandy 1000 HD (see the Photo).

IBM broke the $1,000 price barrier for an MS-DOS computer late last year, when it discounted the ailing PCjr to $995. Tandy's willingness to follow suit with the hot-selling 1000 shows its determination to maintain a price advantage over competitors.

The new 1000 HD costs $1,999, which happens to be the price of Tandy's hard drive PC XT clone, the 1200. Since this puts Tandy in the position of price competition with itself, I asked Dave Frager, buyer for Tandy's MS-DOS line, if the 1200 had a future. It does, he said, because the 1200 is aimed at "those people who want an IBM clone. The Tandy 1000 HD is an extension of the original machine, which is marketed as the machine the PC should have been and the PCjr never was." Frager and others at Tandy said they've made no decision to replace the 1200.

And what about the 80186-based Tandy 2000? It costs $1,999 too. Tandy had high hopes for its high-performance micro when it hit the market in November 1983, but sales have been disappointing. The 2000 was partly responsible for Tandy's taking an $18.3 million write-down at the end of 1985's third quarter (see the August Pulse Train, p. 21). All this makes you wonder how the 2000 fits into Tandy's plans. According to Bernie Appel, Radio Shack Division president, "the 2000 is still a viable product and will continue in the line."

Photo. The Tandy 1000 HD.

However, Appel has publicly conceded that "the 1000 and 1200 make the 2000 not as good a value as it was."

As for Tandy's marketing strategy for the fall and into the Christmas season, the word from Tandy is "push the Tandy 1000." Consider the following list of new products and peripherals available or forthcoming for the 1000:

- Tandy 1000 external 10-megabyte hard hotdisk drive
- External HD controller board
- 1,200-baud PC modem board
- Memory Plus expansion board
- Printer emulator for IBM printers (700–2118)
- The FUNdamentals, a Tandy 1000 tutorial program
- Infocom's Cornerstone data base manager

Tandy's clearly giving the 1000 all the support it can muster, almost daring competitors to take them on.

All the hoopla surrounding the 1000's success drowned out the rather quiet announcement that Radio Shack would sell off its stock of single-drive Model 4's at $649.50. When the last one goes, Tandy won't produce any more.

This news, coming so soon after the Model 4P bowed out (see Pulse Train, August 1985, p. 21) fueled rumors that the Model 4 itself would be the next to go. As this column went to press late in June, CompuServe special-interest groups were abuzz with Model 4 talk. Some callers even quoted a Model 4 close-out price of $795 and predicted that Tandy would introduce a new machine, possibly a replacement for the 4, in August.

"Not so," said Tandy's director of market planning, Ed Juge. "We've said repeatedly that there are long-term plans for our 8-bit machines. Plans that translate into years. You may not see the enhancements like a hard drive or double-sided disk drives by August, but the Model 4 is not going to be replaced."

For computer buyers, meanwhile, the single-drive Model 4 sell-off is a good deal. You can get the computer for $650, buy another disk drive from a third-party vendor for $150, and have yourself a dual-drive Model 4 for $800. At the time Tandy announced the sale, the dual-drive Model 4 was still selling for $1,299 at most Radio Shack Computer Centers.

Back in February, you might have noticed a Tandy advertisement in your local newspaper imploring computer owners to "Clean up, America! Throw your orphan computer or TV game on the junk pile. . .." The ad showed a pile of trashed computers surrounded by a

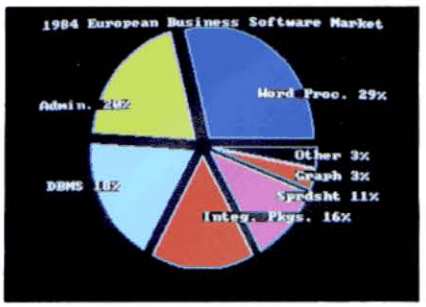

Figure. European software market share by application.

Vendor	Market Share	Units
Commodore	23.9%	2,915,800
Texas Inst.	17.1%	2,086,200
Apple	11.7%	1,427,400
Atari	11.5%	1,403,000
Tandy	11.0%	1,342,000
IBM	6.2%	756,400
Others	18.6%	2,269,200
Totals	100.0%	12,200,000

Table. Top U.S. home computer brands.

list of companies who had, in Tandy's eyes, orphaned their products, leaving consumers without support. Tandy offered $75 or $150 for the so-called orphans when owners traded them in for a Tandy computer.

Not everyone found the ad amusing. Victor Technologies, whose Victor 9000 was one of the products listed, has filed suit against Tandy in San Francisco's U.S. District Court. Victor wants Tandy to retract the "orphan" tag in the 1,000 newspapers in which the ad appeared, and to pay $1 million in punitive damages.

Victor says it never stopped manufacturing, selling, or servicing the 9000, although the company has been through Chapter 11 bankruptcy proceedings. The suit charges Tandy with trademark infringement, unfair competition, defamation, and interference with business relations.

Tandy did send Victor a letter of apology, but so far has declined to publish a retraction.

Is Tandy abandoning Xenix? That was a concern at this year's Tandy Computer Business Users' Group meeting (TCBUG). Many TCBUG members are large corporate micro users who've invested substantially in Tandy's multiuser system. They wanted to know if Tandy would continue to support Xenix or jump ship to AT&T's Unix multiuser operating system.

Tandy's CEO, John Roach, told the group, "You've got AT&T on one side, and they've said they're Unix 5-oriented. IBM is on the other side, saying they're Xenix-oriented. Now, someone is going to be excluded in this battle. . .. I'm not going to say which one I think will end up being excluded, but I don't want to be lined up with the excludee."

Roach's answer indicates that Tandy plans to sit back and wait before committing to one system or the other. But if Tandy, the leading seller of multiuser systems, straddles the fence, it might be a while before the Unix/Xenix issue resolves itself. Maybe AT&T and IBM should be watching Tandy, not vice versa.

A new mass-storage system is showing up at Radio Shack Computer Centers. It's called the Tandy Cartridge Disk System and Tandy's marketing it by agreement with Iomega Corp. It uses Bernoulli Box technology, a variation on hard disk drives. You get 10 megabytes of storage in the form of a flexible, removable cartridge.

A complete system costs $2,195. The replaceable 8½- by 11-inch cartridges are $89.95.

MicroTrends

The European microcomputer market doesn't get press in the U.S., but that doesn't mean nothing's happening "over there."

A study by the Paris-based consulting firm Intelligent Electronic Europe forecasts 30 percent growth in Europe's personal computer software market in 1985. Software sales totaled $550 million in 1984 and could reach $710 million this year.

But the report found that European software developers face handicaps that will tend to limit many products' growth. Their technology often lags several months behind the U.S.'s, which means a new European product may have to compete with an already established American product. When European distributors look for new products, they look to the West; it's rare for a program from one European country to be successfully marketed in another. Distribution channels are fragmented, and language barriers are a problem.

The report concludes that overall prospects for an independent European software market aren't good. Chances for success seem to be limited to two areas: managerial/administrative programs, and specialized, vertical applications aimed at smaller markets (see the Figure).

Commodore is sailing away with the biggest share of the home computer market, according to a recent study by Future Computing.

Researchers surveyed nearly 17,000 computer owners in 24 urban areas. They found, not surprisingly, that the New York metro area leads the nation in home computers, with 900,000 units. Of those computers, 30 percent are Commodores. Los Angeles has the second-largest home computer population, of which 24 percent are Commodores.

Nationwide, Commodore has a 23.9 percent market share (see the Table). Other top brands included Texas Instruments, Apple, Atari, and Tandy/Radio Shack, which took fifth place with an 11 percent market share.

Since 1979, Software Arts has sold more than 800,000 copies of VisiCalc. But when Lotus Development Corp. bought out Software Arts, it decided to discontinue the venerable spreadsheet.

At Lotus' annual meeting in May, chairman Mitch Kapor called the product "mature" and said that Lotus' plans for VisiCalc "would reflect that status." In announcing VisiCalc's demise, Lotus said they'd support the program for the next two years.

Two other products that Lotus acquired from Software Arts are also in a state of transition. In July, Lotus began marketing the desktop management program Spotlight under its own logo. However, Lotus won't be selling TK!Solver, an equation processor originally designed for engineers. Instead, Lotus is looking for a third-party manufacturer to produce and market the program.

New Threads

Tandy computer owners have a new on-line source of information. . .and a new place to air their pet peeves. Delphi, the Cambridge, MA, communications and information utility, has added a Tandy User's Group to its system. The special Tandy section contains public-domain programs, utilities, reviews, a message forum, and a "Tandy Topics" conference facility. The access number is 617-576-0862. ■

Photograph by Suzanne Torsheya

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Prompt Attention

José E. Anaya's Basic input routine, Prompter, ("Restricted Entry," May 1985, p. 70) is neat, but it lacks one feature that I feel is important for an INKEY$ subroutine: an input delimiter. I changed the lines shown in Program Listing 1a to print a series of graphics blocks, so you can tell exactly how many characters you can enter during a program run. These changes work on the Models I, III, and 4. Changing lines 150 and 190 as shown in Listing 1b gives an automatic carriage return when you've typed in the number of characters that LM specifies.

Rod Mallery
Rt. #12, Box 71-D
Goldsboro, NC 27530

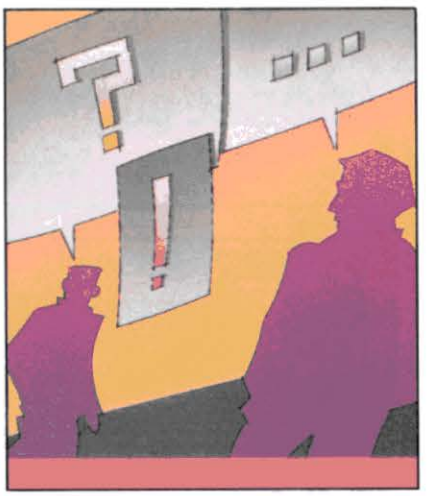
Just for Openers

I begin all my programs with the lines:

```
1 GOTO 10
2 SAVE "Program Name", A:STOP
3 LPRINT LEFT$(TIME$,8):LPRINT:LLIST:
STOP
```

This gives me some flexibility in how I run my programs (the program actually begins on line 10). If I want to run the program conventionally, I type in RUN. If I want to save it to disk after a modification, or save every few lines as I type in the program, I use RUN2. RUN3 prints the date and lists the program to the printer.

Dr. Jacques Weill
43, rue Principale
37250 Veigne´
France



Sensor Deprivation

An incompatibility between the Epson RX-80/FT printer and the Model 4 causes problems with the Epson's paper-out sensor. Pressing escape-8 disables two lines going to the computer, but the third line, pin 12 on the RX-80 side, pin 23 on the Model 4 side, remains active. This 1-byte patch to the printer driver corrects the problem:

For TRSDOS 6.1 PATCH SYS0/SYS.LSIDOS (X'0E47' = B0)
For TRSDOS 6.2 PATCH SYS0/SYS.LSIDOS (X'0E39' = B0)

The byte B0 replaces the byte F0 in the AND 0F0H statement. This masks bit 6 and the paper-out feature now works correctly.

Hubert C. Borrmann
Star Route Box 3450
Lillian, AL 36549

Watching Serials

There's a dearth of information to help owners of serial printers operate in a world of programs designed chiefly with parallel printers in mind. I suspect the need in this area will grow, since several electric typewriter manufacturers produce units with an RS-232C port.

I have a Model III with tape input and Scripsit 1.3. The output feeds into a serial printer, but the arrangement has an awkward drawback. I have to initialize the RS-232C with a POKE instruction before loading Scripsit. If I forget to do this, I must save my file to tape before returning to Basic, or lose everything I've typed. The following addition to Scripsit does the initialization automatically:

```
42D9  CD 5A 00 CALL  005AH
   : CALL $RSINIT
42DC  C3 03 43  JP    4303H
   : JP TO ENTRY ADDR
```

One convenient way to load Scripsit, make the change, and save the revised version to disk is via David Trapasso's Tape48 ("Tape It Easy," January 1984, p. 112). This utility lets you load any machine-language program, read out its name and three key addresses, change memory contents, write to tape at 500 or 1,500 baud, and verify the result. The original and revised addresses for Scripsit 1.3 are:

	Original	Revised
Start address:	42E9	42D9
End address:	6AA8	6AA8
Transfer address:	4303	42D9

The same pattern could apply to many other programs. Naturally, you'd make these changes to a copy of your software, not the master tape.

John H. Schoberg
1049 McMurdo Drive
Kamloops, BC
Canada V2C 3G8

The Seekers

I'm using a Model III, and would like to find a C compiler that produces source code compatible with Microsoft's Macro-80 (M80) assembler.

Dan Henderson
6770-65 Ave.
Red Deer, Alberta
Canada T4P 1A5

Program Listing 1. Modifications to Prompter.

(a)
```
150 IF LN=LM THEN GOTO 160 ELSE PRINT PT$;:GOSUB 120:
    PRINT BS$;:IF Z$<>"" THEN RETURN
180 LN=0: BF$="":PRINT CHR$(15);:PRINT STRING$(LM,132);
    STRING$(LM,24);
190 GOSUB 150: IF Z$=CR$ THEN PRINT CHR$(14);
    STRING$(LM-LN,30);: RETURN
210 IF LN=0 THEN 190 ELSE LN=LN-1: BF$=LEFT$(BF$,LN):
    PRINT BS$; STRING$(2,132); STRING$(2,24);:GOTO 190
```

(b)
```
150 IF LN=LM THEN RETURN ELSE PRINT PT$;:GOSUB
    120: PRINT BS$;: IF Z$<>"" THEN RETURN
190 GOSUB 150: IF LN=LM THEN RETURN ELSE IF
    Z$=CR$ THEN PRINT CHR$(14); STRING$(LM-LN,30);:
    RETURN
```

End

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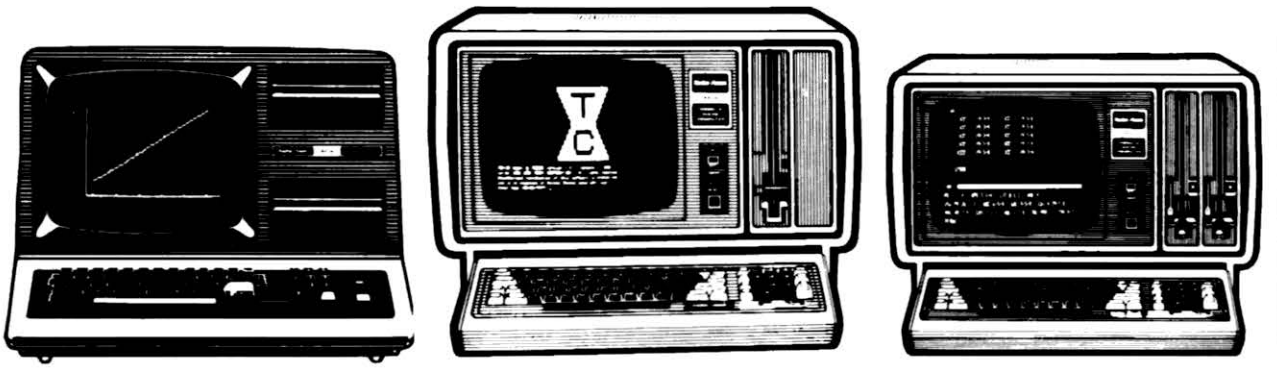

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I'm looking for a repairman who can fix a disk controller on an LNW 80-2. The drives begin to spin on reset, but then quit before the DOS has a chance to load fully. I've tried a number of DOSes and had the drives checked. If anyone knows of a good LNW repair outlet, or has had the same problem, I could use some help.

Alan Schmautz
1321 5th Ave. E.
Kalispell, MT 59902

I have a Model I with a Lobo interface. The interface has a 40-pin edge card connector for a printer. I'm not able to find a compatible printer for a reasonable price. Radio Shack can't get me a modified cable or adapter with a 40-pin edge connector and a 36-pin plug connector. Can someone help?

Peter M. Puchkowski
217 Strathearn N.
Montreal W., Quebec
Canada H4X 1Y1

Program Listing 2. Lines missing from Tape Check object code listing.

```
00430 VERCHK   DEFL    $
00440 ERRMSG   DEFW    0D0DH
00450          DEFM    '*** ERROR - TAPE BAD - TRY AGAIN ***'
00460          DEFW    0D0DH
00470 READY    DEFM    '**** READY CASSETTE ****'
00480          DEFB    0H
00490 TAPEOK   DEFW    0D0DH
00500          DEFM    '*** TAPE OKAY ***'
00510          DEFB    0H
00520 VERIFY   DEFB    0DH
00530          DEFM    '*** VERIFYING SOURCE TAPE - PLEASE
WAIT ***'
00540          DEFW    0D0DH
00550 TPENME   DEFM    'SOURCE TAPE NAME IS '
00560          DEFB    0H
00570 *LIST ON
```

End

Error Trap

Several lines are missing from the object code listing of Jay Walton's Tape Check program (November 1984, p. 92). You should insert the lines in Program Listing 2 after line 420.

—Eds.

My Model 4 conversion of Bruce A. and Jeffrey P. Graebner's Grapher program (April 1985, p. 40) has a problem. Grapher assumes the module PRINTR is within the main body of the program, but it isn't. This causes line number errors. The following addition to Program Listing 1 should clear up the trouble:

```
145 CHAIN MERGE "PRINTR",150,ALL
```

Line 145 loads in the module before the main program executes.

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

Line 1972 of Howard Potvin's modifications to NovaCalc (Reader Exchange, July 1985, p. 25) contained a typographical error. The less-than character (<) should be a left parenthesis.

—Eds.

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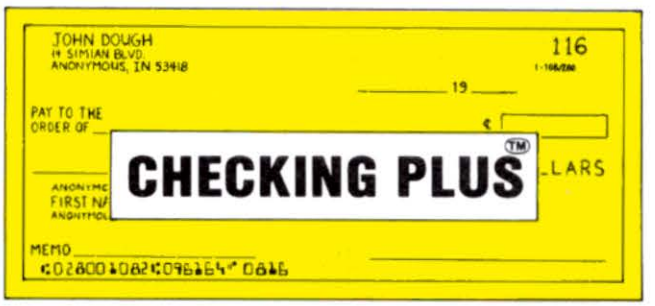

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Supercross/XT Bridges the Gap of Incompatibility

by John B. Harrell III

★★★★

Supercross/XT runs on the Models I (double-density drives required), III, and 4/4P. Powersoft Products, 17060 Dallas Parkway, Suite 114, Dallas, TX 75248, 214-733-4475. Supercross/XT $99.95. Hypercross available from Hypersoft, P.O. Box 51155, Raleigh, NC 27609, 919-847-4779. $49.95 to $129.95.

Easy to use:	★★★★★
Good docs:	★★★★★
Bug free:	★★★☆☆
Does the job:	★★★★☆

Illustration by Katherine Mahoney

Supercross/XT is a versatile disk-based utility that lets you easily transfer files between a TRS-80 computer and a CP/M or MS-DOS machine. It also supports full file transfer between CP/M and MS-DOS computers with no intermediate steps. I can use the files I transfer between systems with virtually no change. I also use Supercross to format disks for my Tandy 2000 to transport information to my IBM PC/XT. This is the most useful program I've seen in quite some time.

Supercross was originally developed by Hypersoft (as Hypercross) and they license it to Powersoft. Hypersoft markets four different versions of the utility: 40 CP/M formats, four MS-DOS formats (1.1/2.X), 70 CP/M and MS-DOS formats, and 130 CP/M and MS-DOS formats. Since Supercross and Hypercross are essentially the same, all comments made about Supercross apply to Hypercross.

Getting Started

Supercross comes on a standard disk compatible with the format you order. The Model 4/4P version contains the complete disk operating system and the software (including back-up copies in case of disaster).

The Model III version comes without an operating system but works with any of the popular Model III operating systems; however, I tested it only under LDOS 5.1.4. The Model I version comes on single-density disks and requires the double-density modification to work properly.

When you first run Supercross, you answer several questions describing your computer system and the configurations available for the alien disk formats (see Fig. 1). A utility on the disk builds a configuration file that bypasses these prompts on subsequent runs. You can set up to 10 user-defined configuration files.

Supercross Commands

Once you have Supercross running, a simple menu displays the disk formats you selected and summarizes the commands (see Fig. 2). In addition to the complete command set, Supercross provides quick commands, an easy-to-remember subset of the most frequently used commands that you can abbreviate to one or two letters.

You can display a disk directory of the selected drive. The command syntax is identical to TRSDOS's and you can specify either a directory of the default alien drive or the default TRS-80 drive.

Supercross distinguishes between the native TRS-80 drive formats and the alien formats by the drive designator. Drive numbers 0–7 indicate standard TRS-80 disks and drives A–D designate disks in either CP/M or MS-DOS format.

Under TRSDOS 6.X (and LDOS), you can reassign logical disk drive numbers to any physical drive device. But Supercross doesn't allow drive remapping with alien formats; drive A represents physical disk drive unit zero.

The versatile Copy command supports transfer of a file to and from the TRS-80 format to any other format. The XFER command transfers data between CP/M and/or MS-DOS formats. You can enter the command in full or use the quick format.

Unfortunately, Supercross doesn't support wildcard file names. Copy and XFER support three types of file transfers: image, ASCII, and random.

The image mode copies an exact image to the target disk. This is the usual method of transferring binary files such as data bases and spreadsheet files.

The ASCII file transfer mode compensates for the differences in storing ASCII files on TRS-80 and MS-DOS or CP/M computers, including carriage-return/line-feed variations, end-of-file marks, and certain nonstandard TRS-80 characters.

The random mode transfers a TRS-80 file stored with the logical record length set to fewer than 256 bytes. Supercross otherwise transfers the file in the image mode.

To remove files from the target disk, use the command with which you're most familiar. Supercross offers four alternative commands corresponding to the respective disk operating systems.

The Format command lets you format a disk in any of the available formats. You identify the target disk drive as you do for the Directory command. However, the Format command doesn't duplicate the code found in the boot sectors of the source disks. While the documentation states that some programs may reject these disks if they check the boot sector, I haven't experienced this in many transfers to MS-DOS systems.

You can change your transfer configuration by pressing the C key from the main menu; this takes you to the Configuration menu (see Fig. 3). You can select a new format from either of the two alien formats, change the default drives, the formats, or the actual disk drive configuration. The user command also provides a convenient way to access different user areas on CP/M disks.

Supercross has a powerful facility for moving files in bulk. The Tag command displays the directory of the source disk one item at a time and lets you select the option for transferring the file or for file removal.

```
SuperCROSS DOS Format Selection Menu. Enter 2 character Code.
   ***  SuperCross          Serial No: P41022XT  ***
Type              Tks/Sds/Den     Type              Tks/Sds/Den
1A PC/MS-DOS 1.1    40 SS DD      1B PC/MS-DOS 2.0    40 SS DD
1C PC/MS-DOS 1.1    40 DS DD      1D PC/MS-DOS 2.0    40 DS DD
1E PC Tandy 2000    80 DS DD      1F Aardvark         35 SS DD
1G Access Matrix    40 SS DD      1H Access II        40 DS DD
1I Altos            80 DS DD      1J Ampro Ltl Bd.    40 SS DD
1K ATR 8000         40 SS DD      1L CCS              35 SS DD
1M Cromemco Z-2     40 SS SD      1N Cromemco Z-2     40 SS DD
1O Cromemco         40 DS DD      1P DEC VT180 Robin  40 SS DD
1Q DEC Rainbow      80 SS DD      1R Eagle            80 SS DD
1S Epson            40 DS DD      1T Epson  QX10      40 DS DD
1U Florida Grphics  80 DS DD      1V HP 125           40 DS DD
2A IBM PC CP/M-86   40 SS DD      2B Kaypro II        40 SS DD
2C Kaypro 4 & 10    40 DS DD      2D LNW-80/Team      40 SS DD
2E Lobo Max-80      40 SS DD      2F Max-80 CPM 3.0   40 SS DD
2G Morrow MicroDec  40 SS DD      2H Morrow           40 DS DD
2I NEC PC-8001      40 SS DD      2J Osborne-I        40 SS SD
2K Osborne-I, Exec  40 SS DD      2L Otrona           40 DS DD
2M Sanyo 1000       40 DS DD      2N Sanyo 1250       80 DS DD
2O Sanyo 2000       80 SS DD      2P SD Computers     40 SS SD
2Q Superbrain       35 SS DD      2R Superbrain D     35 DS DD
2S Teletek          35 SS SD      2T Teletek          35 SS DD
2U Teletek          35 DS DD      2V Televideo 802    40 SS DD
3A Televideo 802    40 DS DD      3B Televideo 1603   80 DS DD
3C TRS80 1 CPM 1.4  35 SS SD      3D TRS80 1 FEC      40 SS SD
3E TRS80 1 FEC      40 SS DD      3F TRS80 1 Omikron  40 SS SD
3G TRS80 1 Omikron  40 SS DD      3H TRS80 3 Holmes   40 SS DD
3I TRS80 3 Hurricn  40 SS DD      3J TRS80 3 MM Shfl  40 SS DD
3K TRS80 3 Omikron  40 SS DD      3L TRS Mtzuma 1.30  40 SS DD
3M TRS Mtzuma 1.30  40 DS DD      3N TRS Mtzuma 1.4x  40 SS DD
3O TRS Mtzuma 1.4x  40 DS DD      3P TRS Mtzuma 2.2x  40 SS DD
3Q TRS Mtzuma 2.2x  40 DS DD      3R TRS80 4 CPM 3.0  40 SS DD
3S Xerox 820-II     40 SS SD      3T Xerox 820-II     40 DS SD
3U Xerox 820-II     40 SS DD      3V Xerox 820-II     40 DS DD
4A Zenith-Hth H89   40 SS SD      4B Zenith-Hth H89   40 SS DD
4C Zenith-Hth H89   40 DS DD      4D Zenith-Hth H89   80 DS DD
4E Zenith-Hth Z90   40 SS DD      4F Zenith Z100      40 SS DD
4G Zenith Z100      40 DS DD      4H Zenith Z100 8re  40 DS DD
4I Zorba            40 DS DD      4J Zorba Z2000      40 DS DD
4K Zorba Q          80 DS DD      4L Zorba Z2000Q     80 DS DD
4M 8 inch CPM std.  77 SS SD
```

Figure 1. SuperCROSS/XT formats.

```
* SuperCROSS/XT *    TRS-80 <-> MS-DOS & CP/M File Transfer
 Copyright 1985 HyperSOFT, Published by PowerSOFT Products
                    Serial No. P41022XT
-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-
Drive - B C D is format F1  PC/MS-DOS 1.1   40 SS DD
Drive A - - - is format F2
-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-

Enter Command or select from Quick Menu:
DA  Directory of Alien disk      TA  Tag Alien default disk
DT  Directory of TRS-80 disk     TT  Tag TRS-80 default disk
T   Copy TO alien from TRS-80    F   Copy FROM alien to TRS-80
FA  Format default Alien drive   C   Set Configuration
H   Help                         X   Exit to DOS
```

Figure 2. Main menu of SuperCROSS/XT.

```
Drive - B C D is format F1  PC/MS-DOS 1.1   40 SS DD
Drive A - - - is format F2

Drive Tracks Format Skip Default
A     0     40     2     N     TRS-80
B     1     40     1     N     Alien
C     2     40     1     N
D     3     40     1     N

Choose from one of the following:

A,B,C or D Set drive config.      X  Exit to command level
1  Select new format F1           3  Select default TRS-80 drive
2  Select new format F2           4  Select default Alien drive
```

Figure 3. Configuration menu of SuperCROSS/XT.

The Star Ratings

80 Micro's star ratings reflect our reviewer's impression of a product.

In most cases, the overall rating is an average of the ratings in each of the four specific categories. However, some overall ratings may be higher or lower than this average, depending on the reviewer's subjective opinion.

The stars mean:

★★★★★ Superior;
★★★★ Excellent;
★★★ Good;
★★ Fair;
★ Poor.

The ratings terms translate as follows:

Easy to use: How easy is it for the new user to use the hardware/software/book?

Good docs: Is the documentation clear and helpful in explaining the product's use and anticipating user problems?

Bug free: Did the reviewer encounter any bugs while using the product?

Does the job: How well does the product do what it was designed for?

For example, you could decide to transfer all the Basic files to the target disk—just tag all the files with a /BAS extension. A simple set of keystrokes moves the entire group of files from the source disk to the target disk.

If you exit the Tag command menu, you can reenter the menu with the previous file status. This is a blessing if you mistakenly exit too soon or want to repetitively copy the same group of files to several disks. You can also save the tag list in a file and then reload it later for batch processing.

Appendixes in the documentation provide additional information on disk formats and the conversions performed. One provides a short set of instructions on making an initial configuration file containing the features you want.

It's Great But. . .

Supercross is really a time-saver. Before using it, I used the RS-232 port for intercomputer data transfers, which is slow.

But all products have blemishes: The first copy of Supercross I received didn't work very well, and Powersoft was responsive in quickly providing a new release.

I still feel that Supercross has a few problems. First, if you try to access a disk with the wrong format, the system will probably hang up, requiring a reset. This often happens when you try to access an 80-track double-sided disk with only single-sided drives, for example. I can't see any reason for the system to reset to solve this problem; a simple error message would be sufficient.

The original version of Supercross would sometimes silently die while copying or formatting an alien disk. While the newer version exhibits two related problems, the reliability is substantially improved.

First of all, the disk error-handling routine is highly critical of simple problems. Supercross sometimes rejects disks that format perfectly under CP/M, TRSDOS, and MS-DOS as bad. For instance, it claimed that one disk had flawed sectors in five tracks, but I could later format this disk on the Tandy 2000 (in 80-track quad-density mode).

Supercross still periodically slips into silent death while copying files. This is the same problem I identified with the earlier version but it doesn't happen so often. It now occurs so infrequently that I can live with it.

Conclusion

The value of this program far exceeds its price. If Powersoft fixed the few problems mentioned, Supercross would be an outstanding utility. As it is, if you work with different computers, it's a must.■

Customer Billing In a Big Way

by Wynne Keller

★★★★

Accounts Receivable Version 1.85 runs on the Model III (48K) and requires two disk drives. It also supports a hard disk drive. Holman Data Products, 2366 Lincoln, Oroville, CA 95965, 916-533-5992. $149.95.
Hard disk version $199.95.
Easy to use: ★★★☆☆
Good docs: ★★★★☆
Bug free: ★★★★☆
Does the job: ★★★★☆

Holman Data Products' Accounts Receivable, a large-capacity workhorse for customer billing, offers all the features you need in a data manager of this type, but it fails to provide the convenience features, like error-trapping and alphabetical sorting, you'd expect in a software package today. While this doesn't detract from the program's utility, it does make it more difficult to use than it should be.

Accounts Receivable handles large files: You can fit approximately 300 customers on a disk and use up to 30 disks. While you probably wouldn't want to do that much disk swapping, the point is that the program grows with your business. If you start with one customer disk, you can continue to split the file and add disks as the need arises.

One of Accounts Receivable's unusual features is that hard disk users can write files back to floppies and use them should the hard disk fail.

Customer Data

You must enter customer data, or at least step through each field in a record, before you can exit the data entry mode. If you type in an entry in incorrect format, the program gives you an "Invalid entry" error but doesn't specify it. When you finish with a record, you make corrections by typing in the line number containing the error and retyping the line.

You can include a status code for each customer signifying anything of interest to you, such as a customer's credit rating or type of account (retail or wholesale). For example, you could request one-third of the balance due on selected statements with these codes. Other information on each customer includes the date you set up the account, interest rate (percent per month), date of last payment, and credit limit.

While you can use lowercase letters in customer records, the program doesn't recognize them. Also, the program supports five-digit zip codes only. To help reduce errors on data entry, you can specify a range of numbers you want the data base to accept: it rejects any number outside this range.

You access customer records by account number only, rather than by customer name. Unfortunately, you can't sort records by customer name either, only by number. The manual suggests that if you need to order names alphabetically, you should assign customer numbers relative to position in the alphabet, using numbers 1–26 to start off the account number.

You can record subaccount numbers by separating them from the account number with a decimal point.

You have to have the proper customer disk in drive 1 whenever the program accesses an account. Instructions to do this appear on-screen and you must press the enter key to continue on, even if you already have the correct disk in the drive. Companies that have all their data on one disk would probably find it more helpful for the program to request a disk switch only if you had the wrong disk in the drive.

Transactions

Accounts Receivable supports 99 transaction codes to define the types of entries you make. For instance, one code represents an invoice (to charge a sale), another a payment. For each transaction, you have to supply the account number, invoice number, date, transaction code, and amount.

To make corrections, you enter the edit mode and choose one of seven options to delete, change or locate a transaction forward or backward.

You can verify the sum of all transactions before posting them to disk to ensure that you haven't omitted any. The manual wisely suggests that you don't enter more than 150 transactions in one session.

Accounts Receivable sorts transactions before posting them to keep disk swapping to a minimum. It flags and deletes any transaction with an invalid account number during the posting. You can then reenter the transaction. Holman Data Products offers an optional invoicing program. It supports a customer purchase order number (the statements do not) and posts a single-line entry to the statement transaction file. Another optional program supports discounts on statements.

Reports

You can review a customer's status on-screen, displaying old and current balances and aging. Accounts Receivable

Circle 85 on Reader Service card.

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And, Our thirty page user guide is packed with examples and hints showing how to make any manual program changes required after using CNV3TOPC.

So, there you have it. HYPERCROSS gets you "over there" and CNV3TOPC performs most of the required program changes. Sound too good to be true? Don't take EMSI's word for it. Here are excerpts from two magazine reviews. Note that since publication of these reviews, CONV3TO2000 V1.0 has been enhanced and consolidated with CONV3TOPC V1.0 into one package, namely, CONV3TOPC V2.0

"...Its the best such program I've seen, well worth its higher price over similar programs...The conversion program performed flawlessly. CONV3TO2000 works so well it merits the $139.95 price tag...."
Mr. Gary Shade, 80 MICRO, May 1985 (4½ stars).

"The documentation is a very strong asset to this package...More software producers should put out documentation like this...NICE JOB BY EMSI!!...."
Mr. Lon Andrews, COMPUTER SHOPPER, December 1984.

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offers an option to calculate finance charges, too. Each account can have a different percentage rate for interest, no rate at all, or you can set a minimum dollar amount for finance charges. You can rerun this option if necessary without posting the finance charges twice.

Aging reports offer several options, including active accounts, zero balance only, credit balance only, over credit limit, and past due. You can invoke the options for all customers, a specific range, or dollar totals. You print out the reports according to the most recent end-of-month status or, if 15 days or more have elapsed since the end-of-month, you can age the balances.

Accounts Receivable prints statements on standard 7-inch invoice forms or on regular paper. As with aging reports, you can do all or selected accounts, and restart a complete run at any selected account.

You can print statements by aging category and optionally print zero- or credit-balance statements. You can also select printouts by status code; if you coded your customers as retail and wholesale, you might print all the retail or all the wholesale clients separately.

The program even prints mailing labels in case you don't use windowed envelopes. Here again, your choices are flexible, including status code, range of zip codes, and range of account numbers. You can even select the number of lines per label if you use nonstandard labels. The only thing missing is an option to use two- or three-across labels.

End-of-Month Updates And Utilities

At the end of the month, run the update program to erase the transactions and update balances. This also generates an audit report.

The utility programs help with specialized problems, like splitting the file when a disk becomes full. One utility clears all transactions and another deletes selected transactions. The utilities aren't as easy to use as the main programs. You must, for example, add 50 to the disk number when asking the system to scan a customer disk; if you enter the wrong number you can't cleanly escape.

Conclusions

The trend in software these days is toward hard drives and you'll find little software available for large files on a floppy system. Certainly using Accounts Receivable entails some disk swapping, but it minimizes this as much as possible. The screen-editing features aren't state-of-the-art nor is the error-trapping, but the program can do a big job inexpensively and is well worth investigating.■

The Enhancer

by David B. Dalton

★★★★★

Supermod4 runs on the Model 4 (64K). Intellitech Corp., formerly Intelligent Technologies Co., 21 Campbell Drive, Dix Hills, NY 11746, 516-462-6970. $49.95

Easy to use: ★★★★★
Good docs: ★★★★★
Bug free: ★★★★★
Does the job: ★★★★★

If you use a Model III DOS even though you moved up to a Model 4, you don't have to sacrifice the 4's increased capabilities: You can choose from a number of programs that give you the Model 4's extra power in Model III mode. Supermod4 is the best one I've seen.

In Model III mode, Supermod4 enables an 80-character by 24-line screen, speeds up the processor from 2 megaHertz (MHz) to 4 MHz, spools text and data to your printer, and activates an audible key click through the 4's built-in speaker. And Supermod4 eats up no user memory, even for the printer spooler; every Model 4 has at least 16K of memory not normally accessible in Model III mode, and that's where Supermod4 resides.

Using Supermod4

You can select a number of options when you call up Supermod4, including those for screen size, 4 or 2 MHz operation, the printer spooler, an audible key click, clearing or resuming spooler operation (with no data loss, even during a reboot), or canceling the program.

In addition, you can assign any keyboard character or any other ASCII character to the Model 4's three function keys. Unfortunately (and this is one of my few disappointments with Supermod4) the function keys can be programmed only for one character. It would be nice if they were macro keys so that each function key could be used for an entire string of characters, such as a commonly used command.

One of Supermod4's nicest features is its printer spooler. It's the only I've seen that's both useful and easy to use. The spooler uses up to 14K of the Model 4's invisible memory. If you want to print out a Basic program of fewer than 14K, you regain control of the computer immediately when Supermod4 loads the program into the spooler. The printer may slow down a little if the computer is busy; it slows down quite a bit if you read from or write to a disk.

Like most spoolers, this one has some limitations. It works only with the Model 4's built-in printer routines; that includes listing and printing from Basic. Consequently, most word processors won't work with the spooler because they use their own printer routines.

Video

Supermod4 works with all the video formats available on the Model 4: 80 characters by 24 lines, 40 by 24, 64 by 16, and 32 by 16. It automatically corrects most problems that arise from using a Basic program written for the Model III's 64-character by 16-line display. For instance, it automatically corrects the Basic statements PRINT@, PRINTTAB, POS, Set, Reset, and Point. It also lets you use reverse video. In Basic, printing a CHR$(16) enables reverse video, and CHR$(17) or CLS turns it off.

Supermod4's video features work only with programs that use the built-in video drivers. This includes, of course, programs written in Basic or compiled programs written in languages such as Pascal or C. Many Assembly-language programs also use the built-in video drivers and work fine with Supermod4.

Unfortunately, most word processors use their own video routines and won't work with Supermod4 (Scripsit and SuperScripsit, for example). In Basic, PEEKs or POKEs directly to the video RAM won't work correctly, either.

You'll have to test your favorite programs to see how they work with Supermod4. I found that Micro-Systems' Microterm, one of my favorite terminal programs, works fine with Supermod4 even though its menu is a bit skewed on the 80 by 24 screen. I had no problems with Aspen Software's Grammatik, either. Even eSoft's The Bread Board System (TBBS) bulletin board software, which is complex, works well.

All the NEWDOS/80, LDOS, and DOSPLUS functions (such as directories) look fine on the 80 by 24 screen. TRSDOS, though, directly addresses some of the video memory, and its directories don't look pretty.

Configuration

Supermod4 works under TRSDOS, LDOS, and DOSPLUS, but it was developed and works best under NEWDOS/80.

Supermod4 comes on an unprotected TRSDOS data disk. The current version won't work on the 4P, but Intellitech says that a 4P version is in the works.

Conclusion

Supermod4 has become almost as essential to me as my DOS. When I'm not working on my computer, I use it as a TBBS bulletin board. I've had Supermod4 running almost full-time on the BBS for many weeks and it hasn't malfunctioned yet.■

Little Brother, Little Price

by Hardin Brothers

★★★½

Little Brother runs on the Model 4/4P (64K with one disk drive and a hard disk or 128K and two disk drives) and the Tandy 1000 and 1200 (128K and two disk drives, or one drive and a hard disk). Logical Systems Inc., 8970 N. 55th St., P.O. Box 23956, Milwaukee, WI 53223. $99.

Easy to use: ★★★☆☆
Good docs: ★★☆☆☆
Bug free: ★★★★★
Does the job: ★★★★☆

Little Brother is a new data base program for the Model 4 and the Tandy 1000 and 1200. While it's similar to the Profile data bases available from Radio Shack, it costs considerably less and offers a lot of versatility in such an inexpensive program. But the documentation is disorganized and it requires some disk swapping if you don't have large capacity drives or a hard disk drive unit.

Getting Started

Defining and using a data base file is relatively simple, considering the number of options available. You start by defining fields for your data base records. Then you define one or more input screens and one or more report or label forms. When you finish, you can begin entering information into your data base.

The Data Fields

Little Brother recognizes nine different types of data fields. Text fields comprise alphabetic, uppercase alphabetic, literal, or uppercase literal characters. Only literal and uppercase literals allow numbers and punctuation.

You specify numeric fields as left- or right-justified standard types or as dollar or floating-point types: The standard types allow numeric input of any length (up to 254 characters), the floating-point type allows up to eight places on each side of the decimal point, and the dollar type allows a maximum of eight places to the left of the decimal point.

You can also define calculated fields, where input derives from mathematically manipulated constants or numeric values from elsewhere in the data base.

Each field label in the data base holds up to 254 characters, except for dollar and floating-point numeric fields. You can define a maximum of 64 fields per record, each with a maximum of 1,024 characters, and save up to 65,534 records per data base (if your disk can hold that much).

The Input Screen

After you define the fields, you create an input screen, the template where you'll enter data. Each input form must fit in the top 22 rows of a single video screen, and you can mix data input fields and normal and inverse text. Little Brother reserves the screen's bottom two lines for its own use.

Once you define the input screens, you can begin entering data. Be sure that everything is the way you want, because you can't redefine the field formats.

Little Brother exhibits one peculiarity during data entry. When you finish entering information in one field and press the enter or return key, the cursor doesn't move to the next field on the form. Instead, it moves to the next field that you input when you initially defined the fields. Consequently, you should define the fields in the order that you will want to enter data.

Reports and Indexes

You can define up to 10 report or label formats to print out your files. While you can use up to 20 lines for each report, you can also use information from your data base in a full-page form letter, as long as the letter's not too wordy.

One of Little Brother's nicest features is the variety of reports it can produce. Unlike some other data-handling programs, Little Brother doesn't assume that you'll always want to generate columnar reports. You can print out each report on a separate page, print each record more than once, and print multiple reports per column.

Like most other data base programs, you can sort or select records based on up to eight fields and store an ordered list of the files in one of five special disk files.

Little Brother also provides an unusual type of index, called an add index. If you enable the add index while entering data, the program automatically sorts records as you enter them. You can then use the add index to quickly retrieve records in a predetermined order. However, the add index only sorts newly entered records; it ignores all other information.

You can create a job file to automate your keystrokes for performing various tasks, such as sorting your data base or printing out information. First, tell the program that you want to create such a file and give the file a name. Then, perform the procedure you want to automate. Every key you press will be echoed to the job file. You can later use the job file by specifying its name either from within the program or in the command line when you call up Little Brother from DOS.

Little Brother stores its files in ASCII format, padded with zero bytes. This way, you can use the data in other programs. For example, you could easily write a Basic program to read your files and manipulate them in ways that Little Brother can't.

Problems

Generally, I like Little Brother. However, it has some problems that may make it unsuited to some applications. If you use it on a two-drive Model 4, you'll feel cramped for disk space. You have to store all your data, as well as your input screens, report forms, and index files, on a single disk. A hard disk is almost mandatory to use Little Brother with a large data base, unless you want to constantly swap disks.

Although the add index is handy, it should let you use previously entered data with it. It's useless if you start using it while in the middle of adding information to a file, or if you forgot to turn it on when you started the data entry session.

Little Brother's weakest feature is its documentation. The manual is both disorganized and confusing. For example, the first thing you must do with a new data base is define fields, but the manual doesn't discuss this until page 59, after it tells you how to define input screens and report formats. To add to the confusion, the descriptions of screen and print formats both assume that you have already defined your data base's fields and understand that topic well.

Once you learn how to use Little Brother, the manual is only fair as a reference, since it lacks an index as well as any clear quick-reference charts.

The documentation is supplemented by on-line help which is more clear than the printed documentation, but tends to be too wordy. I finally dumped the help screens to my printer and used them instead of the manual to teach myself the system.

One other problem that two-drive Model 4 owners will face (which, unbelievably, the documentation doesn't discuss) is how to correctly use the separate creation and run-time disks. Nothing tells you which disk should be in your system for which functions.

Conclusions

Despite its documentation problems and its unwieldy nature, Little Brother is a good value compared to other similar programs. It doesn't have all the bells and whistles of Profile 4, but it works well and I didn't find any bugs. If you have the patience to learn the program, you will find that it is a good choice to manage a moderately sized data base. ■

Continued on p. 100

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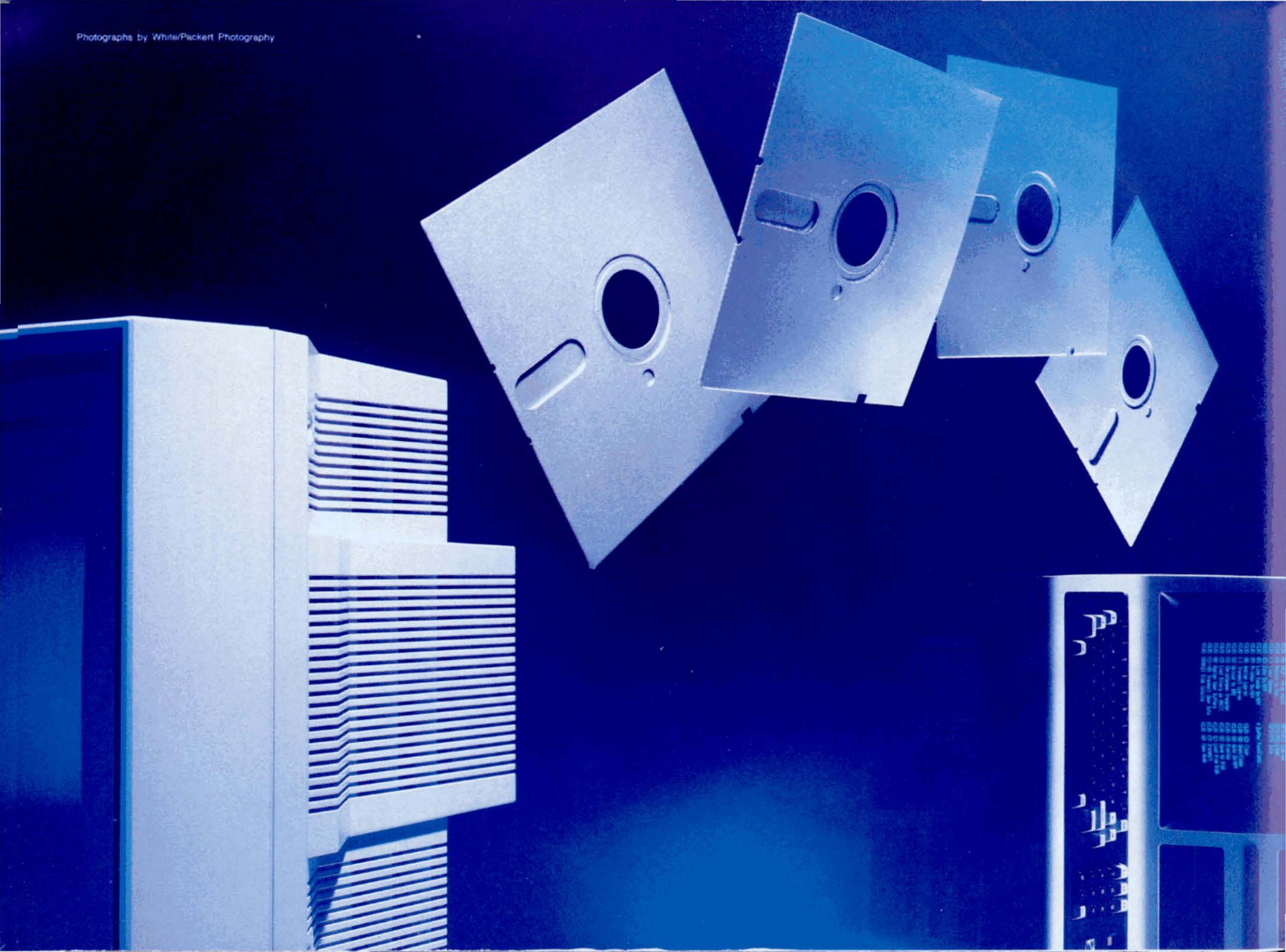

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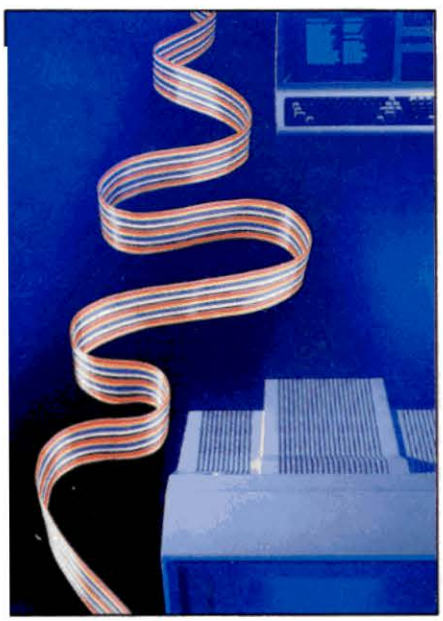

Everything you need to know about moving files from one computer to another.

by Bradford N. Dixon

The most common question computer users ask these days is, "How do I get data from one computer to another?"

Consider these scenarios:

►You have a file you want to share with someone else in your office.

►A friend has a Basic program on his Model 2000 that you'd like to use on your Model 4.

►You've got a Model III at home, and you want to use your word processing files on an IBM PC or PC-compatible at work.

Unfortunately, you can't simply take a disk out of the first computer, pop it into the second, and boot up a program; you might just as well try starting your car with a house key.

Even though the microcomputer industry is 10 years old, we're still light years away from a standard that will let you interchange disks as you can records or compact discs. Nearly every computer has its own disk operating system and disk format—if it uses disks at all. Even if you have identical hardware, you might run into major problems, as anyone who has tried to move a file from DOSPLUS 3.4 to LDOS will tell you.

Nevertheless, you *can* transfer files between machines, and with a minimum of pain. Given the right hardware and software, you can send data back and forth as if it were second nature.

In this article, I'll discuss three methods of file transfer: direct, remote, and software. I'll cover the pros and cons of each, and give you a way to solve the three problems mentioned above.

I won't discuss how to transfer data from one software package to another, however; that's in *80 Micro*'s next issue. I'll limit myself here to taking information from a disk formatted on one kind of computer and putting it on a disk formatted for another kind.

They Went Data Way

Before going any further, consider some of the fundamentals of how computers send and receive data. At the heart of file transfer is the American Standard Code for Information Interchange (ASCII). ASCII uses a standardized system by which it represents characters. For instance, it stores the letter "A" as the decimal number (or ASCII code) 65, the number "1" as 49, and the question mark as 63. Nearly all popular computers store data according to this system.

In most cases, you want to use ASCII code when transferring files; it ensures that both computers speak the same language. The first computer sends a string of ASCII numbers, and the second one receives them. When you retrieve the file—with, say, a word processor or data base manager—the computer translates the ASCII number back to the original character it represents.

You should be aware, however, that even this "standard" has its problems. Note in Table 1 that the printable characters run from 33–127. The first 32 are reserved for special codes, and not all computers use these codes in the same way. For instance, 29 represents a line erase on the Model 4, and moves the cursor left on the IBM PC. A 7 emits a beep on the PC, but has no function on the 4.

Then there's the extended (non-ASCII) character set. I won't get bogged down in details here, but the computer can assign special characters to the decimal numbers 128–255. These characters vary widely from computer to computer.

Despite these obstacles, the ASCII set can make your life a lot easier when you need to move a file.

Directing Traffic

Direct file transfer is the fastest and most reliable of the two hardware solutions. As the name implies, you link two computers together directly. The tools you need are RS-232 ports on both computers, an RS-232 cable, a null modem adapter, and terminal software.

Using the direct file transfer method, you can transmit data from one machine to another at rates of up to 2,400 baud. This is twice the transmission speed of most modems, which transfer data over phone lines. The relatively short length of RS-232 cable used to link the computers provides minimal electrical resistance to the data signal, and the absence of external static ensures reliable, nongarbled data.

As mentioned above, direct transfer requires that both computers have RS-232 ports. An RS-232 port is a 25-pin connector whose specifications, established by the Electronic Industries Association (EIA) in 1969, are designed to standardize the way in which computers send and receive

ASCII code (decimal)	Video display	ASCII code (decimal)	Video display	ASCII code (decimal)	Video display
32	BLANK	64	@	96	
33	!	65	A	97	a
34	"	66	B	98	b
35	#	67	C	99	c
36	$	68	D	100	d
37	%	69	E	101	e
38	&	70	F	102	f
39	!	71	G	103	g
40	(	72	H	104	h
41	)	73	I	105	i
42	*	74	J	106	j
43	+	75	K	107	k
44	'	76	L	108	l
45	–	77	M	109	m
46	.	78	N	110	n
47	/	79	O	111	o
48	0	80	P	112	p
49	1	81	Q	113	q
50	2	82	R	114	r
51	3	83	S	115	s
52	4	84	T	116	t
53	5	85	U	117	u
54	6	86	V	118	v
55	7	87	W	119	w
56	8	88	X	120	x
57	9	89	Y	121	y
58	:	90	Z	122	z
59	;	91	[	123	{
60	<	92	BLANK	124	|
61	=	93	]	125	}
62	>	94	^	126	~
63	?	95	—	127	±

Table 1. Values for ASCII codes 32–127.

Pin	Signal	Direction
1	Earth ground	
2	Transmitted data	To DCE
3	Received data	To DTE
4	Request to send	To DCE
5	Clear to send	To DTE
6	Data set ready	To DTE
7	Logic ground	
8	Carrier detect	To DTE
9	Reserved	
10	Reserved	
11	Unassigned	
12	Secondary carrier detect	To DTE
13	Secondary clear to send	To DTE
14	Secondary transmitted data	To DCE
15	Transmit clock	To DTE
16	Secondary received data	To DTE
17	Receiver clock	To DTE
18	Unassigned	
19	Secondary request to send	To DCE
20	Data terminal ready	To DCE
21	Signal quality detect	To DTE
22	Ring detect	To DTE
23	Data rate select	To DCE
24	Transmit clock	To DCE
25	Unassigned	

Table 2. Pin assignments for RS-232 port.

data. When you connect two RS-232 ports with an RS-232 cable, you're ensuring that one computer can transmit information in such a way that another computer can easily accept it. Table 2 lists the pin assignments of a standard RS-232 cable.

Within Tandy's line of computers, the Models II, 12, 100, 200, 2000, and 6000 come with an RS-232 already installed. The Model III/4 RS-232 board and cable (catalog number 26-1148) costs $99 and should be installed at a Radio Shack Computer Center. The Tandy 1000 and 1200HD use identical RS-232 boards; they cost $99.95 apiece and you can install one yourself.

An RS-232 cable (catalog number 26-1048) costs $19.95, and the null modem adapter (catalog number 26-1496) is $29.95. You can also make your own null modem cable; a tutorial in February 1984's C*Notes ("Pin Pals," p. 194) tells you how.

Unfortunately, like the ASCII code, the RS-232 standard has its variations. In fact, the EIA has approved 13 such "standards." The most common version is the RS-232C, which most major brands of mi-

Let's Talk
Good Software
12900 Preston Road
Dallas, TX 75230
214-239-6085

File Transfer
Personal Computer Products
1400 Coleman Ave., Suite C-18
Santa Clara, CA 95050
408-988-0164

Microlink II
B.T. Enterprises
10 Carlough Road
Bohemia, NY 11716
516-567-8155

Omniterm
Lindbergh Systems Inc.
49 Beechmont St.
Worcester, MA 01609
617-263-5049

Microterm
Micro-Systems Software Inc.
4301-18 Oak Circle
Boca Raton, FL 33431
305-983-3390

DeskMate
Videotex Plus
Tandy/Radio Shack
One Tandy Center
Fort Worth, TX 76102
817-390-3011

Supercross/XT
17060 Dallas Pkwy.
Suite 114
Dallas, TX 75248
1214-733-4475

Table 3. Manufacturers' addresses.

Powerful Programming Tools At Bargain Prices

C compiler

for the model 1 or 3 using TRSDOS, LDOS, NEWDOS, DOSPLUS, or MULTIDOS; includes full screen text editor and advanced development package

List Price ~~$250.00~~
Sale Price $89.95

This is a full K & R standard implementation of C that includes a Unix compatible function library. The package also includes a 450 page manual with a tutorial on using the C language. If you've been wanting to learn C, this is the package you need.

Features Include

char	8 bits	initializers
short	8 bits	typedef
int	16 bits	static
unsigned	16 bits	auto
long	32 bits	extern
float	32 bits	struct/bit fields
double	64 bits	union

Execution speed on the Model 3 for 10 iterations of the prime number program published in Byte, Jan 83, page 284.

LC Compiler	105 secs.
Alcor C	78 secs.

Special Bonus

Buy one version for $89.95 and get the version for the other model for only $21.

Multi-Basic compiler

for the model 1 or 3, or 4 using TRSDOS, LDOS, NEWDOS, DOSPLUS, or MULTIDOS; includes full screen text editor and advanced development package

List Price ~~$250.00~~
Sale Price $89.95

Multi-Basic is a TRS-80 BASIC compatible compiler. The Model 4 version supports everything in the TRSDOS 6 BASIC interpreter except the COMMON statement. The same support is provided in the Model 1 and 3 versions so programs are portable. The CMD statement is the only statement from the Model 1 and 3 BASIC interpreters that is not supported.

Multi-Basic also supports advanced language features like multi-line procedures and functions, recursion, and dynamic string management (no long pauses for garbage collection).

Execution speed on the model 3 for 10 iterations of the prime number program published in Byte, Jan 83, page 286.

BASIC Interpreter	4570 secs.
Multi-Basic	89 secs.

Special Bonus

Buy one version for $89.95 and get versions for the other two models for only $21 each.

Sale Price Extended Through October 31

C Compiler

Circle version(s)	Model 1	Model 3
One version ($89.95)		
Both versions ($110.95)		
Add 6% sales tax (Texas only)		
Shipping $6 USA/$28 foreign)		
Total		

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Richardson, TX 75081
(214) 238-8554

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Multi-Basic Compiler

Circle version(s)	Model 1	Model 3	Model 4
One version ($89.95)			
Two versions ($110.95)			
Three versions ($131.95)			
Add 6% sales tax (Texas only)			
Shipping $6 USA/$28 foreign)			
Total			

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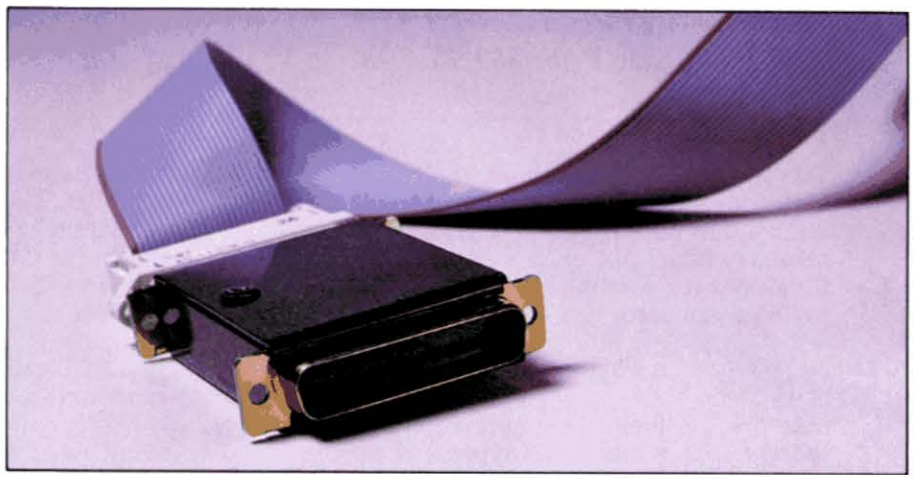
crocomputers use. The RS-232C works with all operating systems, so you can link your Model 4 to any other micro as long as it also uses an RS-232C port.

You'll also have to connect one of the computers to the cable with a null modem adapter (see the Photo). This simply crosses the send and receive lines in the cable so the two machines can communicate. Without the null modem, the sending computer wouldn't know when to send another character and the receiving computer can't tell the sender it's ready for more.

Now for the software. Both computers will need terminal programs to send and receive data in a mutually acceptable format (word length) and at a mutually acceptable speed (baud rate). You can choose between two types of terminal packages—one that's designed specifically for direct transfer or one that handles both direct and remote transfers. Direct-transfer software is, as you might expect, more efficient than a dual-purpose package, but it isn't as flexible. Which one you choose depends on your needs and budget. The advantage of direct-transfer software



Photograph by Suzanne Torsheya

Photo. Null modem adapter.

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PC/MS-DOS 2.X
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Sanyo 2000
Sanyo 1250
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Superbrain
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MM SHUFFLE Board

TRS-80 Model 4 CP/M
Montezuma Micro CP/M 2.2
Radio Shack CP/M Plus
Zerox 820-II
XOR-100
Zenith-Heath H89
Zenith-Heath Z90
Zenith Magnolia
Zenith Z100
Zorba
Zorba Z2000
Zorba Q
Zorba Z2000A

Table 4. Formats available on Supercross/XT.

Circle 357 on Reader Service card.

The Perfect Host

by Bennett Shulman

You can put your Model 4 in host mode so that it accepts ASCII files at rates of up to 2,400 baud by using Memdisk. My examples use the Model 100 or 1000 as the terminal, but the principles apply to any computer with the proper terminal software.

First, connect the two computers with an RS-232 cable and null modem adapter. Set the terminal computer's parameters using the following procedures:

For the Model 100, enter Telcom and press the F3 key. Enter 67E1E after the STAT prompt. The "6" configures the 100 for 2,400 baud, while the "7E1E" sets it for 7-bit words at even parity, 1 stop bit, and XON/XOFF protocol enabled. Now put the 100 in terminal mode.

On the Model 1000, boot up DeskMate and enter Telecom. From the menu, choose 2,400 baud, 7-bit words, even parity, and 1 stop bit. Press the F7 key to save this configuration. Be sure to add the .LOG extension to the file name so you can hereafter call the parameters directly from DeskMate's menu. Put the 1000 in terminal mode.

Now you need to set up the 4 as a host. You normally type in LINK *DO *CL and then LINK *KI *CL at TRSDOS Ready (DO stands for "device output," CL for "communications line," and KI for "keyboard input"). Since TRSDOS lets you copy files to devices and devices to files, you should be able to copy *CL to File/DAT:0 and upload from the terminal. Unfortunately, the Model 4 can't keep up the pace, even at 300 baud. The solution is Memdisk.

Using a word processor or the Build command, create the job control language (JCL) file in the Program Listing. Name it Host/JCL. Reset your computer and, using the Do command, run the JCL file. When the file ends, you'll see the message "Job done" on both computers. Here's what Host/JCL does:

The System command begins to install Memdisk as drive 2. "A" selects the top half of user memory to locate Memdisk. If you have 128K, you can replace the "A" with "B," "C," or "D," which will select bank 1, bank 2, or both. "D" selects double-density. "5" is the number of cylinders, which will be 4.5K each for a total of 22.5K. "Y" tells the computer to format the disk.

The Set command installs the forms filter program.

The Forms command selects options in the filter program. The computer sets a line width of 40 characters and sends a line feed with each carriage return. This permits proper screen width and scrolling on the Model 100. For the 1000, set the line length for 80 characters, and eliminate the ADDLF option. The next Set command installs the communications driver and links it to the RS-232 port. The SETCOM command sets the baud rate to 2,400.

The Filter command filters the RS-232 port output as set by the Forms command, and the two Link commands link the screen (DO) and keyboard (KI) to the RS-232 port.

Time to Upload

Now follow these steps on your Model 100 or 1000:

First, type in CREATE FILE/DAT:2 (SIZE = 16). This creates an empty 16K file on your Model 4 Memdisk.

Type in COPY *CL TO FILE/DAT:2. This opens File/DAT and copies the *CL to it until you enter control-C. The message "Copying *CL to File/DAT:2" appears on both screens when the Model 4 is ready to receive. Don't use the Copy command's echo option; it will slow the transfer and possibly lose data.

At this point, upload your data from the terminal, then press control-C.

Now type in COPY FILE/DAT:2 :1 on the terminal. This copies the files from Memdisk to the disk in drive 1. Finally, type in REMOVE FILE/DAT:2 to remove the file from Memdisk.

When you first use this method, carefully check the files received. If they aren't exactly what you send, reduce the baud rates on both computers until the files arrive intact. ■

Write to Bennett Shulman at 1414 W. Shiawassee St., Lansing, MI 48915.

Program Listing. Host/JCL.

```
SYSTEM (DRIVE=2,DRIVER="MEMDISK")
A
D
5
Y
SET *FF TO FORMS/FLT
FORMS (CHARS=40,ADDLF)
SET *CL TO COM/DVR
SETCOM (BAUD=2400)
FILTER *CL *FF
LINK *DO *CL
LINK *KI *CL
//EXIT
```

System Requirements

Model 4
64K RAM
TRSDOS 6.X

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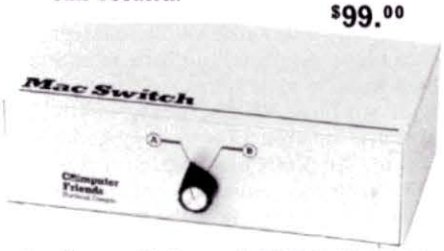

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is its ease of use. You don't need to worry about buffer controls, DOS commands, optional transfer protocols, or making selections from extensive menus. All you do is set the sending computer and the receiving computer to the same transfer parameters and let the software do the rest.

If you own a Model 100, 200, or 1000, you get a terminal program that lets you send and receive files directly or remotely. The 100 and 200 come with Term in ROM, while the 1000's terminal program, called Telcom, is part of the DeskMate package. (DeskMate is also available for the Models 1200 and 4.) With Term, you can directly transfer data at speeds ranging from 75 to 19,200 baud.

The Model 4 doesn't come with a terminal program, but the *Disk System Owner's Manual* tells you how to configure the RS-232 so you can use the 4 as a terminal. Pages 1-34 through 1-46 list the key combinations for direct connections to another computer and via a modem for telephone communications. The documentation is, however, difficult to follow. Bennett Shulman's sidebar on page 41 gives some simple instructions for using the direct method of data transfer at high speeds.

If you're only going to send data directly through an RS-232, several packages are made specifically for that job. Good Software's Let's Talk, for instance, comes with disks formatted for the Model III/4, IBM PC/Tandy 1000, Tandy 2000, and Model II/12/6000; moving information between any combination of these machines is a snap (see Table 3 for a list of manufacturers' addresses).

File Transfer, from Personal Computer Products, is similar. In addition to PC/1000 and III/4 disks, it comes with a null modem adapter.

Example No. 1

I'll take you through one of the situations listed at the beginning of this article to demonstrate how direct transfer works.

One of your employees (we'll name him Fred) uses a Model 4, while another (Louise) has a brand-new Tandy 1000. Fred has a VisiCalc file that Louise wants to integrate into a report she's writing with WordStar. Their desks are right next to each other and they both have RS-232 ports, so direct transfer is feasible. How do they go about getting the VisiCalc file from Fred's TRSDOS disk to Louise's WordStar disk?

First, Fred should save the spreadsheet using VisiCalc's print file option with the PF command described in the VisiCalc manual. VisiCalc saves the print file in ASCII format for transferring it via an RS-232 cable or modem.

Next, Louise plugs the null modem adapter into the RS-232 port of her 1000. (Fred could put it on his Model 4, but his RS-232 port is on the bottom of the machine, so Louise's is easier to access. Newer 4's have the RS-232 more conve-

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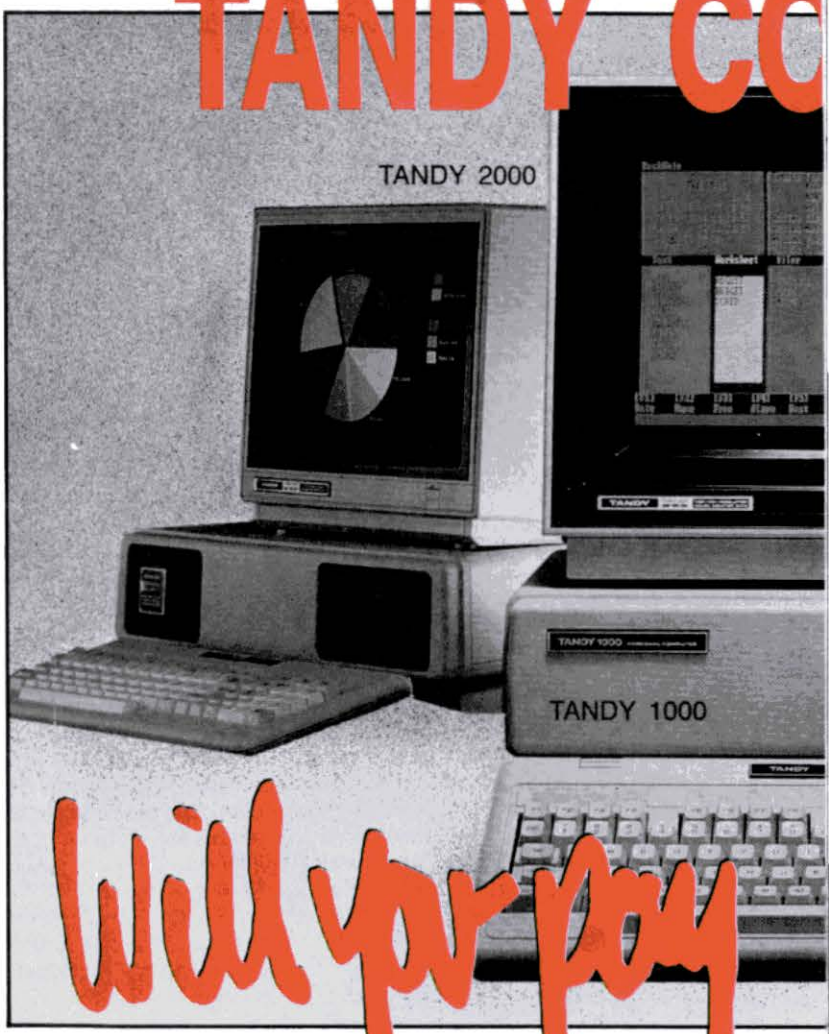

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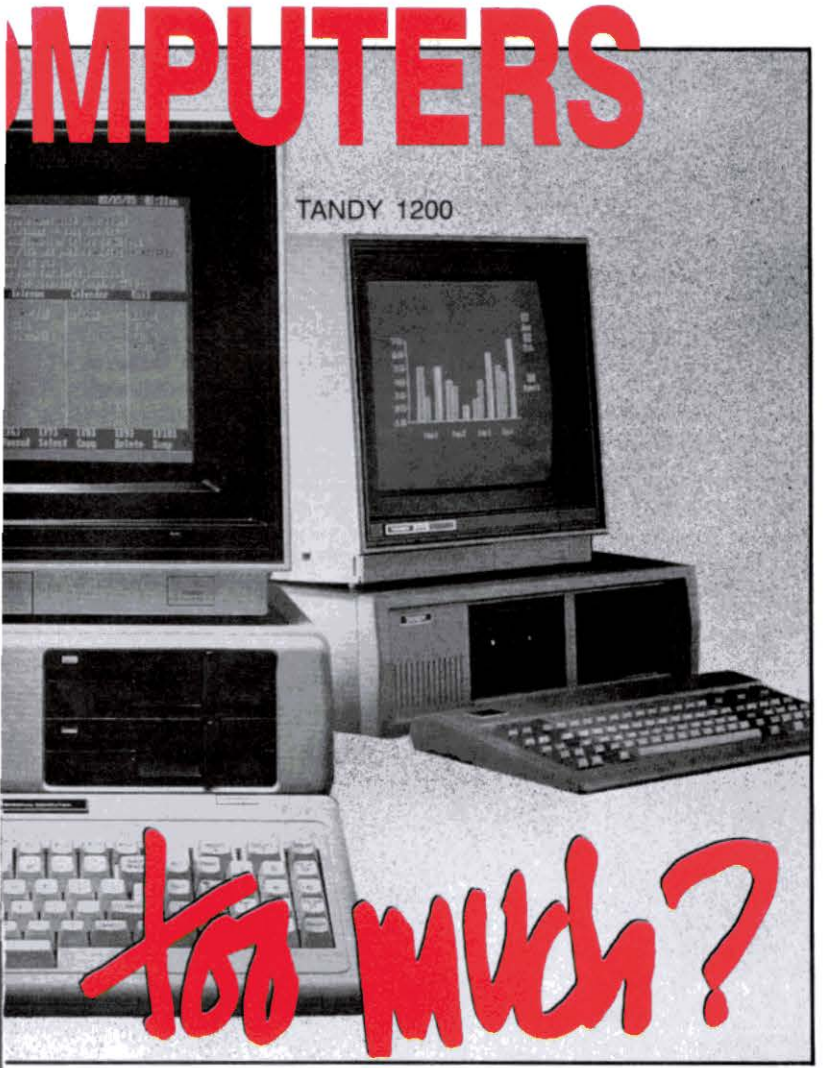

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niently located at the back of the computer.) They then connect the two machines' ports with an RS-232 cable.

Radio Shack computers send asynchronous data through the RS-232 ports; that is, they permit gaps of varying length between the characters. The advantage of asynchronous transmission is that you don't have to send characters one right after another; you can send them as they're available, such as when you're pressing keys.

Fred and Louise load and run Good Software's Let's Talk on their machines. They configure their computers to transfer the Print file at 2,400 baud and instruct the software to prompt them before sending or receiving any files. The RS-232 port in Radio Shack computers can send and receive asynchronous data at rates as slow as 75 baud and as fast as 19,200 baud when you've got two computers directly connected. However, the maximum rate of data transfer using Let's Talk is 2,400 baud.

It doesn't matter to Let's Talk whether Fred sends the file to Louise or Louise receives it from Fred's 4, but for this example, we'll have Louise receive the file. Louise presses control-R on her Tandy 1000 to initiate the transfer. The software prompts her for the name of the file she wants to receive and for the name she wants to save it under on her Tandy 1000. Once she does this, the program transfers the file and writes it directly to Louise's MS-DOS disk.

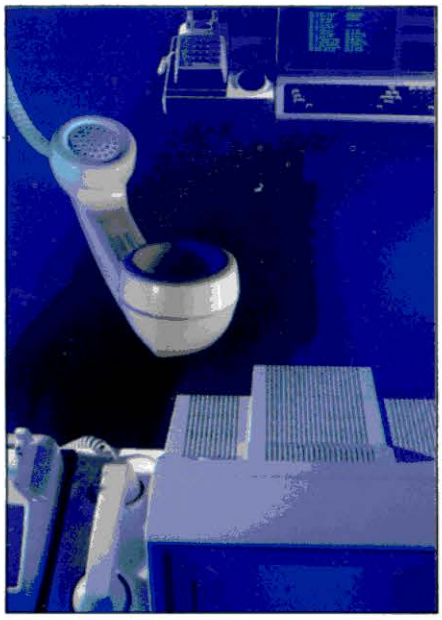
When Let's Talk completes the transfer, it returns to its conversational mode and waits for instructions to transfer another file or to exit back to DOS. With the VisiCalc file safely transferred, Louise can go on with her job of merging the new file with her WordStar document. In all, including the time it takes to hook up the two machines, the process should take no more than a few minutes.

Remote File Transfer

Remote file transfer means sending data over the telephone lines from one computer to another. You'll need an extra piece of hardware for remote transfer, a modem. The modem converts the digital data pulses transmitted from the RS-232 port to tones the telephone line can handle. The receiving computer must also have a modem to convert the tones back to digital data.

I could easily get lost in a discussion of the different kinds of modems available. For our purposes, you need only know that the two basic types of modems are acoustic and direct-connect. A direct-connect modem can be either internal (as a card) or external.

An acoustic modem (also called an acoustic coupler) has a cradle for the telephone, while a direct-connect modem has a plug for your phone jack. Both connect to your computer via the RS-232 port, with one exception. An internal modem doesn't



need an RS-232, since it's attached directly to your computer's innards.

Modem hardware continues to evolve. Three-hundred baud has been the standard transmission rate, but 1,200-baud modems have improved significantly. Modems that transfer at 2,400 baud are becoming prominent as high-speed data transfer becomes more important. For microcomputer enthusiasts, 300- or 1,200-baud communications is the most common.

When you send data over phone lines, the computer receiving the call is known as the host. You must configure it to answer a call from the remote computer set up in the originate mode.

You can use remote transfer to send data directly from one computer to another, or you can use the host as a way station—that is, the host computer can hold data you want retrieved later by another remote computer.

For instance, *80 Micro*'s authors will sometimes upload files to CompuServe, and the editors will download the files at their convenience.

As is the case with direct data transfer, most remote data transfer requires that you put the information in ASCII format. However, you do have an alternative: Xmodem (sometimes called Christensen, after its author Ward Christensen). This protocol lets you send compressed Basic files, binary (/CMD) files, and ASCII files. It features a superior method of checking for errors during transmission. Xmodem is a public-domain program available on many electronic bulletin boards and as a feature of many terminal programs, such as Microlink II.

As with direct transfer, you need software. You have a little more flexibility here, since most terminal packages let you access most host computers.

If you own a Model III or use your 4 in III mode, you can pick from several programs still on the market. These include

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Comments and letters on-file from registered users are unusually enthustiastic about this product and its ease of use. *It WILL do what you think it will do, it's easy, and it WORKS GREAT!* New features in SuperCROSS/XT include "tagging" files for multiple **COPY**'s or **KILL**'s to eliminate *many* unnecessary keystrokes!

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CNVBASIC/CMD, available seperately, "preps" your BASIC programs before sending over with SuperCROSS/XT. It will make most of the syntax and spacing changes required for converting Model I/III BASIC programs for use on MS-BASIC, CP/M BASIC, or Model 4 BASIC. Complex or commercial business packages written in BASIC probably will not convert 100% over by our or any other BASIC translator. So why put the bulk of your money into a translator when what you REALLY need is a great disk format FILE-TRANSFER utility?

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Omniterm from Lindbergh Systems, Microterm from Micro-Systems Software, and Radio Shack's Videotex. Model 4 owners can choose, in addition to Model 4 versions of the above, Microlink II from B.T. Enterprises. Many public-domain BBSes also carry simple terminal programs, as do publications like *80 Micro* (see Related Articles at the end of this article).

Most terminal software is functionally the same; some packages allow more buffer space for transferring files, some let you perform DOS commands while online with a host computer, and some support transfer protocols other than ASCII. The best way to get the most out of a terminal package is to define exactly what you will be doing with it and then find the program that meets those needs.

Another Example

Time for another case study. John and his Model 4 live in Duluth, while Peter has a Model 2000 in Miami. Peter has a simple data encryption program written in Basic that he would like to send John. How do they go about transferring the program?

The software John has for his Model 4 is B.T. Enterprises' Microlink II, while Peter runs Radio Shack's Videotex Plus. Since Videotex Plus does not support Xmodem transfer, Peter will have to send it in ASCII. The first step for him is to save the encryption program in ASCII format using the SAVE "FILE NAME",A command.

John and Peter then load and run their terminal programs and set them to the same baud rates and word lengths. Either can act as the calling, or remote, computer while the other plays host, but for this example, let's set up Peter's as the host system.

As the remote system, John must set up his modem in the originate mode, while Peter's system must be in the answer mode. These two configurations work automatically in smart modems or you set them with dual in-line package (DIP) switches inside each modem.

John then calls Peter's computer. After they make the connection, they can converse via the keyboard while they're in terminal modes. To transfer the ASCII file, Peter first loads it into Videotex's capture buffer while John opens his buffer and waits for the file. When Peter loads the file, he sends the contents of the buffer over the phone, where it enters the buffer on John's machine.

John closes his capture buffer and saves it to a disk file, types in "Goodbye," and exits the terminal program. With the ASCII file now on his disk, John can look at it with a word processor to delete any miscellaneous characters caused by static on the phone line, and save the clean file.

In Basic, John can load and run the ASCII file. Basic will convert the ASCII to compressed Basic and run it as usual, but to save time in the future you should save the file again in its compressed format. This

way, Basic won't have to convert the ASCII file every time John runs the program.

Software Solutions

Some companies have taken a software approach to file transfer: Their products let your computer read data from an alien disk (one written by another computer) and move that data to its own disks or write a file to disk that a different computer can read. Powersoft's Supercross/XT and Tandy's PC Maker are two such products.

Supercross/XT is Powersoft's version of Hypersoft's Hypercross. It lets you transfer files to and from disks in a variety of formats, including MS-DOS, CP/M, and the various I/III/4 DOSes (see Table 4 for a complete list of I/III/4 formats). It also lets you format a disk that another computer can read. For example, with Supercross/XT in drive zero of your Model 4, you can format an MS-DOS disk in drive 1, transfer TRSDOS 6.X.X files to the MS-DOS disk, and then read the MS-DOS disk on a PC or PC-compatible.

PC Maker is Tandy's attempt to make the Tandy 2000 more IBM PC-compatible by providing an intermediate disk format that lets the 2000 write files that both machines can read. Normally, the Tandy 2000 can read files from PC disks, but since the 2000 uses 80-track, quad-density disks, any files you write to a PC disk that you might want to read with the 40-track, double-density PC drives won't load. As a band-aid approach to the 2000's incompatibility problem with the PC, PC Maker is only a partial solution.

Example No. 3

Here's an example of how you use Supercross/XT to solve our remaining problem. Diane uses Scripsit on her trusty Model III at home to write reports that she distributes on her company's e-mail system, which runs on a Tandy 1200HD. Nei-

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ther her Model III nor the Tandy 1200 can read the other's disks, so she uses Supercross to write the file on an MS-DOS disk.

First she boots her Scripsit disk with the report and Supercross on it in drive zero and puts the MS-DOS disk in drive 1. She runs SX3/CMD (the Supercross program) and configures it for the Model III format her system disk uses.

On the first page of the list of disk formats Supercross supports, she finds choice 1D, which is the MS-DOS 2.0 double-sided, double-density format used by the Tandy 1200. She enters 1D and the screen changes to another menu from which she can pick what she wants to do with the alien disk. Pressing the T key transfers a file from a TRS-80 disk to an alien disk.

After Diane presses the T key, the program asks which file she wants to transfer. She enters the file name. Then Supercross asks if she wants an ASCII or image transfer. Image transfers are sometimes a little quicker than ASCII transfers because they copy data sector by sector. For this exercise, though, Diane chooses the ASCII transfer.

Supercross then reads the file from the TRS-80 disk and writes it directly to the MS-DOS disk. It takes no more time than TRSDOS 1.3's Copy command. Once she has transferred the file, she goes to work, puts the MS-DOS disk in the 1200, and submits it to the e-mail system. The whole process takes very little time and is the most direct method of moving information from one computer to another without using the RS-232 port.

Now What?

So you've finally figured out how to move files between machines quickly and easily. Now you face two additional barriers: how to convert programs written with other Basics so they'll run properly, and how to massage data files so the program you want to process them can do so. We'll tackle these problems next month. ■

Bradford N. Dixon is a technical editor on the 80 Micro staff.

Related Articles

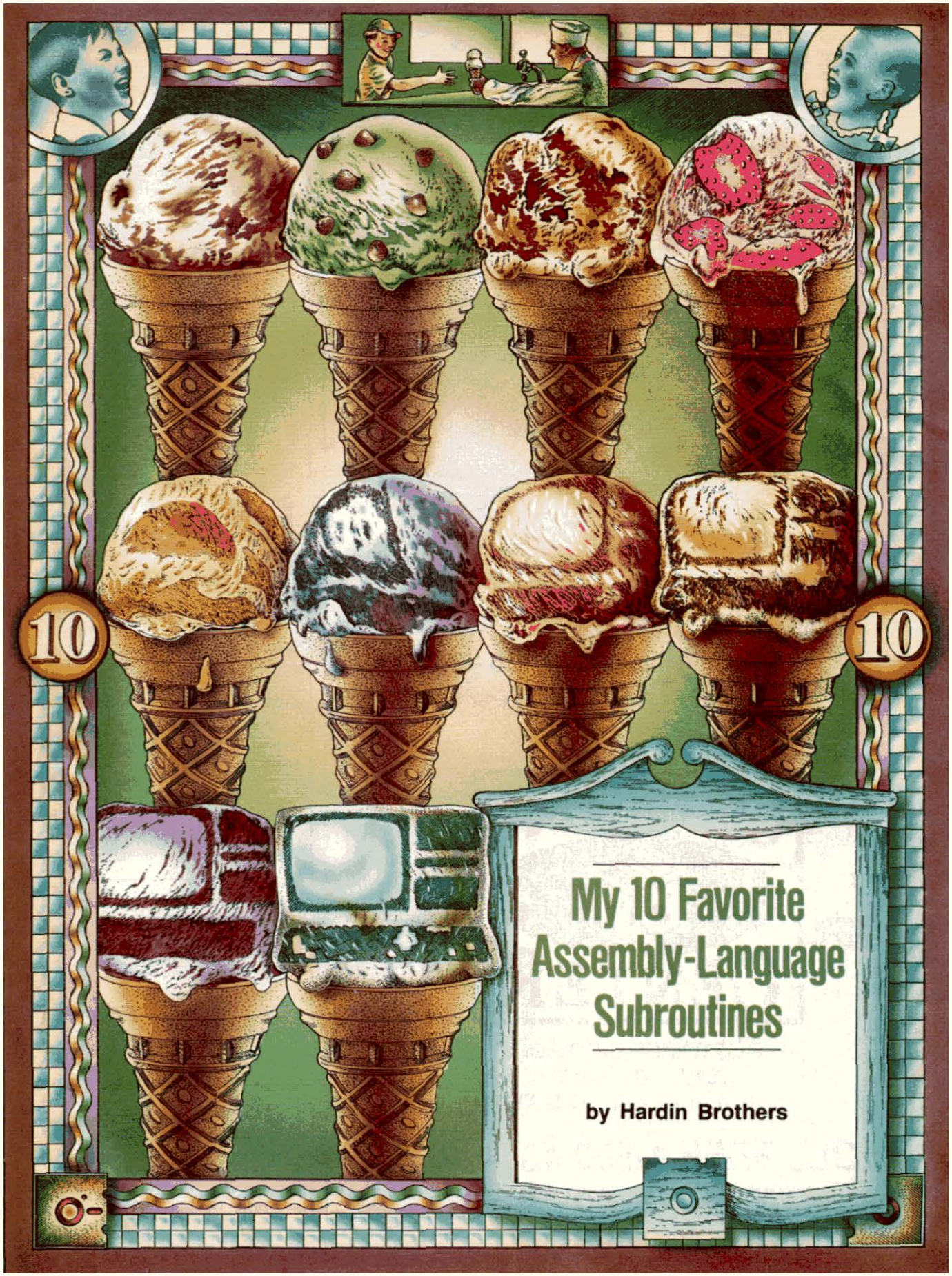
Balonis, Ronald, "Pin Pals," February 1984, p. 194. Make a null modem cable.

Fischer, David M., "Smart Talk," May 1984, p. 50. Debugs: October 1984, p. 32; February 1985, p. 33. DynaTerm, a smart terminal program for the Models I and III.

McGarvey, Richard C., "Basic Communication," June/July 1982, p. 324. Basic terminal program for the Model I.

Means, Jack, "Crossdos," October 1981, p. 288. Utility to copy Model I TRSDOS files to CP/M.

Payne, Douglas, "Talk to the Big Guys," September 1983, p. 230. *Debug: December* 1983, p. 20. Using the Model III as a dumb terminal to access mainframes.



My 10 Favorite Assembly-Language Subroutines

by Hardin Brothers

Illustration by Roger Leyonmark

Add zip to your Basic programs with these utilitarian machine-language routines.

Most computer programs perform three tasks: get data, manipulate that data, and then put the data somewhere. Basic, though sometimes slow, has enough power to do most tasks and, with its Print Using command, it's better at displaying information than many other languages.

However, Basic's input and screen-handling commands often leave much to be desired, especially if you're writing large application programs. Some functions that would be useful in simplifying data input for a user are either difficult or impossible to write in Basic.

To simplify my own programming, I've written a number of machine-language subroutines that I merge into my Basic programs. You'll find 10 of them for the Model 4 in Program Listing 1, along with a demonstration of how the routines work. Program Listing 2 shows the same routines for the Model III. The only differences in the demonstration portion of the listings are due to the differences in the Models III and 4 Basics and their screen sizes.

I've adopted several conventions that make these routines easy to use. The initialization routines, which run once at the beginning of a program, always start at line 61000; I call the subroutines with GOSUBs to lines between 60000 and 60999; and I reserve all variables beginning with the letter Q for these routines.

The final convention is perhaps the most important. Since Basic does not use local variables except in user-defined functions, you must avoid variable conflicts in a program. The 40-character variables Model 4 Basic allows help avoid conflicts, but I've found that reserving a whole class of variables names for library subroutines speeds up my programming substantially. I can merge these routines into a program without worrying about accidentally altering variables that are important in other parts of the program.

The Routines

Basic's Input and Line Input commands exhibit a major weakness: You can't control the number of characters you're allowed to type in, even though programs often must define maximum lengths for various data fields.

My first routine overcomes this problem by displaying an input field and restricting input to a given number of characters. Before you call the routine, you must print any necessary prompts on the screen and position the cursor to the start of the input area. Your program then loads the maximum size of the input field into the variable Q% and calls the routine at line 60100. The program automatically displays the input field and accepts all normal keyboard input, as long as you don't try to type beyond the end of the field. When you press the enter key, the input goes back to the program in the variable Q$.

You'll find the next two subroutines useful for standardizing input in a form that a program can easily handle. The routine at 60200 strips any trailing blanks from a string so you can work with its true length. And the routine at 60300 converts a string's lowercase characters to uppercase. Though you could write these subroutines entirely in Basic, they would require more programming space and more execution time.

I wrote the fourth and fifth routines to give Model 4 Basic two Model III functions. The fourth protects up to seven lines at the top of the screen from scrolling. In Model III Basic, you can protect the top of the screen with a simple POKE; because the Model 4 has no set addresses, you must use a short machine-language routine that communicates with the operating system via a supervisory call.

The fifth routine sets, resets, or tests the current state of the Caps Lock key. In the Model III, an entire byte holds the state of that key; the Model 4 uses a single bit of one of the flag bytes to show whether the machine will translate lowercase input to uppercase. You must use a supervisory call in machine language to find that byte.

The next four routines give you complete control over data entry. Routine 6 is a simple full-screen editor that lets you move the cursor around the screen at will and type in anything anywhere.

Before you call the full-screen editor, you can print any messages and prompts you want and set the cursor anywhere on the screen. Then you pass control of the screen to the keyboard by calling the subroutine. While the editor is running, most keys operate normally. If, however, you press the shift and arrow keys, you can move the cursor without erasing. To move down on the Model III, you have to press the shift/down-arrow/Z keys. To leave the editor and return to Basic, press the clear key on the Model III or the shift and clear keys on the Model 4.

The full-screen input editor will not let you scroll off the bottom of the screen with the shift and down-arrow keys but it will let you type off the bottom. The machine-language routine would have to be much longer to prevent that from happening. However, I've found that this routine works well for everyone except those intent on trying to bomb programs.

Once a program gets some data, it must have some way to copy that information into a string to process it. The seventh subroutine does just that. The Model III version is fast; it operates by pointing a string at a line of the screen and then copying everything in that line to a new string.

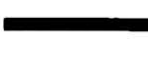
The Model 4 video display is not normally in addressable memory. Therefore, the Model 4 Line Copy routine uses one of the supervisory calls and copies the screen row to a string 1 byte at a time. Though noticeably slower than the Model III routine, the Model 4 version can still copy the entire screen to 24 strings in slightly over a second, which should be fast enough for most applications.

Sometimes you'll want to copy a single line from the screen to a string. At other times, you might need to copy the entire screen to an array of strings. Routines 8 and 9, written entirely in Basic, use the Screen Copy utility to copy the entire screen. Your program can capture everything you type on the screen and then manipulate that information as necessary. The final routine, which appears only in Program Listings 2 and 4, takes advantage of the Model 4 in the Model III mode. If you try to use it on a standard Model III, nothing happens. If you try it on a 4 in 4 mode, you'll be faced with certain catastrophe.

The Model 4 has 2K bytes of video memory. However, it uses only half that for the Model III mode's 16-column by 64-character display. The other half generally sits unused. This routine lets you switch between two video pages.

When you do so, the cursor moves to the second page, although its position is the same. When you switch a screen out of view, its information hides from the rest of the system until you call it back.

I've used this second page to display a



System Requirements

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help screen of a previous version of data that has been edited.

The Listings

I wrote the programs in Listings 1 and 2 in a style I often use. Even though each Basic line has several commands, no program line has more than one, and all loops have consistent indenting. Programs like these are easier to debug than those with several commands squeezed together. However, once you've debugged a program, you might want to remove extra spaces.

You might wonder why the Model 4 subroutines never use element zero of any array. I often use the Option Base command in Model 4 Basic programs to make arrays begin at 1 instead of zero. By completely ignoring the zero element of each array, these subroutines are compatible with all Basic programs whether they use Option Base or not.

Program Listings 3 and 4 provide the Assembly-language source code for the subroutines. Although the Model III and 4 Basic listings look almost identical, the real work done at the machine-language level is quite different.

By studying the differences between the Models III and 4 versions of the source code, you can learn a great deal about the peculiarities of each machine. Notice, in particular, that the Model 4 version has no Call instructions to outside routines. Since the Model 4 is completely RAM-based, I can't guarantee that routines will be in a specific location in different versions of TRSDOS. However, Logical Systems has guaranteed that the supervisory calls will stay the same in all versions of TRSDOS 6.X, so most programs interact with the DOS only through the SVCs.

You can link a machine-language subroutine to Basic in many ways. The method I've used here—loading each routine into an integer array—is one of the most flexible and easiest to use once you've converted each routine to its integer equivalents. You can make that conversion by hand, of course, but it's easier to let the computer do it for you if you follow these steps.

First, write and assemble your routine with an origin near the top of memory. From DOS, clear memory, then protect high memory and load the assembled routine. Enter Basic and invoke your routine with an appropriate USR or Call instruction to debug it. Once you're sure you've thoroughly debugged the program, you can convert it to integer form.

You must know the beginning and ending addresses of the routine in high memory. Run Program Listing 5, and the integer equivalents of your program will appear on your screen or printer. If you cleared memory before you started, you can ignore any trailing zeros in your list of integers. Finally, write a short installation routine in your Basic program that will read those integers into an array, and you're all set.

If you keep disk files of routine libraries, write these so that their line numbers don't conflict. You'll soon be able to write programs as a simple series of calls to bug-free routines. ■

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Program Listing 1. Model 4 subroutines and demonstration program.

```
10 '      Model 4 Subroutines

20 GOSUB 61000                  'Initialize
30 CLS: PRINT "MENU of Demos": PRINT
40 PRINT "  1. Formatted input"
50 PRINT " 2. Strip blanks"
60 PRINT " 3. Convert to upper case"
70 PRINT " 4. Caps-lock utility"
80 PRINT " 5. Scroll protect"
90 PRINT " 6. Full screen input"
100 PRINT " 7. Capture screen-row in string"
110 PRINT " 8. Full screen capture (1)"
120 PRINT " 9. Full screen capture (2)"
130 PRINT " 0. End Demo"
140 PRINT: PRINT "choice==> ";
150 A$=INPUT$(1):  A = VAL(A$):  IF A<0 OR A>9 THEN
    GOTO 150 ELSE IF A = 0 THEN CLS: END
160 ON A GOSUB 180,220,260,290,360,410,470,520,570:
    GOTO 30
170 '
180 CLS: PRINT "Formatted input ": INPUT "How many
    characters to input (1 - 254)";Q%
190 IF Q%<1 OR Q%>254 THEN GOTO 180  ELSE PRINT
    "Input your string==> ";:GOSUB 60100
200 PRINT: PRINT "Your string ==> ";Q$: A$=INPUT$(1):
    RETURN
210 '
220 CLS: PRINT"Strip strings": INPUT "Length of text"
    ;A%: INPUT "Number of blanks";B%
230 Q$ = STRING$(A%,"#") + STRING$(B%," "): PRINT Q$;
    " Length=";LEN(Q$): GOSUB 60200
240 PRINT Q$; "Length="; LEN(Q$): A$=INPUT$(1):RETURN
250 '
260 CLS: PRINT "Convert case": PRINT "type in string
    ==> ";:LINE INPUT Q$
270 PRINT Q$: GOSUB 60300: PRINT Q$: A$=INPUT$(1):
    RETURN
280 '
290 CLS: PRINT" Caps lock utility"
300 Q% = 0: GOSUB 60400: PRINT "Caps lock is now off
    (type something) ";: LINE INPUT Q$
310 Q% = 1: GOSUB 60400: PRINT "Caps lock is now on
    (type something) ";: LINE INPUT Q$
320 PRINT: PRINT"Set caps lock however you wish and
    type something ";: LINE INPUT Q$
330 Q% = 2: GOSUB 60400: IF Q% THEN PRINT "Caps lock
    on" ELSE PRINT "Caps lock off"
340 A$ = INPUT$(1): RETURN
350 '
360 CLS: PRINT "Scroll Protect"
370 FOR I% = 1 TO 5: INPUT "# of lines to protect";Q%
    :GOSUB 60500
380 CLS: FOR J% = 1 TO 30: PRINT J%: NEXT J%: FOR J%
    = 1 TO 30: PRINT: NEXT J%: NEXT I%
390 A$=INPUT$(1): Q%=0: GOSUB 60500: CLS: PRINT "Done
    with scroll protect": A$=INPUT$(1): RETURN
400 '
410 CLS: PRINT "Full Screen Input"
420 PRINT "<Shift> + arrows will move the cursor,
    <Shift><Clear> to end"
430 GOSUB 60600
440 PRINT @ (23,33), "Done with that";
450 A$=INPUT$(1): RETURN
460 '
470 CLS: PRINT"Capture screen row in a string -- fill
    screen with whatever you wish"
480 PRINT "Press <Shift><Clear> to end": GOSUB 60600
490 FOR I%=2 TO 23: PRINT @ (I%,0),I%;" ";: NEXT I%:
    PRINT @ (0,0),STRING$(79," "): PRINT @ (0,2),
    "Which row to capture?";: LINE INPUT A$:A=VAL(A$)
500 IF A < 2 OR A > 23 THEN GOTO 490 ELSE Q% = A:
    GOSUB 60700: CLS: PRINT Q$: A$=INPUT$(1): RETURN
510 '
520 CLS: PRINT "Full screen capture #1 -- each line
    saved in an 80-character string"
530 PRINT "Type whatever you want then press
    <Shift><Clear>":GOSUB 60600
540 GOSUB 60800: CLS: PRINT "Press a key to see the
    captured screen";: A$=INPUT$(1)
550 Q$(24)=LEFT$(Q$(24),79): CLS: FOR I%=1 TO 24:
    PRINT Q$(I%);: NEXT I%: A$ = INPUT$(1): RETURN
560 '
570 CLS: PRINT "Full screen capture #2 -- trailing
    spaces stripped from lines"
580 PRINT "Type whatever you want then press
    <Shift><Clear>": GOSUB 60600
590 GOSUB 60900: CLS: PRINT "Press a key to see the
    captured screen";: A$=INPUT$(1)
600 CLS: FOR I% = 1 TO 23: PRINT Q$(I%): NEXT I%:
    PRINT Q$(24);: A$ = INPUT$(1): RETURN
610 '
60000 ' Model 4 Version -- Data handling subroutines
      Be sure to initialize routines with GOSUB 61000
      before use
60098 '   Formatted input -- shows input field with
      '.' characters and restricts number of
      characters user can enter.  Calling sequence:
      Q% = number of characters allowed (1 - 254)
      GOSUB 60100
60099 '   Input string returned in Q$
60100 IF Q%<1 OR Q%>254 THEN RETURN ELSE Q$=STRING$
      (Q%+1,32): Q%=VARPTR(Q$): Q1%=VARPTR(Q1%(1)):
      CALL Q1% (Q%): RETURN
60101 '
60199 '   Strip blanks from end of a string
      Calling sequence: Q$ = string to strip
      GOSUB 60200  String returned in Q$
60200 DEF USR9 = VARPTR(Q2%(1)): Q$=USR9(Q$): RETURN
60201 '
60299 '   Convert lowercase characters in a string to
      uppercase     Calling sequence: Q$ = string to
      convert   GOSUB 60300   String returned in Q$
60300 DEF USR9 = VARPTR(Q3%(1)): Q$=USR9(Q$): RETURN
60301 '
60397 '   CAPS-Lock utility: turn CAPS on or off, or
      test present condition   Calling sequence: Q% =
      function request (0 = turn CAPS off  1 = turn
      CAPS on
60398 '   2 = test present state)      GOSUB 60400
      If test function is chosen then Q% returns
      present state of CAPS:
60399 '   if CAPS are on,  Q% = -1 (true)
       if CAPS are off, Q% =  0 (false)
60400 Q1% = VARPTR(Q4%(1)): CALL Q1% (Q%): RETURN
60401 '
60499 '   Scroll protect -- protects 0 - 7 lines at
      top of screen from scrolling (but not from CLS)
      Calling sequence: Q% = number of lines to
      protect  GOSUB 60500
60500 DEF USR9 = VARPTR(Q5%(1)): Q%=USR9(Q%): RETURN
60501 '
60599 'Full screen input --- user can freely move
       around screen and enter input anywhere
       <Shift> + arrow moves cursor non-destructively
       Calling sequence: GOSUB 60600
60600 DEF USR9 = VARPTR(Q6%(1)): Q%=USR9(0): RETURN
60601 '
60699 '   Copy screen row to a string
      Calling sequence:  Q% = row of screen to copy
      (0 - 23)  GOSUB 60700    String returned in Q$
60700 Q$=STRING$(80,32):  Q1%=VARPTR(Q$):  Q2%=VARPTR
      (Q7%(1)): CALL Q2%(Q1%,Q%): RETURN
60701 '
60799 '   Full screen capture -- Capture all screen
      characters in array  Each string returned is 80
      characters long.  Calling sequence: GOSUB 60800
      Screen returned in Q$(1) through Q$(24)
60800 FOR Q%=0 TO 23:GOSUB 60700:Q$(Q%+1)=Q$:NEXT Q%:
      RETURN
60801 '
60899 '   Full screen capture as above -- each string
      in Q$() array is stripped of trailing blanks
      Calling sequence: GOSUB 60900  Screen returned
      in Q$(1) through Q$(24)
60900 FOR Q%=0 TO 23: GOSUB 60700: GOSUB 60200:
      Q$(Q%+1)=Q$: NEXT Q%: RETURN
60901 '
61000 '   Initialization for Model 4 subroutines
      GOSUB 61000 once at beginning of program
61100 '      Routine 1 -- Formatted input
61101 DATA 9086, 28518, 18149, 32291, 26147, 1391,
      -14907, 11790, 574, 4335, -15877, 6158, 574,
      4335, -15877, 2366, 14575, 8197, 30723, 536,
      62, 30689, 201
61102 DIM Q1%(23): RESTORE 61101: FOR Q%=1 TO 23:
      READ Q1%(Q%): NEXT Q%
61103 '
61200 '      Routine 2 -- Strip blanks from string
61201 DATA -5163, 9038, 9086, 28518, 6, 11017, -386,
      8224, 11012, 8205, -7689, -13967
61202 DIM Q2%(12): FOR Q%=1 TO 12: READ Q2%(Q%):
      NEXT Q%
61203 '
61300 '      Routine 3 -- Convert to upper case
61301 DATA 18155, 32291, 26147, 32367, 25086, 1848,
      31742, 816, 24550, 9079, -3824, 201
61302 DIM Q3%(12): FOR Q%=1 TO 12: READ Q3%(Q%):
      NEXT Q%
61303 '
61400 '      Routine 4 -- Caps lock utility
61401 DATA 25918, 32495, 470, 32509, 14346, 10253,
      -13553, 15983, 10240, 15617, 9079, -13961,
      -20533, 536, -4149, 30717, -14070
61402 DIM Q4%(17): FOR Q%=1 TO 17: READ Q4%(Q%):
      NEXT Q%
61403 '
61500 '      Routine 5 -- Scroll protect
61501 DATA 1614, 15879, -4337, 201
61502 DIM Q5%(4): FOR Q%=1 TO 4: READ Q5%(Q%):NEXT Q%
61503 '
61600 '      Routine 6 -- Full Screen input
61601 DATA 318, 8431, -261, -14305, 6910, 3104, 1631,
      15876, -4337, -388, 31511, -6104, 15951, -4350,
      -7656
61602 DIM Q6%(15): FOR Q%=1 TO 15: READ Q6%(Q%):
      NEXT Q%
61603 '
61700 '      Routine 7 -- Screen to string utility
61701 DATA 9086, 28518, 9030, 9086, 28518, 26347, 46,
      -10811, 262, 3902, -11793, 4882, -16084, -3568,
      201
61702 DIM Q7%(15):  FOR Q%=1 TO 15:  READ Q7%(Q%):
```

Listing 1 continued

Listing 1 continued

```
        NEXT Q%
61703 '
61800 '    Create space for necessary variables:
61801 Q1%=0: Q2%=0: DIM Q$(24): RETURN
```

End

Program Listing 2. Model III subroutines and demonstration program.

```
10 ' Model 3 Subroutines
20 '
30 CLEAR 2000
40 GOSUB 61000 'Initialize
50 CLS: PRINT "MENU of Demos": PRINT
60 PRINT " 1. Formatted input"
70 PRINT " 2. Strip blanks"
80 PRINT " 3. Convert to uppercase"
90 PRINT " 4. Caps-lock utility"
100 PRINT " 5. Scroll protect"
110 PRINT " 6. Full screen input"
120 PRINT " 7. Capture screen row "
130 PRINT " 8. Full screen capture (1)"
140 PRINT " 9. Full screen capture (2)"
150 PRINT " 0. Screen swap"
160 PRINT " X. End Demo"
170 PRINT: PRINT "choice==> ";
180 GOSUB 200: IF INSTR("Xx",A$) THEN CLS: END ELSE A
    =VAL(A$): IF A=0 AND A$<> "0" THEN GOTO 180
190 ON A+1 GOSUB 660, 220, 260, 300, 330, 400, 450,
    510, 560, 610: GOTO50
200 A$=INKEY$: IF A$="" THEN 200 ELSE RETURN
210 '
220 CLS: PRINT "Formatted input ": INPUT "How many
    characters to input (1 - 254)  ";Q%
230 IF Q%<1 OR Q%>254 THEN GOTO 220 ELSE PRINT"Input
    your string  ==> ";: GOSUB 60100
240 PRINT: PRINT "Your string ==> ";Q$: GOSUB 200:
    RETURN
250 '
260 CLS: PRINT"Strip strings": INPUT "Length of
    text";A%: INPUT "Number of blanks";B%
270 Q$ = STRING$(A%,"*") + STRING$(B%," "): PRINT
    Q$;" Length="; LEN(Q$): GOSUB 60200
280 PRINT Q$;" Length=";LEN(Q$): GOSUB 200: RETURN
290 '
300 CLS: PRINT "Convert case": PRINT"type in string
    ==> ";: LINE INPUT Q$
310 PRINT Q$: GOSUB 60300: PRINT Q$: GOSUB 200:
    RETURN
320 '
330 CLS: PRINT" Caps lock utility"
340 Q% = 0: GOSUB 60400: PRINT "Caps lock is now off
    (type some thing) ";:  LINE INPUT Q$
350 Q% = 1:  GOSUB 60400:  PRINT "Caps lock is now on
    (type some thing) ";: LINE INPUT Q$
360 PRINT:   PRINT "Set caps lock however you wish
    and type some thing ";:LINE INPUT Q$
370 Q% = 2: GOSUB 60400:  IF Q% THEN PRINT "Caps lock
    on" ELSE PRINT "Caps lock off"
380 GOSUB 200: RETURN
390 '
400 CLS: PRINT "Scroll Protect"
410 FOR I% = 1 TO 5: INPUT "# of lines to
    protect";Q%: CLS: GOSUB 60500
420 FOR J% = 1 TO 30: PRINT J%: NEXT J%: FOR J% = 1
    TO 30: PRINT : NEXT J%: NEXT I%
430 GOSUB 200: Q%=0: GOSUB 60500:  CLS:  PRINT "Done
    with scroll protect": GOSUB 200:  RETURN
440 '
450 CLS:  PRINT "Full Screen Input.   <Shift> + Arrow
    moves the cursor"
460 PRINT "<Shift><Down Arrow><Z> moves down <Clear>
    to end"
470 GOSUB 60600
480 PRINT @ (985), "Done with that";
490 GOSUB 200: RETURN
500 '
510 CLS: PRINT"Capture screen row -- fill screen with
    whatever you wish"
520 PRINT "Press <Clear> to end": GOSUB 60600
530 FOR I%=2 TO 15:  PRINT @(I%*64),I%;:  NEXT I%:
    PRINT @ (0), STRING$(63," "):PRINT @ (2), "Which
    row to capture?";: LINE INPUT A$: A = VAL(A$)
540 IF A < 2 OR A > 23 THEN GOTO 420 ELSE Q% = A:
    GOSUB 60700: CLS: PRINT Q$: GOSUB 200: RETURN
550 '
560 CLS: PRINT "Full screen capture #1 -- saved in
    64-character strings"
570 PRINT"Type whatever you want then press
    <Clear>":GOSUB60600
580 GOSUB 60800:CLS:PRINT"Press a key to see the
    captured screen";: GOSUB 200
590 Q$(15)=LEFT$(Q$(15),63): CLS: FOR I%=0 TO 15:
    PRINT Q$(I%);: NEXT I%: GOSUB 200: RETURN
600 '
610 CLS:PRINT"Full screen capture #2 -- trailing
    spaces stripped from lines"
620 PRINT"Type whatever you want then press
    <Clear>":GOSUB60600
```

Listing 2 continued

Circle 534 on Reader Service card.

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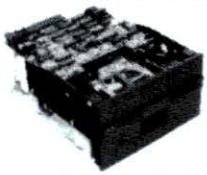

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80tk DS, Full Size, Tandon TM101-4	267
40tk SS, Half-High, TEAC FD55-A	147
40tk DS, Half-High, TEAC FD55-B	187
80tk DS, Half-High, TEAC FD55-F	237
8" SS, Thinline, Tandon TM848-1E	259
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8" Diskette DSDD, Lifetime Guar. Pack of 10	34
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Listing 2 continued

```
630 GOSUB 60900: CLS:PRINT "Press a key to see the
    captured screen";: GOSUB 200
640 CLS: FOR I% = 0 TO 14: PRINT Q$(I%): NEXT I%:
    PRINT Q$(15);: GOSUB 200: RETURN
650 '
660 Q%=0: GOSUB 60950: CLS:  PRINT "Screen Swap --
    Model 4/4P in Model III Mode only!": PRINT "Type
    something then press <CLEAR>": GOSUB 60600
670 Q%=1:  GOSUB 60950: CLS: PRINT "Type something
    else, then press <CLEAR>": GOSUB 60600: Q%=0:
    GOSUB 60950
680 PRINT @960-Q%*10,"Press 'S' to swap screens, 'Q'
    to quit";: GOSUB 200
690 IF INSTR("Qq",A$) THEN RETURN ELSE IF
    INSTR("Ss",A$) THEN Q% = NOT Q%: GOSUB  60950
700 GOTO 680
710 '
60000 ' Model 3 Version -- -- -- Data handling
      subroutines. Be sure to initialize routines
      with GOSUB 61000 before use
60098 ' Formatted input -- shows input field with '.'
      characters and restricts number of characters
      user may enter. Calling sequence: Q% = length
      of input field (1 - 254)
60099 ' GOSUB 60100 Input string returned in Q$
60100 IF Q%<1 OR Q%>254 THEN RETURN ELSE
      Q$=STRING$(Q%+1,32): DEFUSR9 = VARPTR(Q1%(0)):
      Q% = USR9(VARPTR(Q$)): RETURN
60101 '
60199 ' Strip blanks from end of a string Calling
      sequence: Q$ = string to strip GOSUB 60200
      String returned in Q$
60200 DEFUSR9 = VARPTR(Q2%(0)): Q1%=USR9(VARPTR(Q$)):
      RETURN
60201 '
60299 ' Convert lowercase characters in a string to
      uppercase Calling sequence: Q$ = string to
      convert GOSUB 60300 String returned in Q$
60300 DEFUSR9 = VARPTR(Q3%(0)): Q%=USR9(VARPTR(Q$)):
      RETURN
60301 '
60397 ' CAPS-Lock utility: turn CAPS on or off, or
      test present condition. Calling sequence: Q% =
      function request (0 = turn CAPS off 1 = turn
      CAPS on 2 = test present state)
60398 ' GOSUB 60400 If test function is chosen then
      Q% returns present state: Q% = -1 (true) means
      CAPS on Q% = 0 (false) means CAPS off
60400 Q1% = &H4019:  IF Q% => 0 AND Q% < 2 THEN POKE
      Q1%,Q% ELSE Q% = (PEEK(Q1%)<>0)
60401 RETURN
60402 '
60499 ' Scroll protect -- protects 0 - 7 lines at top
      of screen from scrolling (but not from CLS)
      Calling sequence: Q% = number of lines to
      protect GOSUB 60500
60500 POKE &H4214,Q%: RETURN
60501 '
60599 ' Full screen input -- user can freely move
      around screen and enter input anywhere <Shift>
      + arrow moves cursor non-destructively. Calling
      sequence: GOSUB 60600
60600 DEFUSR9=VARPTR(Q6%(0)):Q%=USR9(0):PRINT
      CHR$(15);:RETURN
60601 '
60699 'Copy screen row to a string Calling sequence:
      Q% = row of screen to copy (0 - 23) GOSUB 60700
      String returned in Q$
60700 Q$(16)=" ": Q1%=VARPTR(Q$(16)):
      Q2%=&H3C00+Q%*64: POKE Q1%,64: POKE Q1%+1,Q2%
      AND 255: POKE Q1%+2,INT(Q2%/256): Q$= Q$(16):
      RETURN
60701 '
60799 ' Full screen capture -- --  Capture all screen
      characters in array or 64-character strings.
      Calling sequence: GOSUB 60800 Screen returned
      in Q$(0) through Q$(15)
60800 FOR Q%=0 TO 15: GOSUB 60700: Q$(Q%)=Q$: NEXT
      Q%: RETURN
60801 '
60899 ' Full screen capture as above - each string in
      Q$() array is stripped of trailing blanks.
      Calling sequence: GOSUB 60900 Screen returned
      in Q$(0) through Q$(15)
60900 FOR Q%=0 TO 15: GOSUB 60700: GOSUB 60200:
      Q$(Q%)=Q$: NEXT Q%: RETURN
60901 '
60949 ' Screen Swap -- For use ONLY on a Model 4/4p
      in Model III mode! Calling sequence: Q%= page #
      (even for page 0 odd for page 1) GOSUB 60950
60950 DEFUSR9=VARPTR(Q9%(0)): Q%=USR9(Q%): RETURN
60951 '
61000 ' Initialization for Model 3 subroutines GOSUB
      61000 once at beginning of program
61001 DATA MODEL3
61002 RESTORE
61003 READ Q$: IF Q$ <> "MODEL3" THEN GOTO 61003
61004 '
61100 ' Routine 1 -- Formatted input
61101 DATA 32717, -4854, 8283, -6848, 18133, 8965,
      9086, 28518, 16069, -13010, 51, -1264, -11839,
      21485, 16416, 16589, 14336, 30723, 536, 62,
      30689, 201
```

Listing 2 continued on p. 104

Circle 107 on Reader Service card.

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DRAWING IN DETAIL

by Jim Abbassian and Glen E. Sparks

MacPaint-style graphics bring out the best in your Model III or 4 high-resolution board.

"I wish my computer could do graphics like that." Maybe Model III/4 owners don't say that out loud, but they probably think it when they see an Apple Macintosh or a Tandy 1000 in action.

You don't have to put up with that gnawing feeling of inadequacy. By installing Radio Shack's high-resolution board, you'll be the envy of the neighborhood, with graphics that outshine an IBM PC's with 18 percent higher resolution.

Rembrandt is a Model III/4 icon-driven high-resolution (hi-res) graphics program that gives you a plethora of drawing and editing commands (see Program Listing 1). It lets you:

- Draw line figures.
- Paint sections of the screen with 16 patterns.
- Mix text and graphics.
- Manipulate predefined geometric shapes, including rectangles, circles, polygons, cones, and cylinders.
- Cut and paste; that is, define a section of the screen and duplicate it elsewhere.
- Save screens to disk or dump them to a Radio Shack dot-matrix printer with dot-addressable graphics capability.
- Erase the screen pixel by pixel or all at once.

As you read the documentation below, you'll get an idea of Rembrandt's potential for design, business, and entertainment applications. You can modify the program for special needs, such as architectural drawing, model design, and mapping.

In the Beginning...

While Rembrandt isn't hard to use, you'll need a few practice sessions to master it. If you start by trying to create an on-screen version of the Mona Lisa, you'll become frustrated and confused.

Type in and run Program Listing 1 from BasicG. (The high-resolution board comes with BasicG, which supports a number of GW-Basic commands.) Don't save the program in ASCII format; some lines will become too long to load, causing a "Direct statement in file" error.

After a pause for initialization, you'll see Rembrandt's icon menu to the left and a pattern menu along the bottom of the screen (see Fig. 1). The rest of the screen is free for graphics.

Rembrandt has three modes: the cursor, function, and paint modes. In each mode, the cursor changes its appearance to indicate which mode you're in. In the cursor mode, the cursor is arrow-shaped and movable. In the function mode, it changes to a stationary inverse-video arrow; here, control passes to the icon menu so you can choose a function. In the paint mode, the cursor becomes a stationary spray can.

A La Mode

On boot-up, Rembrandt starts out in the cursor mode. You use this mode to position the cursor only, to get it where you want to start drawing on the screen. The arrow keys move the nondestructive cursor around the screen in a total of eight directions. Use single keys to move up, down, right, and left; combine keys to move diagonally.

To create and manipulate shapes, you switch to Rembrandt's function mode, with its icon menu on the left of the screen. Press the spacebar once to enter this mode; the cursor changes to inverse video. Use the arrow keys to position the cursor on the icon of interest. Rembrandt highlights each icon as the cursor travels through it.

Pressing the spacebar again returns the cursor to its previous position and invokes the highlighted function. If, for example, you choose the Circle function, the circle's center is at the cursor's on-screen position. To exit the function mode and restore cursor control, hit the spacebar again.

Iconography

I'll take you through the function menu icon by icon, starting in the upper left-hand corner. Refer to Fig. 1 if you don't have Rembrandt up on your computer.

The first icon represents the Line function, which draws lines one at a time. To see how it works, get into the function mode by pressing the spacebar, use the arrow keys to get to the line icon, and press the spacebar again. The line starts at a fixed point, determined by the cursor's position when you entered the function mode. You control the second endpoint by using the arrow keys to extend the line and give it direction.

To make a freehand line drawing, alternately enter the line mode, draw a line, exit to the function menu, then select the Line function again, starting your new line where the last one left off. This sounds involved, but it actually takes only a few seconds.

The second function, the Eraser, lets you clear the screen selectively, just like a blackboard. As you move the eraser around the screen with the arrow keys, you permanently delete everything it passes over.

The Triangle function is a little tricky, but useful. One vertex is fixed at the cursor's position. You can manipulate the other two vertices, but only one at a time. Press the enter key (hold it down, don't just tap it) to switch between the two variable endpoints, and use the arrow keys to pivot the triangle or change its size. You can also draw triangles with the Line function, or with the Polygon function, described below.

The Box/Rectangle function works like the Line function. The cursor's position defines the top left corner of the box. You control the opposite corner and use the arrow keys to change the box's length and width.

The Circle function draws circles or ellipses. The up- and down-arrow keys control the X, or horizontal, axis; the left- and

LOAD 80

System Requirements

Models III and 4
64K RAM
BasicG
High-resolution board
Dot-matrix printer optional

Illustration by Phil Geraci

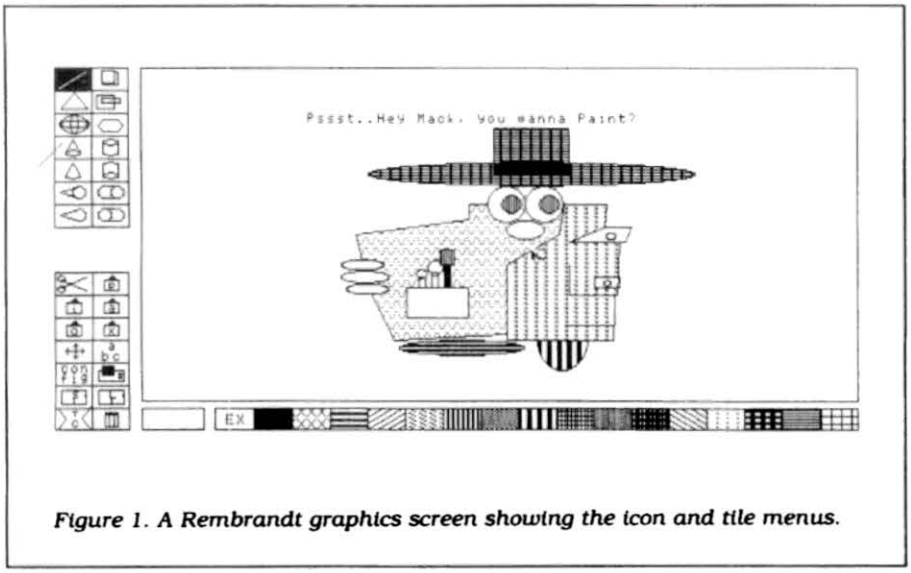

Figure 1. A Rembrandt graphics screen showing the icon and tile menus.

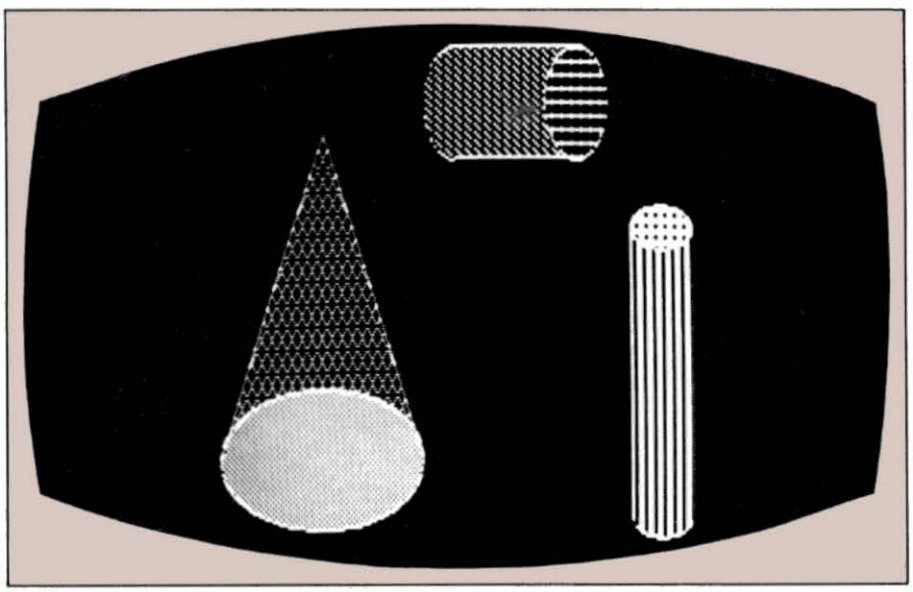

Photo 1. Geometric figures automatically drawn by Rembrandt.

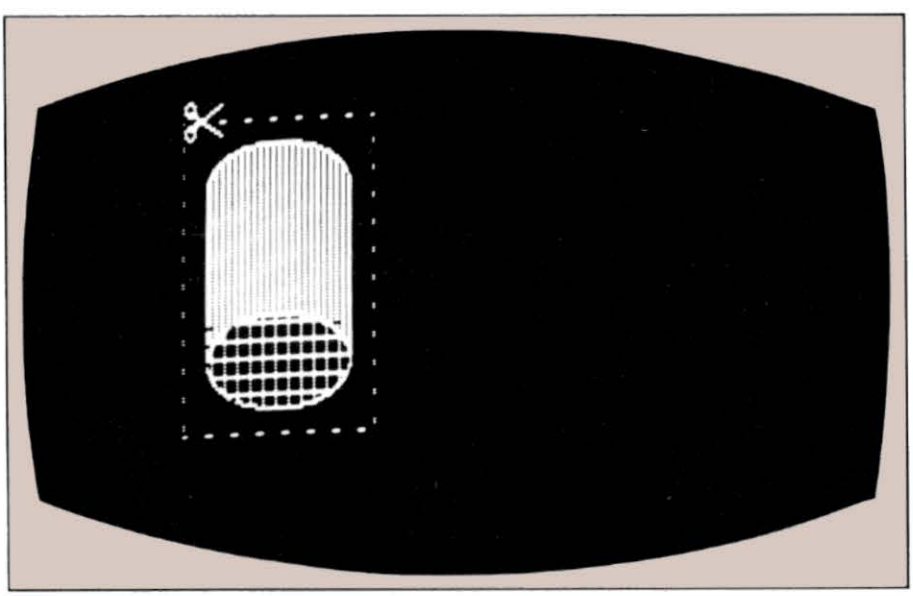

Photo 2. Demonstration of cut-and-paste function: Dotted lines indicate area to be pasted.

right-arrow keys control the Y, or vertical, axis.

You can use the next function, the Polygon, to create a regular polygon of any size and shape. The left- and right-arrow keys change the figure's size. The up- and down-arrow keys control the number of sides. The lower and upper limits to the number of sides are three (a triangle) and 20 (roughly a circle). You can increase the number of sides to more than 20, but your figure won't look much different from a 20-sided one, and will take longer to draw.

The rest of the icons in the top half of the function menu represent a variety of cones and cylinders. You control the lengths of vertical shapes with the up- and down-arrow keys and change their radii with the left- and right-arrow keys. You control horizontal cones or cylinders in a similar manner. Photo 1 shows three figures drawn using these functions.

Impeccable Paste

The bottom half of the function menu begins with several Cut-and-Paste icons, which let you move or duplicate parts of your graphics screen.

First, move the cursor to the upper left-hand corner of the section you want to cut and paste. Now select the Cut function using the scissors icon. Use the arrow keys to adjust the dotted-line box until it surrounds the area you want to cut and press the spacebar (see Photo 2). The dotted lines should disappear, indicating that the figure is stored in the buffer. If they don't, reduce the size of the outlined area and try again.

The area inside the box doesn't move. Rembrandt reproduces the image and stores it in memory. You can paste the image elsewhere on the screen using the five Paste functions, shown on the menu as paste bottle icons.

Move the cursor to where you want to paste the stored image. Now select one of the paste functions. The "P" bottle pastes an image exactly like the original, overwriting anything else on that part of the screen. The "I" bottle pastes an inverse-video image of the memory buffer, meaning the whole area in the dotted box.

The "A," "O," and "X" paste bottles compare the image on screen to the image in the buffer using the Boolean operators And, Or, and XOR. This means you can combine images or select parts of the stored image to display.

You can reverse the pasting process by pasting with the "X" bottle twice. This restores the screen to its original condition.

Once you've captured an image in memory, you can paste it over and over again using different paste bottle options (see Photo 3).

Text Talk

You can add text to your graphics screen using the ABC and crossed-arrows icons. Use ABC to select the Text function, then go to the crossed arrows to select the

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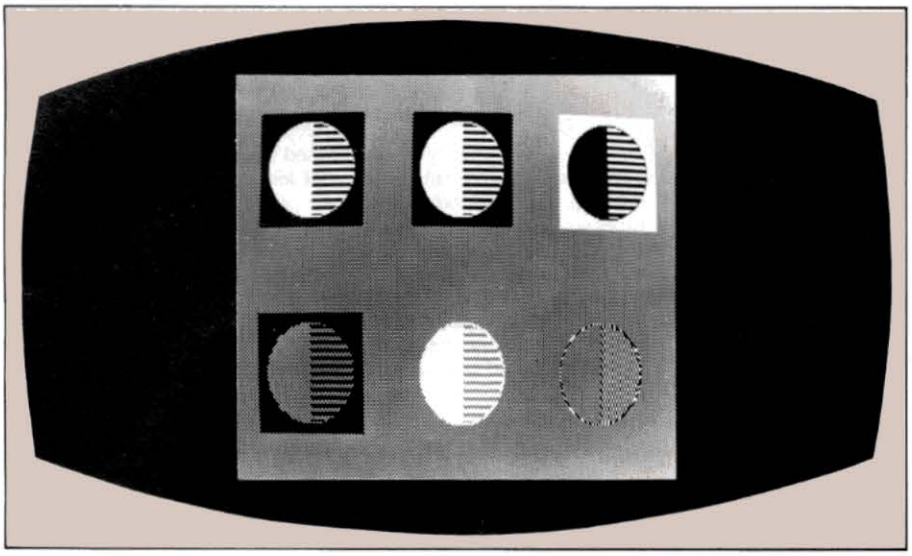

Photo 3. Demonstration of cut-and-paste feature: The original design in the upper left-hand corner is pasted using (left to right from the middle of the top row) the "P," "I," "A," "O," and "X" options.

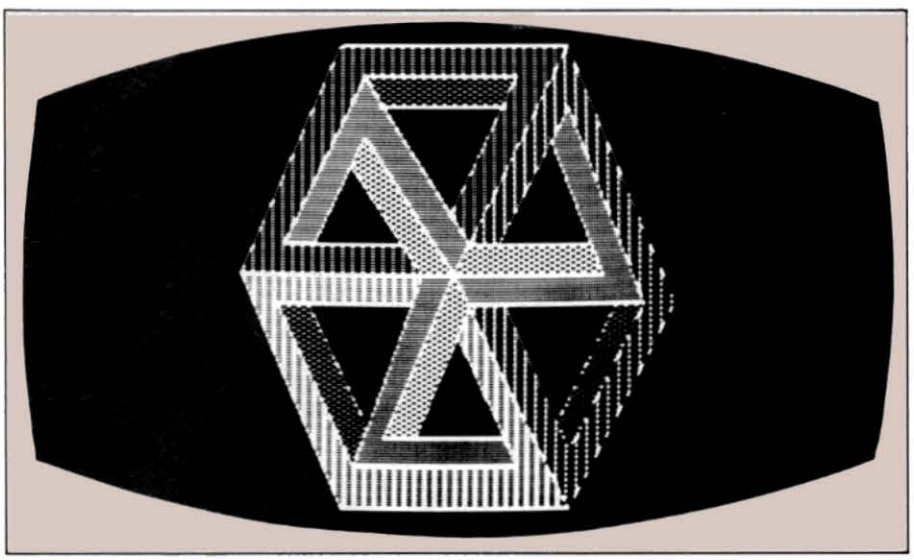

Photo 4. Hexagon design corresponding to Program Listing 3.

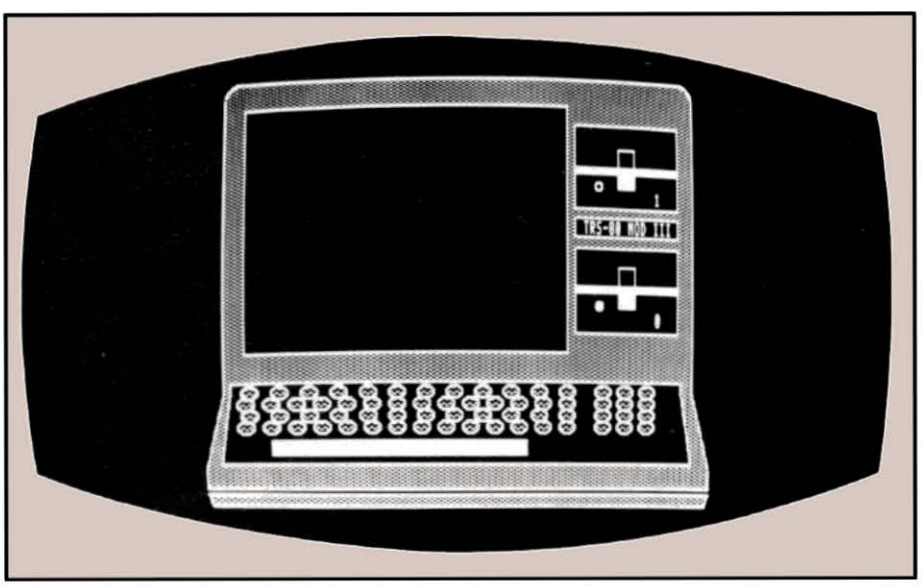

Photo 5. Computer design corresponding to Program Listing 4.

direction in which the text reads. To switch directions, press the appropriate arrow key. Normally, you'll get text in capital letters; for upper- and lowercase text, press shift-zero.

You automatically exit the text mode if you try to type off the edge of the graphics screen. Otherwise, this is the only function you exit by pressing the enter key.

One note: This feature has a long error-checking routine, so you Model III owners had better keep your typing speed down, or you'll lose characters. Model 4 owners, your increased CPU speeds means you can type rather quickly.

Output to Disk or Printer

The CONFIG icon is the only function that calls up another menu. The CONFIG menu's first option lets you change cursor speed. Choose low values for slow, precise cursor movement or high values for speedier movement.

The other options are for the Model 4; they define which printer driver you use for a screen dump to your Radio Shack DMP printer. GPRINT turns your picture sideways and flattens it out a bit. GPRT2 and GPRT3 are similar drivers that don't rotate the image, but you have to set your printer to condensed mode or use 15-inch paper with them.

The Printer icon is for Model 4 owners only; select your printer driver using the CONFIG function, then invoke the Printer function to dump the screen to your dot-addressable Radio Shack DMP printer.

Model III users can't print out from the function menu. If you want a screen dump, press the break key, then type in RUN. After Rembrandt erases the menus, press the break key again before they reappear on the screen. Now you can type in GPRINT, GPRT2, or GPRT3 for a screen dump, or type in CMD"I" to exit to TRSDOS.

Even after you exit to DOS, Rembrandt doesn't erase your graphics screen. At DOS ready, type in GRON to display the screen. At this point you can dump it to the printer using the GPRINT option.

The "S" and "L" icons let Model 4 users save and load graphics files. When you invoke the "S" function, the program displays a directory of files with the extensions /GR or /HR, then prompts you for a file name and saves the file to disk. Use the "L" function to load files from disk.

It's not that easy on a Model III. You can't save or load graphics from Rembrandt, so you must complete a picture in one sitting (blame TRSDOS 1.3, not our program). To save a screen to disk, type in GSAVE FILE NAME from TRSDOS Ready. To load a file, type in GLOAD FILE NAME. The GRON command displays your picture on the screen; GROFF turns the display off. You can also print a screen you've loaded from disk; use the printer drivers discussed above.

Saving a graphics screen to disk takes up 75 records and 25 granules, so make sure you have enough room on your disk.

The Tandy logo icon returns you to DOS with no questions asked. Be careful around this one.

The Garbage Can function erases the entire graphics screen, again with no questions asked.

The Paint Box

So much for the function mode. The paint mode lets you fill in any enclosed area of your design with one of the bit-mapped patterns, or tiles, shown at the bottom of the screen. This method is called painting or tiling.

After you've drawn a figure or two, move the cursor inside an area you want to paint. Tap the enter key to invoke the paint mode, indicated by a spray can cursor. Use the right- and left-arrow keys to scroll through the tile menu; you'll see the patterns change in the box to the left of the menu. When the pattern you want appears in the box, press the space bar. Rembrandt fills the area containing the spray can with that pattern and returns you to the cursor mode.

The tile menu's Exit option lets you escape without painting. Just press the space bar when you see the word "exit" in the tile selection box.

Make sure you completely enclosed the area you paint. Otherwise, the paint bleeds out and covers the rest of your graphics screen.

Footnotes

If Rembrandt happens to crash but doesn't return you to DOS, type in RUN and the program will reinitialize without erasing the graphics screen.

The three screen dump routines, GPRINT, GPRT2, and GPRT3, that come with the hi-res package work with Radio Shack's DMP series printers. These printer drivers are in Assembly-language and BasicG calls them as external programs. They might not work with non-Radio Shack printers. However, the BasicG manual prints their complete listings. You should be able to modify one of them to suit your hardware's configuration.

Getting Fancy

We'll touch briefly on a way to create more complicated pictures using the hi-res board and BasicG. Run Program Listing 2 and send it to the printer. You'll get a grid corresponding to the screen's pixels. Cover the grid with plastic and use a grease pencil to transfer an image to the grid.

You can plot out the design and write a BasicG program that draws the picture. It's even more tedious than it sounds, but the results are impressive. Program Listing 3, for example, produces the geometric shape shown in Photo 4. Program Listing 4 draws the computer shown in

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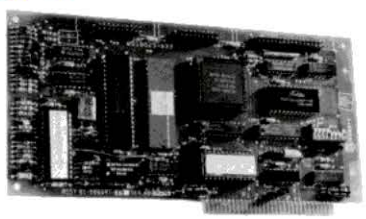

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Program Listing 1. Rembrandt graphics editor.

```
5 CLEAR 500  'Model 4 users omit this line
10 IF GF=1 THEN X1=320:Y1=120:CR=10:LC=10:AR=.5:RA=5:PR$="GPRT3":C
A=10:PF=1:LF=1:LR=10:R=5:SI=10:SD=5:AP=.5:FF=1:PI=3.14159:SD=5:SI=
10:DIM GB(250):VIEW(0,0)-(639,239):DIM T$(17):GOSUB 1850 :GOSUB 22
80 :GOSUB 2480 :GET(0,0)-(0,0),GB:GOTO 170  :ELSE 2510
20 KE=PEEK(KP):IF KE AND 1 OR KE AND 128 OR KE AND 8 OR KE AND 16
OR KE AND 32 OR KE AND 64 THEN RETURN ELSE 20
30 SP=PI/SD:FOR A=0 TO PI+SP/2 STEP SP:SZ=SI*SIN(A)+.5:X=SZ*SIN(A)
+X1:Y=SZ/2*COS(A)+Y1:IF A=0 THEN 40   ELSE LINE(X0,Y0)-(X,Y),OO
40 X0=X:Y0=Y:NEXT:RETURN
50 LINE(X1,Y1)-(X2,Y2),OO:LINE-(X3,Y3),OO:LINE-(X1,Y1),OO:RETURN
60 XX=LR:CIRCLE(X1,Y1),R,OO,1.57,4.71,.8:CIRCLE(X1+XX,Y1),R,OO,4.7
1,1.57,.8:Z=R/1.25:LINE(X1,Y1+Z)-(X1+XX,Y1+Z),OO:LINE(X1,Y1-Z)-(X1
+XX,Y1-Z),OO:IF RL$="R" THEN CIRCLE(X1+XX,Y1),R,OO,1.57,4.71,.8:RE
TURN:ELSE CIRCLE(X1,Y1),R,OO,4.71,1.57,.8
70 LINE(X1,Y1)-(X1+XB,Y1),OO,,&HC003:LINE-(X1+XB,Y1+YB),OO,,&H8181
:LINE-(X1,Y1+YB),OO,,&HC003:LINE-(X1,Y1),OO,,&H8181:RETURN
80 CIRCLE(X1,Y1),R,OO,,,.3:CIRCLE(X1,Y1+LR),R,OO,3.14,6.28,.3:LINE
(X1+R,Y1)-(X1+R,Y1+LR),OO:LINE(X1-R,Y1)-(X1-R,Y1+LR),OO:RETURN
90 CIRCLE(X1,Y1),R,OO,0,3.14,.3:CIRCLE(X1,Y1+LR),R,OO,,,.3:LINE(X1
+R,Y1)-(X1+R,Y1+LR),OO:LINE(X1-R,Y1)-(X1-R,Y1+LR),OO:RETURN
100 IF KE AND 32 THEN X0=X0-CA
110 IF KE AND 64 THEN X0=X0+CA
120 IF KE AND 16 THEN Y0=Y0+INT(CA/2):IF CA=1 THEN Y0=Y0+1
130 IF KE AND 8 THEN Y0=Y0-INT(CA/2):IF CA=1 THEN Y0=Y0-1
140 RETURN
150 CZ=CR/1.25:LINE(X1,Y1)-(X1+LC,Y1+CZ),OO:LINE(X1,Y1)-(X1+LC,Y1-
CZ),OO:CIRCLE(X1+LC,Y1),CR,OO,ST,EN,.8:RETURN
160 LINE(X1,Y1)-(X1+CR,Y1+LC),OO:LINE(X1,Y1)-(X1-CR,Y1+LC),OO:CIRC
LE(X1,Y1+LC),CR,OO,ST,EN,.3:RETURN
170 X1=320:Y1=120
180 X1=X1+60:VIEW(0,0)-(639,239):PUT(X1,Y1),CU,XOR:FOR K=1 TO 50:N
EXT:IF BP=25 THEN 1770
190 GOSUB 20   :IF KE AND 128 THEN VIEW(0,0)-(639,239):GOSUB 2220
:FOR K=1 TO 20:NEXT:GOTO 330
200 IF KE AND 1 THEN GOSUB 2040 :GOTO 260
210 PUT(X1,Y1),CU,XOR:X0=X1:Y0=Y1:GOSUB 100  :X1=X0:Y1=Y0:IF X1<61
 THEN X1=61
220 IF X1>628 THEN X1=628
230 IF Y1>219 THEN Y1=219
240 IF Y1<1 THEN Y1=1
250 PUT(X1,Y1),CU,XOR:GOTO 190
260 PUT(X1,Y1),CU,XOR:PUT(X1,Y1),PC,XOR
270 GOSUB 20
280 IF KE AND 128 THEN PUT(X1,Y1),PC,XOR:GOSUB 2000 :X1=X1-60:GOTO
 180
290 IF KE AND 32 THEN PF=PF-1:IF PF<=0 THEN PF=1
300 IF KE AND 64 THEN PF=PF+1:IF PF>=17 THEN PF=17
310 IF KE AND 32 OR KE AND 64 THEN GOSUB 2040
320 GOTO 270
330 PUT(X1,Y1),CU,XOR:PUT(X1,Y1),IC,XOR
340 GOSUB 20
350 IF KE AND 128 THEN PUT(X1,Y1),IC,XOR:VIEW(71,1)-(638,219):FOR
K=1 TO 150:NEXT:X1=X1-60:GOTO 410
360 GOSUB 2160 :IF KE AND 32 THEN FF=FF-1:IF FF<=0 THEN FF=1 ELSE
IF FF+1=19 THEN FF=14
370 IF KE AND 64 THEN FF=FF+1:IF FF>=32 THEN FF=32 ELSE IF FF-1=14
 THEN FF=19
380 IF KE AND 16 THEN FF=FF+2:IF FF>=32 THEN FF=32 ELSE IF FF-2=13
 THEN FF=19 ELSE IF FF-2=14 THEN FF=20
390 IF KE AND 8 THEN FF=FF-2:IF FF<=0 THEN FF=1 ELSE IF FF+2=19 TH
EN FF=13 ELSE IF FF+2=20 THEN FF=14
400 GOSUB 2220 :GOTO 340
410 IF FF<>1 THEN 450  ELSE X2=X1:Y2=Y1:LINE(X1,Y1)-(X2,Y2)
420 GOSUB 20
430 IF KE AND 128 THEN X1=X2:Y1=Y2:X2=0:Y2=0:GOSUB 1880 :GOTO 180
440 LINE(X1,Y1)-(X2,Y2),0:X0=X2:Y0=Y2:GOSUB 100  :X2=X0:Y2=Y0:LINE
(X1,Y1)-(X2,Y2):GOTO 420
450 IF FF<>2 THEN 550
460 IF Y1>209 THEN Y1=209
470 IF X1>554 THEN X1=554
480 PUT(X1,Y1),E1,PSET:GOSUB 20   :PUT(X1,Y1),E2,PSET
490 IF KE AND 128 THEN 180
500 X0=X1:Y0=Y1:GOSUB 100  :X1=X0:Y1=Y0:IF Y1>209 THEN Y1=209
510 IF Y1<0 THEN Y1=0
520 IF X1<0 THEN X1=0
530 IF X1>554 THEN X1=554
540 GOTO 480
550 IF FF<>4 THEN 590  ELSE X2=X1:Y2=Y1:LINE(X1,Y1)-(X2,Y2),,B
560 GOSUB 20
570 IF KE AND 128 THEN 180
580 LINE(X1,Y1)-(X2,Y2),0,B:X0=X2:Y0=Y2:GOSUB 100  :X2=X0:Y2=Y0:LI
NE(X1,Y1)-(X2,Y2),1,B:GOTO 560
```

Listing 1 continued

Photo 5. Since your graphics data is in Basic, you can use these designs in other programs.

Epilogue

With a hi-res board installed, you can still run programs that use those miserable, chunky, block graphics characters. But once you discover how easy, fast, and versatile the hi-res board is, you won't want to go back.

Think of our program as a starting point. Let it inspire you. Tinker around with it or create your own high-resolution applications. Have fun.■

Jim Abbassian and Glen E. Sparks are writers and programmers. Both are members of the Dearborn, MI, TRS-80 User's Group. You can write them at 6168 Custer, S. Rockwood, MI 48179.

Related Articles

Graebner, Bruce A. and Jeffrey P., "Clear-Cut Trends," April 1985, p. 40. High-resolution line and bar graphs for the Models III, 4, 1000, and 2000.

Justice, Steve, "Fractals in Focus," May 1985, p. 58. High-resolution geometric fractals for the Models III, 4, 1000, and 2000.

Listing 1 Continued

```
590 IF FF<>5 THEN 670  ELSE RA=10:CIRCLE(X1,Y1),RA,,,,AR
600 GOSUB 20
610 IF KE AND 128 THEN 180
620 CIRCLE(X1,Y1),RA,0,,,AR:IF KE AND 32 THEN RA=RA-10: IF RA<0 TH
EN RA=0
630 IF KE AND 64 THEN RA=RA+10
640 IF KE AND 16 THEN AR=AR+.05:IF AR>.5 THEN AR=AR+.05:IF AR>1.5
THEN AR=AR+1:IF AR>40 THEN AR=40
650 IF KE AND 8 THEN AR=AR-.05:IF AR<-3.72529E-08 THEN AR=-3.72529
E-08:ELSE IF AR>.5 THEN AR=AR-.05:IF AR>1.5 THEN AR=AR-1
660 CIRCLE(X1,Y1),RA,,,,AR:GOTO 600
670 IF FF<>6 THEN 730  ELSE OO=1:GOSUB 30
680 GOSUB 20
690 IF KE AND 128 THEN 180
700 OO=0:GOSUB 30   :X0=SI:GOSUB 100  :SI=X0:IF KE AND 16 THEN SD=
SD-1:IF SD<=2 THEN SD=2
710 IF KE AND 8 THEN SD=SD+1:IF SD>=14 THEN SD=14
720 OO=1:GOSUB 30   :GOTO 680
730 IF FF<>3 THEN 870  ELSE X2=X1:X3=X1:Y2=Y1:Y3=Y1
740 GOSUB 20
750 IF KE AND 128 THEN 180
760 IF KE AND 1 THEN 860
770 OO=0:GOSUB 50
780 X0=X1:Y0=Y1:GOSUB 100  :X1=X0:Y1=Y0
790 OO=1:GOSUB 50   :GOTO 740
800 OO=0:GOSUB 50
810 GOSUB 20
820 IF KE AND 128 THEN 180
830 IF KE AND 1 THEN 790
840 OO=0:GOSUB 50
850 X0=X3:Y0=Y3:GOSUB 100  :X3=X0:Y3=Y0
860 OO=1:GOSUB 50   :GOTO 810
870 IF FF<>7 THEN 920  ELSE OO=1:ST=0:EN=6.28:GOSUB 160
880 GOSUB 20
890 IF KE AND 128 THEN 180
900 OO=0:ST=0:EN=6.28:GOSUB 160  :X0=CR:Y0=LC:GOSUB 100  :LC=Y0:CR
=X0:IF CR<1 THEN CR=1
```

Listing 1 continued on p. 108

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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
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36	BETAALPH	Computes alpha and beta variables for stock
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38	OPTWRITE	Option writing computations
39	RTVAL	Value of a right
40	EXPVAL	Expected value analysis
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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.
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A Basic Programmer's Best Friend

Editor's note: The size of this cross-reference program prohibits 80 Micro *from publishing it as a source code listing. However, because the program is one we feel is of widespread utility, we have published it as a space-saving data statements listing. If you'd rather not type in data statements, the /CMD program and source code, as well as this Basic program, are available on Load 80 (see p. 64 for ordering information).*

Crosscheck saves you debugging time and frustration by automatically cross-referencing Basic key words, variables, and GOSUB, GOTO, and Restore statements by line number.

by Raymond Pelzer

No one likes to debug long Basic programs. In programs with a lot of variables, you can wear yourself out trying to find that one A# that should be A%, or the Print statement that should be LPRINT.

Although cross-reference utilities have been around since the days of the Model I, none has been available for TRSDOS 6.X until now.

Crosscheck loads Model 4 Basic programs from disk and cross-references them by line numbers in GOSUB, GOTO, and Restore statements, by Basic key words, by variables, or by any combination of the three (see the Program Listing). The program displays the results on-screen and prints them out in 80- or 132-column format.

Armed with a Crosscheck printout, you can go directly to program lines that include a referenced line number to check for errors or to ensure that an item isn't in any lines where it doesn't belong.

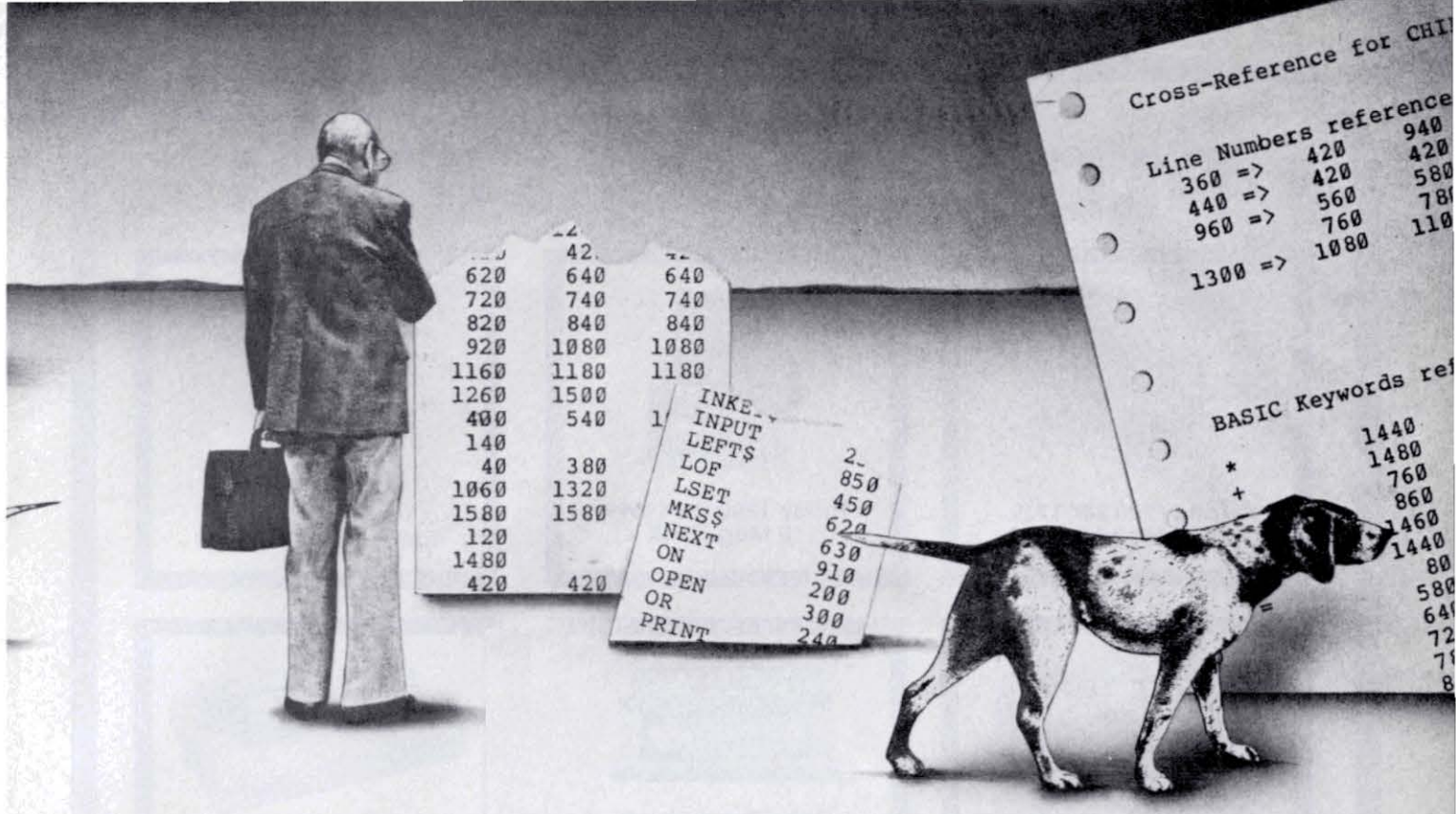
Basic File Formats

Before examining how Crosscheck works, you should understand Model 4 Basic's file format. The first byte of a Model 4 Basic disk file indicates whether you stored your Basic code in compressed (FF hexadecimal [hex]), ASCII (30–39 hex), or protected (FE hex) format. The standard Save command stores Basic programs in compressed format, the one Crosscheck reads.

In compressed format, all Basic programs start at a fixed point in memory. Each program line starts with the 2-byte memory address of the next line in least-significant byte/most-significant byte (LSB/MSB) format (see Fig. 1).

The program's current line number comes next, as a 2-byte integer in LSB/MSB format, followed by the rest of the line's code. The line then ends with a 00 byte, indicating that the next 2 bytes, those that start the next line, identify the memory address for the following line.

This cycle repeats until Basic retrieves a 2-byte address of 00 00. Hex listings of Basic programs always end with 00 00 00, one 00 byte ending the final line, and 00



00 representing the address of the next (nonexistent) line.

Model 4 Basic's Line Numbers and Constants

Model 4 Basic stores line numbers and constants in a format different from Model I/III Basic, which leaves line numbers and numeric constants in ASCII format. Model 4 Basic saves line numbers in hex as 2-byte integers in LSB/MSB format and it compresses numeric constants using special codes (see Table 1). It stores integers 0–9 as single bytes in the range 11–1A hex, integers 10–255 with an indicator (token) byte of 0F hex followed by the 1-byte hex number, and integers between 256 and 32,767 with a token byte of 1C hex followed by 2 bytes in LSB/MSB format.

In Model 4 Basic, all single-precision numbers appear as a token byte of 1D hex followed by 4 hex bytes. All double-precision numbers have a token byte of 1F hex followed by 8 hex bytes.

To Basic, negative numbers don't exist. It treats minus signs as separate entities from their associated numbers. This principle, known as unary minus, means that Basic handles any negative number as a positive number that it subtracts from zero. For example, Basic represents –5 as 0–5. It leaves the minus sign encoded as F4 hex, which is also the compression (token) code for subtraction.

Key Words

Some Model 4 Basic key word token codes are 2 bytes long. They consist of an FF hex byte followed by one of the standard 1-byte token codes. The Model 4/4P *Disk System Owner's Manual* provides an alphabetic list of these tokens (in decimal) by key word (see the table, "Internal Codes for Basic Keywords," p. A-80).

Variables

Model 4 Basic allows variables of up to 40 characters. However, as variables names get longer, Basic execution slows down because of the increased character testing required to verify the variable.

While Model I/III Basic lets you tack the type declaration characters (%, #, !, or $) to the end of a variable, Model 4 Basic treats them as part of the variable. The same holds true for array variables; the left parenthesis is part of the 40-character limit.

An Example

Figure 1 shows a Basic program and its equivalent hex listing. The first byte in the hex listing (FF hex) represents the standard compressed Basic file. The next 2 bytes (17 7F) tell Basic that the second program line starts at memory location 7F17 hex, and the 0A 00 bytes that follow show the line number as 10.

The main portion of the line begins with the variable X (58), a space (20), the token code for the equals sign (F1), another space (20), and the number 5 (16, one of the special 1-byte integers). The 00 byte signals the end of the first line.

Basic then looks for a new line address (1F 7F). This is followed by the 2 bytes for the line number 20 (14 00), the token code for the Print command (91), a space (20), the variable X (58), and the 00 byte that ends the line.

Line 30 shows an integer value of 100 in the compressed form of 0F 64, and line 40 provides a line number reference to line 20, compressed as 0E 14 00.

In line 50, the byte sequence 1D 00 00 5C 85 represents the single-precision number 27.5. The 1D byte tells Basic that the next 4 bytes are special cases. Without this byte, Basic could interpret the 00 byte as an end-of-line indicator and scramble the rest of the program.

The 00 00 00 bytes at the end of the hex listing signal the end of the program.

About Crosscheck

Type in and run the Listing. It includes a form of error-checking known as a checksum. When you run the program, it adds the numbers in each line and checks the total against a predetermined sum for that line. If the numbers fail to match, the program displays a message telling you in which line the errors occur and the program stops executing. Carefully check the data line and the checksum total and correct the error.

Run the program again. When you have all the data statements correct, lines 180–

LOAD 80

System Requirements

Model 4/4P
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Disk Basic
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```
10 X = 5
20 PRINT X
30 X = X + 100
40 IF X < 1000 THEN 20
50 X = 300 + 27.5
60 PRINT X
70 END

FF 17 7F 0A 00 58 20 F1 20 16 00 1F 7F 14 00 91  .....X . .......
20 58 00 2E 7F 1E 00 58 20 F1 20 58 20 F3 20 0F  X.....X . X . .
64 00 42 7F 28 00 8B 20 58 20 F2 20 1C E8 03 20  d.B.(.. X . ...
D0 20 0E 14 00 00 56 7F 32 00 58 20 F1 20 1C 2C  . ....V. 2.X . .,
01 20 F3 20 1D 00 00 5C 85 00 5E 7F 3C 00 01 20  . . ...\ ..^.<..
58 00 64 7F 46 00 81 00 00 00                    X.d.F... ..
```

Figure 1. Sample Basic program in compressed form.

```
Line numbers referenced:  20 = >  40

Basic key words referenced:
+        30  50
<        40
=        10  30  50
END      70
IF       40
PRINT    20  60
THEN     40

Basic variables referenced:  X  10  20  30  40  50  60
```

Figure 2. The program in Fig. 1 cross-referenced by line numbers, key words, and variables.

Special 1-byte integers in Model 4 Basic:

Number	Hex byte in file	Number	Hex byte in file
0	11	5	16
1	12	6	17
2	13	7	18
3	14	8	19
4	15	9	1A

Other numeric representations used:

Number	Hex Byte	Followed by
Integers from 10–255	0F	1 byte
Integers from 256–32767	1C	2 bytes *
All single-precision numbers	1D	4 bytes *
All double-precision numbers	1F	8 bytes *

* Basic stores these numbers in the form shown on p. 2–171 of the *Model 4/4P Disk System Owner's Manual.*

Table 1. Model 4 Basic codes for numeric constants.

Parameter	Description
LINES	Cross-reference line numbers
KEYWDS	Cross-reference key words
VAR	Cross-reference variables
PRT	Print cross-reference
WIDE	Print cross-reference in 132-column format

Table 2. Crosscheck parameters.

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220 will write the program file BASREF/CMD.

Data lines 540–3030 contain Crosscheck's object code in decimal format. Data lines 270–510 contain checksum totals.

Line 40 dimensions the checksum array, and line 50 reads the checksum data into the array. Lines 70–150 is a routine to read each number in a data line (from lines 540–3030) and add it to a total.

Using Crosscheck

To run Crosscheck, at DOS Ready, type in BASREF followed by the name of the compressed Basic file you want to cross-reference and the cross-reference parameters in parentheses (see Table 2 for a list of parameters). The parameters tell Crosscheck to reference a program by line numbers, key words, or variables, and let you select the printout option.

Crosscheck automatically invokes any parameter you omit in parentheses (except printer parameters) unless you specify otherwise. For example, the command BASREF APS/BAS (LINES = NO,KEYWDS, VAR,PRT,WIDE) tells Crosscheck to cross-reference the program APS/BAS by key words and variables, but not by line numbers, and to copy the display to the printer in 132-column format. You can abbreviate parameters to their first letter.

Crosscheck temporarily saves the position of the file name you typed in while it displays the banner message, enables the break key, and clears any detected break or shift-@ entries. It then restores the file name and copies it to the file control block (FCB) using the @FSPEC supervisor call. This call also checks for a valid file name and converts lowercase letters to uppercase.

If Crosscheck identifies an invalid file name, it exits to TRSDOS Ready. It tests the parameters (if any) for proper syntax. A parameter error forces an error message and aborts the program to TRSDOS Ready.

It also tests the special parameter entry of an equals sign with nothing after it. For example, Crosscheck considers KEYWDS = the same as KEYWDS = OFF.

After Crosscheck tests and validates all parameters, it rechecks the printer parameter. If you aren't using a printer, Crosscheck ignores the wide parameter.

If you're using the printer with the wide display, Crosscheck modifies three display buffer measurements to function at the longer length.

The program then opens the file and checks the first hex byte for FF hex. If the open file creates an error, or if the first byte isn't FF, Crosscheck displays an error message and exits to TRSDOS Ready.

Once Crosscheck opens and tests the file, it stores the top of available memory and displays a "Loading file" message. The program reads and discards the two address bytes, then loads the line number to the storage buffer.

As each program byte loads, Crosscheck compares the top of the buffer to the top of available memory. If Crosscheck reaches the top before it finishes loading the program, it displays an error message and returns to DOS.

After collecting the line number in the buffer, Crosscheck continues reading bytes to the buffer until it finds a 00 hex byte. It then reads and discards the 2 address bytes that follow it, and continues if the bytes aren't 00 00.

Crosscheck deletes bytes between quotation marks (and the quotation marks themselves) after a Print statement, and deletes bytes after a Remark statement (REM or ') or a data statement to the 00 (end-of-line) byte.

Crosscheck ignores bytes for special numeric constant tokens and the associated bytes that follow. An 0E hex byte signals a line number reference, so Crosscheck loads the next 2 bytes to the buffer. This prevents Crosscheck from misreading an embedded 00 byte as the end of the line.

When the program has loaded the file and the last address bytes are 00 00, Crosscheck loads an FF FF byte pair to the buffer as the final line number (no valid Basic line number is that large).

To restore the file name, Crosscheck closes the file. This lets the program use the FCB as the end of the display line. The program then skips a few lines and is ready to scan.

Referencing Line Numbers

Crosscheck tests its parameter flag bytes to see if it must look at program line numbers. If not, Crosscheck skips to the key word scan.

If Crosscheck is examining line numbers, it loads the first line number to the HL register. The program eventually loads it in ASCII decimal form to the beginning of the display line through the @HEXDEC supervisor call.

Crosscheck then checks the file for 0E bytes (signaling line number references), and compares them to the line number in HL. When the values match, Crosscheck transfers the line number holding the reference to the display buffer.

This process continues until Crosscheck has scanned the whole program once. It then loads HL with FFFF at the end of the buffer. At that point, Crosscheck has found all references.

A subroutine loads each reference as requested to the first available space in the display line (every seven spaces). After each addition, the subroutine tests the display line for a full condition and returns if it has room for another entry.

When the line is full, the program sends it to another macro for handling. The routine then erases the line and resets it to an empty state for more references.

When the routine receives the FFFF bytes, it displays any partial line of references, or returns if the line is empty.

After the program logs a valid reference to the display line, it replaces the OE byte with a 01 byte in the buffer. After the program tests all valid references (all references to existing line numbers), it makes an additional pass to look for remaining OE bytes and reports references to any line numbers that don't exist. It displays these as the line number of the line containing the bad reference, followed by the bad line number.

One exception to watch for is any reference to a line zero, usually a line such as ON ERROR GOTO 0. Since this valid line resets the error trap in a program, no line zero exists in the actual program to match, and it appears as a false error.

However, this permits quick location of error-trap routines. Since most programs contain few error-checking routines, Crosscheck prints them one reference per line. Once Crosscheck completes the pass, it looks at key word references.

Referencing Key Words

As with the line number references, Crosscheck tests to determine whether you requested a cross-reference of Basic key words. If you haven't, the program skips to the variables scan. Otherwise, the HL register points to a table of key words and token codes.

The key word table is alphabetical to force the scan and the listing into alphabetical order. Crosscheck uses the IX register as it scans the buffer for bytes with the high-order bit set (the sign of a key word token).

As Crosscheck finds each new token in the key word table, it loads the code in the BC register. B is 00 or FF hex (depending on whether the token is normal or extended), and C contains the other token byte. The program then loads the key word to the display line and begins scanning line numbers for a token match.

Referencing Variables

Crosscheck then scans the Basic program for variables references. This is the most complex part of the program, since Crosscheck must keep the variables in alphabetical order without building them into a new table and sorting.

The solution is to use multiple scans, which are sufficiently fast in machine language. First the program searches the buffer for the first character in the range A–Z (the only legal characters for the beginning of a variable).

Crosscheck compares these to the character in the first position of the temporary holding area for the variable. If the new first character found is less, the entire new variable replaces the one in the temporary holding area.

Scanning for valid characters ends when Crosscheck finds an invalid character or a left parenthesis such as V(X). If the new variable found is shorter in length than the one in the temporary holding area, Crosscheck fills the remainder of the area with FF bytes to ensure sorting the shortest one first.

If the first character is equal in value, Crosscheck compares each following character to the same relative character in the temporary holding area until it finds an invalid character or a character of lower value.

When Crosscheck has completed one pass through the buffer, the temporary holding area contains the variable lowest in sorting order. The program displays the variable on a line and sets the IX register back to the start of the buffer to scan for the variable.

After the program sends each line number with a reference to the display line, it zaps the variable with 01 bytes. The next scan for a variable finds only the next lowest variable each time it goes through the buffer.

This process continues until the search pass finds no valid variables. Crosscheck then displays a message indicating the end of the cross-reference, sends a formfeed character to the printer (if used), and exits to TRSDOS Ready.

Random Notes

Some parts of the program call a pause routine to detect shift-@ or break characters.

If you press the break key or if an error occurs, Crosscheck loads the HL register with nonzero values before exiting to DOS. TRSDOS 6.X lets you use a nonzero HL to abort any active job control language (JCL) file, if a JCL file calls Crosscheck.

Also, Crosscheck single-spaces all cross-references by line number and key word to save paper. You can find each new reference list by looking for an entry in the left-most column in the display.

Crosscheck gives you a powerful utility that quickly runs a full cross-reference on most TRSDOS 6.X Basic programs. Crosscheck also prints a list for debugging or documenting your programs. A cross-reference run for the sample program in Fig. 1 appears in Fig. 2.

Lastly, don't be concerned if you see that your variables listing suddenly contains the variables AS or BASE. Basic doesn't convert the word AS into a token code when used in a Field statement, but leaves it in ASCII format. This means that the line

```
10 FIELD 1, 20 AS A$, 20 AS B$, 30 AS C$, 40 AS D$
```

would show four references to the variable AS in line 10. The same holds true for the word BASE, which is in ASCII format in the OPTION BASE statement. Once you get past these two items, you're all set.■

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Program Listing. Crosscheck.

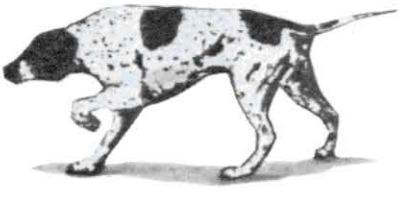
```
10 'Read checksum totals into array
20 ON ERROR GOTO 230
30 CLS:PRINT @ 188, "LOADING CHECKSUM ARRAY"
40 DIM A(250)
50 FOR K=1 TO 250:READ A(K):NEXT
60 'Calculate checksum totals
70 CLS:PRINT @ 185, "CALCULATING CHECKSUM TOTALS":PRINT:PRINT
80 FOR J=1 TO 250
90 FOR K=1 TO 12:READ X: T=T+X: NEXT
100 IF T=A(J) THEN T=0: GOTO 140
110 CL=INT(J/10)*10+270
120 L=530+J*10: I$=RIGHT$(STR$(J),1): IF VAL(I$)=0 THEN I$=" 10"
130 PRINT "TOTAL OF LINE ";L;" DOES NOT EQUAL CHECKSUM TOTAL  (LINE ";CL;" ITEM
";I$;")": PRINT:PRINT "CORRECT DATA AND RUN PROGRAM AGAIN":CLOSE:END
140 NEXT
150 IF T<> A(J) THEN CL=INT((J-1)/10)*10+270:GOTO 120
160 '
170 'Write CMD file
180 CLS:PRINT @ 190, "WRITING CMD FILE"
190 RESTORE 540
200 OPEN "O",1,"BASREF/CMD"
210 FOR K=1 TO 2997: READ A:PRINT#1,CHR$(A);:NEXT
220 CLOSE:END
230 IF ERR=4 THEN 150
240 ON ERROR GOTO 0:RESUME
250 '
260 'Data statements for checksum verification
270 DATA 497,945,1849,1117,971,927,645,1187,1198,689
280 DATA 1266,1361,1134,1375,1306,997,780,803,1357,1167
290 DATA 1495,1638,1001,1704,1490,1306,1333,1012,947,939
300 DATA 1111,1008,1824,1515,1538,1421,2035,1879,1099,1079
310 DATA 1129,1171,1100,347,309,384,384,384,384,384
320 DATA 384,384,384,384,365,1627,1689,1062,1085,1005
330 DATA 1401,1133,1196,1126,1516,722,1358,1695,2235,1374
340 DATA 1343,1450,1228,1187,1484,1140,1205,1204,742,1606
350 DATA 1488,1752,1211,1371,1216,800,1321,556,1087,1725
360 DATA 1183,1625,1026,795,1459,1679,1346,1220,1708,1449
370 DATA 1328,1014,1018,1181,960,705,1403,1149,1675,408
380 DATA 1382,955,1687,1261,1262,1320,893,1267,1323,819
390 DATA 1060,1114,2815,3060,3060,2412,1254,1262,946,1451
400 DATA 1111,1362,1415,1101,1462,983,1399,1221,1559,1337
410 DATA 1602,1480,1613,1429,1442,1398,1130,1384,1502,1349
420 DATA 1210,1297,1045,1701,1388,1446,1200,1351,1799,1224
430 DATA 1401,643,1184,972,1029,1420,1877,1292,1357,1231
440 DATA 1356,1078,1100,1242,1197,1451,1041,1125,985,1083
450 DATA 1035,1300,1170,1292,1287,1273,1340,1150,1198,1381
460 DATA 1200,1298,1348,1132,1138,923,1684,1149,1185,1365
470 DATA 1380,1232,1139,1330,1216,1335,1245,1164,1121,997
480 DATA 1096,1354,1346,1360,1310,1249,1269,1013,1009,1154
490 DATA 1379,1154,1253,1340,1143,1128,1408,1024,940,1073
500 DATA 1202,668,618,796,858,1185,779,1077,1223,662
510 DATA 929,777,715,712,660,1589,505,1097,1018,272
520 '
530 ' Data Statements for CMD file
540 DATA 5,6,66,65,83,82,69,70,1,2,0,48
550 DATA 229,33,116,58,62,10,239,33,0,0,62,103
560 DATA 239,62,101,239,253,203,10,134,253,203,10,142
570 DATA 225,17,111,60,62,78,239,40,7,33,187,58
580 DATA 62,10,239,201,17,18,59,62,17,239,40,7
590 DATA 33,203,58,62,10,239,201,6,5,33,18,59
600 DATA 35,35,35,35,35,35,35,35,126,183,40,16
610 DATA 230,64,32,12,126,254,128,40,7,33,203,58
620 DATA 62,10,239,201,35,35,16,224,58,76,59,183
630 DATA 40,21,58,78,59,183,40,15,33,128,0,34
640 DATA 141,50,33,126,50,34,211,51,34,232,51,253
650 DATA 203,18,198,253,203,18,166,33,82,59,17,111
660 DATA 60,6,0,62,59,239,194,161,49,62,3,239
670 DATA 194,161,49,254,255,40,37,33,222,58,62,10
680 DATA 239,201,10,70,105,108,101,32,102,111,117,110
690 DATA 100,32,45,32,110,111,119,32,108,111,97,100
700 DATA 105,110,103,46,46,46,10,13,33,158,48,62
710 DATA 10,239,33,0,0,6,0,62,100,239,34,80
720 DATA 59,33,144,60,205,149,49,71,205,149,49,184
730 DATA 32,14,183,32,11,62,255,119,35,205,170,49
740 DATA 119,195,150,50,205,149,49,119,35,205,170,49
750 DATA 205,149,49,119,35,205,170,49,205,149,49,254
760 DATA 34,202,135,49,1,2,0,49,119,35,205,170
770 DATA 49,254,0,40,199,254,220,40,107,254,255,32
780 DATA 10,205,149,49,119,35,205,170,49,24,221,254
790 DATA 132,40,89,254,143,40,85,254,14,32,18,205
800 DATA 149,49,119,35,205,170,49,205,149,49,119,35
810 DATA 205,170,49,24,191,254,28,32,8,43,6,2
820 DATA 205,114,49,24,179,254,29,32,8,43,6,4
830 DATA 205,114,49,24,167,254,31,32,6,43,6,8
840 DATA 205,114,49,254,15,32,5,205,149,49,24,10
850 DATA 254,15,218,248,48,254,27,210,248,48,43,195
860 DATA 248,48,205,149,49,16,251,201,205,149,49,254
870 DATA 0,32,249,119,35,205,170,49,195,208,48,205
880 DATA 149,49,254,34,202,248,48,254,0,40,236,24
890 DATA 242,213,205,8,52,17,111,60,62,3,239,209
900 DATA 200,79,203,241,33,255,255,62,26,239,229,213
910 DATA 237,91,80,59,235,183,237,82,209,225,200,33
920 DATA 192,49,62,10,239,62,22,239,10,66,65,83
930 DATA 73,67,32,112,114,111,103,114,97,109,32,115
940 DATA 105,122,101,32,101,120,99,101,101,100,115,32
950 DATA 97,110,97,105,108,97,98,108,101,32,109,101
960 DATA 109,111,114,121,32,45,32,97,98,111,114,116
970 DATA 46,10,10,13,144,60,0,0,0,0,32,32
980 DATA 1,2,0,50,32,32,32,32,32,32,32,32
990 DATA 32,32,32,32,32,32,32,32,32,32,32,32
1000 DATA 32,32,32,32,32,32,32,32,32,32,32,32
1010 DATA 32,32,32,32,32,32,32,32,32,32,32,32
1020 DATA 32,32,32,32,32,32,32,32,32,32,32,32
```

Listing continued

Listing continued

```
1030 DATA 32,32,32,32,32,32,32,32,32,32,32,32,32
1040 DATA 32,32,32,32,32,32,32,32,32,32,32,32,32
1050 DATA 32,32,32,32,32,32,32,32,32,32,32,32,32
1060 DATA 32,32,32,32,32,32,32,32,32,32,32,32,32
1070 DATA 32,32,32,32,32,32,32,32,32,32,32,32,32
1080 DATA 32,32,32,32,32,32,32,32,32,32,32,32,13
1090 DATA 229,213,197,245,33,254,49,17,255,49,54,32
1100 DATA 1,78,0,237,176,241,193,209,225,201,17,111
1110 DATA 60,62,60,239,194,161,49,33,111,60,1,32
1120 DATA 0,62,3,237,177,54,13,33,91,60,205,150
1130 DATA 51,14,13,205,165,51,14,13,205,165,51,58
1140 DATA 70,59,183,202,223,52,33,122,51,205,150,51
1150 DATA 33,144,60,35,34,248,49,42,144,60,34,250
1160 DATA 49,34,252,49,17,254,49,62,97,239,33,61
1170 DATA 62,34,4,50,221,33,146,60,237,75,144,60
1180 DATA 237,67,252,49,42,250,49,221,126,0,183,40
1190 DATA 42,205,8,52,254,14,32,61,1,2,0,51
1200 DATA 221,35,221,78,0,221,35,221,70,0,221,35
1210 DATA 183,229,237,66,225,32,224,205,180,51,62,1
1220 DATA 221,119,253,221,119,254,221,119,255,24,208,221
1230 DATA 35,221,78,0,221,35,221,70,0,221,35,237
1240 DATA 67,252,49,62,255,185,32,187,184,40,6,24
1250 DATA 182,221,35,24,178,205,180,51,42,248,49,35
1260 DATA 126,254,14,32,4,35,35,24,246,183,32,243
1270 DATA 35,78,35,70,35,34,248,49,237,67,250,49
1280 DATA 62,255,184,32,4,185,202,69,52,197,225,17
1290 DATA 254,49,62,97,239,33,61,62,34,4,50,195
1300 DATA 228,50,76,105,110,101,32,78,117,109,98,101
1310 DATA 114,115,32,114,101,102,101,114,101,110,99,101
1320 DATA 100,58,10,13,7,50,62,10,239,58,76,59
1330 DATA 183,200,62,14,239,194,161,49,201,62,2,239
1340 DATA 58,76,59,183,200,62,6,239,194,161,49,201
1350 DATA 229,197,213,205,8,52,42,252,49,62,255,188
1360 DATA 32,3,189,40,22,237,91,148,51,62,97,239
1370 DATA 19,19,237,83,148,51,33,76,50,235,183,237
1380 DATA 82,56,41,237,91,148,51,33,7,50,183,237
1390 DATA 82,40,29,33,76,50,126,254,32,32,3,43
1400 DATA 24,248,35,54,13,33,254,49,205,150,51,205
1410 DATA 128,50,33,7,1,2,0,52,50,34,148,51
1420 DATA 209,193,225,201,253,203,10,70,32,35,253,203
1430 DATA 10,78,200,253,203,10,142,253,203,10,150,213
1440 DATA 245,62,8,239,40,12,253,203,10,70,32,9
1450 DATA 253,203,10,86,40,239,241,209,201,33,58,52
1460 DATA 62,10,239,62,22,239,10,10,91,66,114,101
1470 DATA 97,107,93,10,13,14,13,205,165,51,14,13
1480 DATA 205,165,51,221,33,146,60,237,75,144,60,62
1490 DATA 255,184,32,4,185,202,213,52,221,126,0,205
1500 DATA 8,52,183,40,45,254,14,221,35,32,241,221
1510 DATA 110,0,221,35,221,102,0,221,35,17,206,52
1520 DATA 197,62,97,239,193,197,225,17,170,52,197,62
1530 DATA 97,239,193,33,164,52,205,150,51,205,8,52
1540 DATA 24,202,221,35,221,78,0,221,35,221,70,0
1550 DATA 221,35,24,179,76,105,110,101,32,35,48,48
1560 DATA 48,48,48,32,114,101,102,101,114,101,110,99
1570 DATA 101,115,32,110,111,110,45,101,120,105,115,116
1580 DATA 97,110,116,32,108,105,110,101,32,35,57,57
1590 DATA 57,57,57,46,13,14,13,205,165,51,14,13
1600 DATA 205,165,51,58,74,59,183,202,196,53,33,124
1610 DATA 53,205,150,51,14,13,205,165,51,33,154,55
1620 DATA 221,33,144,60,126,35,183,202,109,53,254,255
1630 DATA 1,2,0,53,6,0,32,3,71,126,35,79
1640 DATA 205,128,50,17,254,49,126,203,127,32,8,183
1650 DATA 40,5,18,35,19,24,243,221,94,0,221,35
1660 DATA 221,86,0,221,35,237,83,252,49,62,255,186
1670 DATA 32,8,187,32,5,205,180,51,24,190,221,126
1680 DATA 0,221,35,183,40,221,254,14,32,6,221,35
1690 DATA 221,35,24,32,184,40,18,254,255,32,4,221
1700 DATA 35,24,21,185,32,18,62,255,184,40,13,24
1710 DATA 8,221,126,0,221,35,185,32,3,205,180,51
1720 DATA 205,8,52,24,201,205,180,51,14,13,205,165
1730 DATA 51,14,13,205,165,51,24,72,10,66,65,83
1740 DATA 73,67,32,75,101,121,119,111,114,100,115,32
1750 DATA 114,101,102,101,114,101,110,99,101,100,58,13
1760 DATA 10,255,255,255,255,255,255,255,255,255,255,255
1770 DATA 255,255,255,255,255,255,255,255,255,255,255,255
1780 DATA 255,255,255,255,255,255,255,255,255,255,255,255
1790 DATA 255,255,255,255,255,255,255,58,72,59,183
1800 DATA 202,133,55,205,128,50,14,13,205,165,51,33
1810 DATA 104,55,205,150,51,221,33,144,60,33,153,53
1820 DATA 6,42,54,255,35,16,251,6,42,33,153,53
1830 DATA 221,94,0,221,35,221,86,0,221,35,62,255
1840 DATA 186,32,4,187,202,168,54,221,1,2,0,54
1850 DATA 126,0,221,35,183,40,224,205,8,52,254,14
1860 DATA 32,6,221,35,221,35,24,235,254,65,56,231
1870 DATA 254,91,48,227,190,56,51,32,72,35,5,40
1880 DATA 68,221,126,0,221,35,183,40,186,205,123,54
1890 DATA 32,19,48,25,119,175,176,40,5,35,54,255
1900 DATA 16,251,6,42,33,153,53,24,186,126,254,255
1910 DATA 40,244,43,24,236,190,40,209,48,23,119,5
1920 DATA 40,232,221,126,0,183,40,221,221,35,35,205
1930 DATA 123,54,56,206,40,236,43,24,208,221,126,0
1940 DATA 183,221,35,202,231,53,205,123,54,56,199,40
1950 DATA 240,24,195,79,205,8,52,254,91,48,30,254
1960 DATA 65,48,30,254,37,200,254,36,200,254,35,200
1970 DATA 254,33,200,254,40,32,2,55,201,254,48,56
1980 DATA 4,254,58,56,4,246,1,121,201,175,121,201
1990 DATA 58,153,53,254,255,202,133,55,6,43,33,153
2000 DATA 53,126,254,255,40,3,35,16,248,54,13,33
2010 DATA 152,53,205,150,51,221,33,144,60,221,94,0
2020 DATA 221,35,221,86,0,221,35,237,83,252,49,62
2030 DATA 255,186,32,19,187,32,16,205,180,51,33,153
2040 DATA 53,6,42,54,255,35,16,251,195,217,53,33
2050 DATA 153,53,205,8,52,221,126,0,221,35,183,40
2060 DATA 204,254,14,32,1,2,0,55,6,221,35,221
2070 DATA 35,24,232,254,65,56,228,254,91,48,224,190
2080 DATA 40,19,221,126,0,221,35,183,40,175,205,123
2090 DATA 54,56,208,40,241,221,43,24,202,221,34,102
2100 DATA 55,35,126,254,13,32,10,221,126,0,205,123
2110 DATA 54,40,219,24,13,221,126,0,190,32,211,221
2120 DATA 35,205,123,54,48,227,205,180,51,221,229,221
2130 DATA 42,102,55,221,43,221,126,0,205,123,54,32
2140 DATA 9,62,1,221,119,0,221,35,48,239,221,225
2150 DATA 24,137,0,0,10,66,65,83,73,67,32,86
2160 DATA 97,114,105,97,98,108,101,115,32,114,101,102
2170 DATA 101,114,101,110,99,101,100,58,13,33,82,60
2180 DATA 205,150,51,58,76,59,183,33,0,0,200,14
2190 DATA 12,62,6,239,24,245,220,39,245,42,243,43
2200 DATA 244,45,246,47,242,60,241,61,240,62,255,134
2210 DATA 65,66,83,248,65,78,68,255,149,65,83,67
2220 DATA 255,142,65,84,78,171,65,85,84,79,182,67
2230 DATA 65,76,76,255,158,67,68,66,76,185,67,72
2240 DATA 65,73,78,255,150,67,72,82,36,255,156,67
2250 DATA 73,78,84,146,67,76,69,65,82,195,67,76
2260 DATA 79,83,69,159,67,76,83,184,67,79,77,77
2270 DATA 79,78,153,67,79,78,84,255,140,67,79,83
2280 DATA 1,2,0,56,255,157,67,83,78,71,255,172
2290 DATA 67,86,68,255,170,67,86,73,255,171,67,86
2300 DATA 83,132,68,65,84,65,222,68,65,84,69,36
2310 DATA 151,68,69,70,176,68,69,70,68,66,76,174
2320 DATA 68,69,70,73,78,84,175,68,69,70,83,78
2330 DATA 71,173,68,69,70,83,84,82,170,68,69,76
2340 DATA 69,84,69,134,68,73,77,167,69,68,73,84
2350 DATA 162,69,76,83,69,129,69,78,68,255,173,69
2360 DATA 79,70,251,69,81,86,166,69,82,65,83,69
2370 DATA 215,69,82,76,216,69,82,82,168,69,82,82
2380 DATA 79,82,223,69,82,82,83,36,255,139,69,88
2390 DATA 80,192,70,73,69,76,68,255,159,70,73,88
2400 DATA 212,70,78,130,70,79,82,255,143,70,82,69
2410 DATA 193,71,69,84,141,71,79,83,85,66,137,71
2420 DATA 79,84,79,255,154,72,69,88,36,139,73,70
2430 DATA 252,73,77,80,224,73,78,75,69,89,36,255
2440 DATA 144,73,78,80,133,73,78,80,85,84,219,73
2450 DATA 78,83,84,82,255,133,73,78,84,200,75,73
2460 DATA 76,76,255,129,76,69,70,84,36,255,146,76
2470 DATA 69,78,136,76,69,84,177,76,73,78,69,147
2480 DATA 76,73,83,84,158,76,76,73,83,84,196,76
2490 DATA 79,65,68,255,174,76,79,67,1,2,0,57
2500 DATA 255,175,76,79,70,255,138,76,79,71,255,155
2510 DATA 76,80,79,83,157,76,80,82,73,78,84,201
2520 DATA 76,83,69,84,225,77,69,77,197,77,69,82
2530 DATA 71,69,255,131,77,73,68,36,255,178,77,75
2540 DATA 68,36,255,176,77,75,73,36,255,177,77,75
2550 DATA 83,36,253,77,79,68,199,78,65,77,69,148
2560 DATA 78,69,87,131,78,69,88,84,214,78,79,84
2570 DATA 255,153,79,67,84,36,149,79,78,191,79,80
2580 DATA 69,78,186,79,80,84,73,79,78,249,79,82
2590 DATA 156,79,85,84,255,151,80,69,69,75,152,80
2600 DATA 79,75,69,255,145,80,79,83,145,80,82,73
2610 DATA 78,84,194,80,85,84,187,82,65,78,68,79
2620 DATA 77,135,82,69,65,68,143,82,69,77,172,82
2630 DATA 69,78,85,77,140,82,69,83,84,79,82,69
2640 DATA 169,82,69,83,85,77,69,142,82,69,84,85
2650 DATA 82,78,255,130,82,73,71,72,84,36,255,136
2660 DATA 82,78,68,255,179,82,79,87,202,82,83,69
2670 DATA 84,138,82,85,78,203,83,65,86,69,255,132
2680 DATA 83,71,78,255,137,83,73,70,205,83,79,85
2690 DATA 78,68,255,152,83,80,65,67,69,36,213,83
2700 DATA 80,67,40,255,135,83,81,82,210,83,84,69
2710 DATA 80,144,83,84,1,2,0,58,79,80,255,147
2720 DATA 83,84,82,36,217,83,84,82,73,78,71,36
2730 DATA 165,83,87,65,80,189,83,89,83,84,69,77
2740 DATA 209,84,65,66,40,255,141,84,65,78,200,84
2750 DATA 72,69,78,226,84,73,77,69,36,207,84,79
2760 DATA 164,84,82,79,70,70,163,84,82,79,78,218
2770 DATA 85,83,73,78,71,211,85,83,82,255,148,86
2780 DATA 65,76,221,86,65,82,80,84,82,150,87,65
2790 DATA 73,84,181,87,69,78,68,180,87,72,73,76
2800 DATA 69,183,87,82,73,84,69,250,88,79,82,254
2810 DATA 92,247,94,0,10,77,111,100,101,108,32,52
2820 DATA 32,66,65,83,73,67,32,67,114,111,115,115
2830 DATA 45,82,101,102,101,114,101,110,99,101,32,85
2840 DATA 116,105,108,105,116,121,10,86,101,114,115,105
2850 DATA 111,110,32,49,46,48,46,48,32,32,32,82
2860 DATA 74,80,46,32,32,48,54,47,50,52,47,56
2870 DATA 52,10,13,10,66,97,100,32,102,105,108,101
2880 DATA 115,112,101,99,10,10,13,10,80,97,114,97
2890 DATA 109,101,116,101,114,32,69,114,114,111,114,10
2900 DATA 10,13,10,70,105,108,101,32,105,115,32,78
2910 DATA 79,84,32,105,110,32,115,116,97,110,100,97
2920 DATA 114,100,32,99,111,109,112,114,101,115,115,101
2930 DATA 1,84,0,59,100,32,66,65,83,73,67,32
2940 DATA 102,111,114,109,97,116,33,10,10,13,128,86
2950 DATA 76,73,78,69,83,32,0,70,59,86,86,65
2960 DATA 82,32,32,32,0,72,59,86,75,69,89,87
2970 DATA 68,83,0,74,59,86,80,82,84,32,32,32
2980 DATA 0,76,59,86,87,73,68,69,32,32,0,78
2990 DATA 59,0,255,255,255,255,255,255,0,0,0,0
3000 DATA 0,0,1,31,82,60,10,10,69,110,100,32
3010 DATA 111,102,32,67,114,111,115,115,45,82,101,102
3020 DATA 101,114,101,110,99,101,32,102,111,114,32,1
3030 DATA 4,143,60,13,0,2,2,0,48
```

End



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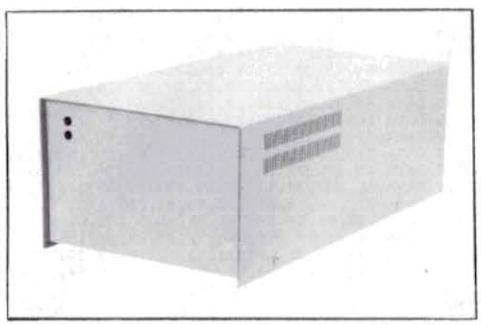

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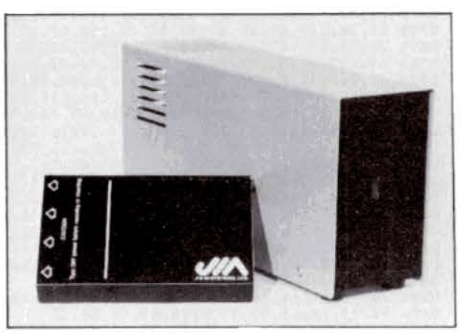

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Memories are Made of This: An I/O-Accessed Memory Board

Now that MS-DOS computers can access megabytes of memory, TRS-80 users feel left behind. This month's Project 80 will rectify that: It's an input/output- (I/O-) accessed memory board. While the board I'll describe has only limited memory, you can add almost as much memory as you want. And with the proper software driver, you can use this memory board as a high-speed RAM disk. Also, with certain RAM chips, you can access special information whenever you turn on the computer.

The computer industry supports a memory device standard known as JEDEC that dictates compatible pin arrangements for RAM and ROM devices. You can install a number of memory devices in a socket that conforms to the JEDEC standard. In addition, on-board jumpers associated with the socket often allow for slight pin differences between devices. You can buy both 24-pin and 28-pin JEDEC devices, and 24-pin devices also work in a 28-pin JEDEC socket.

The block diagram for the I/O-accessed JEDEC memory board appears in Fig. 1; see the Photo for a picture of it. The memory board contains a 24-pin JEDEC standard socket, so you can install a 2K or 4K ROM/EPROM or 2K static RAM. You access the memory device via I/O commands from the TRS-80, instead of from memory space. This is particularly beneficial since many computers lack additional processor memory space.

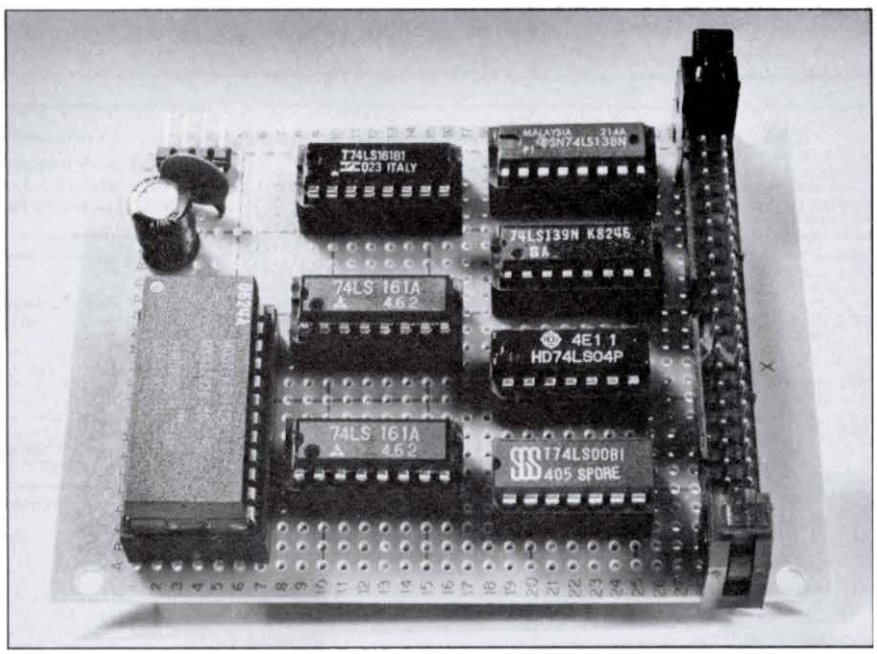

Photo. I/O-accessed JEDEC memory board.

24-Pin JEDEC Memory Devices

You can install a number of devices on the JEDEC memory board, including (but not limited to) the 2716 EPROM (2K), the 2732A EPROM (4K), and the 6116 static RAM (2K). All represent common and inexpensive memory devices.

Another JEDEC-compatible device useful in many applications is the Mostek Zeropower RAM chip (2K) shown, installed, in the Photo. This chip works like a 6116 RAM, but with a built-in lithium battery and the circuitry to power RAM-based memory when you turn off the computer. The battery's life expectancy is 10 years.

The implications of such a device are broad. You can update information in its memory while you use the computer, and have the information available the next time you turn the unit on. You could, for example, keep track of how much time you have your computer on, or when you last used the computer.

You should use a memory device with an access time of 450 or fewer ns, which isn't much of a limitation.

Building the I/O-Accessed JEDEC Memory Board

The schematic for the memory board appears in Fig. 2. Table 1 lists the parts necessary, minus the memory devices you'll use, since this is up to you. You'll find most of the memory devices available from mail-order electronic parts companies. Contact Mostek Corporation (see Fig. 3 for manufacturers' addresses) for your nearest Mostek distributor if you want the Zeropower RAM.

Building the board is straightforward when you follow the schematics in Fig. 2, though I will emphasize some points. First, the board uses four I/O address locations. Two jumpers near the 74LS138 let you select one of four address ranges. I chose address range 2CH–2FH by jumpering as shown by the dotted lines in the schematic. The programs discussed later assume this decoding. Table 2 indicates possible address decoding.

Second, you can either put jumpers on the board (for flexibility in the JEDEC device you put in the 24-pin socket) or you can hard-wire the socket for a particular device. The dotted line on the schematic shows the jumper scheme I used for the Zeropower RAM.

Finally, be sure the '161 device you use is a 74LS161A—*don't substitute* a 74161 or use an LS device without the A suffix, lest you spend a long time won-

Photograph by Suzanne Torsheya

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dering why your board doesn't work. Most distributors merely list a 74LS161 part number, so contact them before ordering to make sure it's the correct part. The 74LS161A operates slightly differently from the 74161. I ordered some 74LS161s from one company and got 74LS161Bs, only to find that (after a couple hours of debugging!) you can't substitute it for the 74LS161A.

Besides the parts indicated in the parts list, you will need five 16-pin sockets, two 14-pin sockets (three for the Models III and 4), and a single 24-pin socket. You will also need a +5-volt power supply capable of supplying 400 or fewer milliamps if you use the CMOS 6116 RAM chip.

Operating the I/O-Accessed Memory Board

The 74LS138 decodes the four-location I/O addressing range the board uses. The 74LS139 decodes each of the board's four specific addresses. I will use the 2CH–2FH addressing range for this discussion, though you can use other ranges (as described earlier).

The 74LS161As are actually the key chips on this board. They function as both 4-bit latches and up-counters. The three of them form a 12-bit address register, used to hold the address of the memory location accessed in the JEDEC memory device. The location the 74LS161As point to is read/written when either I/O port location 2CH or 2DH is read/written.

If you use I/O port 2CH to access the memory location, the address contained in the 74LS161As is incremented after the memory access; if you use I/O port 2DH, the address is left unchanged. The remaining I/O port locations write the desired memory access address to the 74LS161As. The function of each I/O location appears in Table 3.

Because you can only access the memory in the JEDEC socket from I/O port addresses, you can't execute any routines in the JEDEC memory device directly. You first have to bring them into

Quantity	Description	Distributor	Part number	Price (each)
1	74LS138 3-TO-8 decoder IC	JDR	74LS138	.55
1	74LS139 dual 1-of-4 decoder/multiplexer (LS TTL) IC	JDR	74LS139	.55
3	74LS161A latching 4-bit binary counter (LS TTL) IC	JDR	74LS161A	.65
1	74LS00 quad two-input NAND gate (LS TTL) IC	JDR	74LS00	.24
1	7416 hex inverter/drivers (O.C.) (LS TTL) IC**	JDR	7416	.25
1	74LS02 quad NOR gate (LS TTL) IC**	JDR	74LS02	.25
2	.1 UF/50-volt disc capacitor	RS	272-135	.25
1	47 uF/35-volt electrolytic capacitor (OPC mount)	RS	272-1027	.69
1	.1 inch matrix grid prototype board	RS	276-158	1.95
1	40-position cable header (W/W0) *	DK	R241-ND	5.58
1	40-position ribbon cable edge connector*	DK	R503-ND	3.80
1	40-position ribbon cable socket connector*	DK	R306-ND	3.73
8	inches 40-conductor ribbon cable*	DK	R007-ND	0.00
1	50-position cable header (W/W)**	DK	R247-ND	6.93
1	50-position ribbon cable edge connector**	RS	276-1566	4.95
1	50-position ribbon cable socket connector**	DK	R307-ND	4.65
8	inches 50-conductor ribbon cable**	DK	R008-ND	NA

* Model I only
** Models III and 4/4P

Parts Distributors

JDR Microdevices (JDR), 1224 S. Bascom Ave., San Jose, CA 95128, 800-662-6279. Outside CA: 800-538-5000, 408-995-5430.

Digi-Key Corp. (DK), Highway 32 South, P.O. Box 677, Thief River Falls, MN 56701, 800-346-5144 or 218-681-6674.

Tandy/Radio Shack (RS), National Products Division, 900 E. Northside Drive, Fort Worth, TX 76102, 817-870-5662.

Table 1. Parts list.

E2/	E3	I/O Address Range
A6/	A5/	4CH–4FH
A6/	A5	6CH–6FH
A6	A5/	0CH–0FH
A6	A5	2CH–2FH

Table 2. Possible address decoding.

Port	Description
2CH	Read/write current memory location the 74LS161As point to, then increment the address the 74LS161As put out.
2DH	Read/write current memory location the 74LS161As point to without affecting the address the 74LS161As put out.
2EH	Write low byte of the memory address to the two low-order 74LS161As.
2FH	Write the high nibble of the memory address to the high-order 74LS161A.

Table 3. I/O location functions.

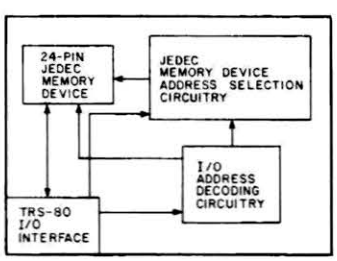


Figure 1. Block diagram of I/O-accessed memory board.

the computer's main memory where the Z80 CPU can access them for execution.

This simple one-line Basic program reads 2,048 bytes of information from a memory device on the board into the computer's main memory, starting at the address assigned to the variable PA (30000 below).

```
10 OUT 46,0:OUT 47,0:PA = 30000:FOR
   I = 1 TO 2048:POKE PA,INP(44):
   PA = PA + 1:NEXT I
```

You only need a single-line program to move information from the JEDEC memory device to the computer's main memory (you could also execute the line immediately, without making it a program). This is a particularly useful board for non-disk users because you can quickly load special routines into memory.

For Assembly-language users, I designed the board to support the Z80's block I/O move instructions: INI, INIR, IND, INDR, OUTI, OTIR, OUTD, and OTDR. Some of these instructions permit a single-instruction block move between the JEDEC memory and the computer's main memory, resulting in a high data-transfer rate.

After building the board, you may want to test it. The Program Listing shows a simple Basic program that performs a memory test on the board (if you use a 2K RAM device). It uses the auto-address-increment capability of the board to step through the JEDEC RAM device, writing a bit pattern into each location. It then starts over to verify that the expected pattern is in each of the 2,048 memory locations. If everything is OK, the test should complete in under 2.5 minutes. If the program finds an error, it displays an error message that includes the RAM address of the error, the expected value, and the value actually read.■

Write to Roger C. Alford at Washtenaw Digital Systems, P.O. Box 2014, Ann Arbor, MI 48106. Please include a self-addressed, stamped envelope for a reply.

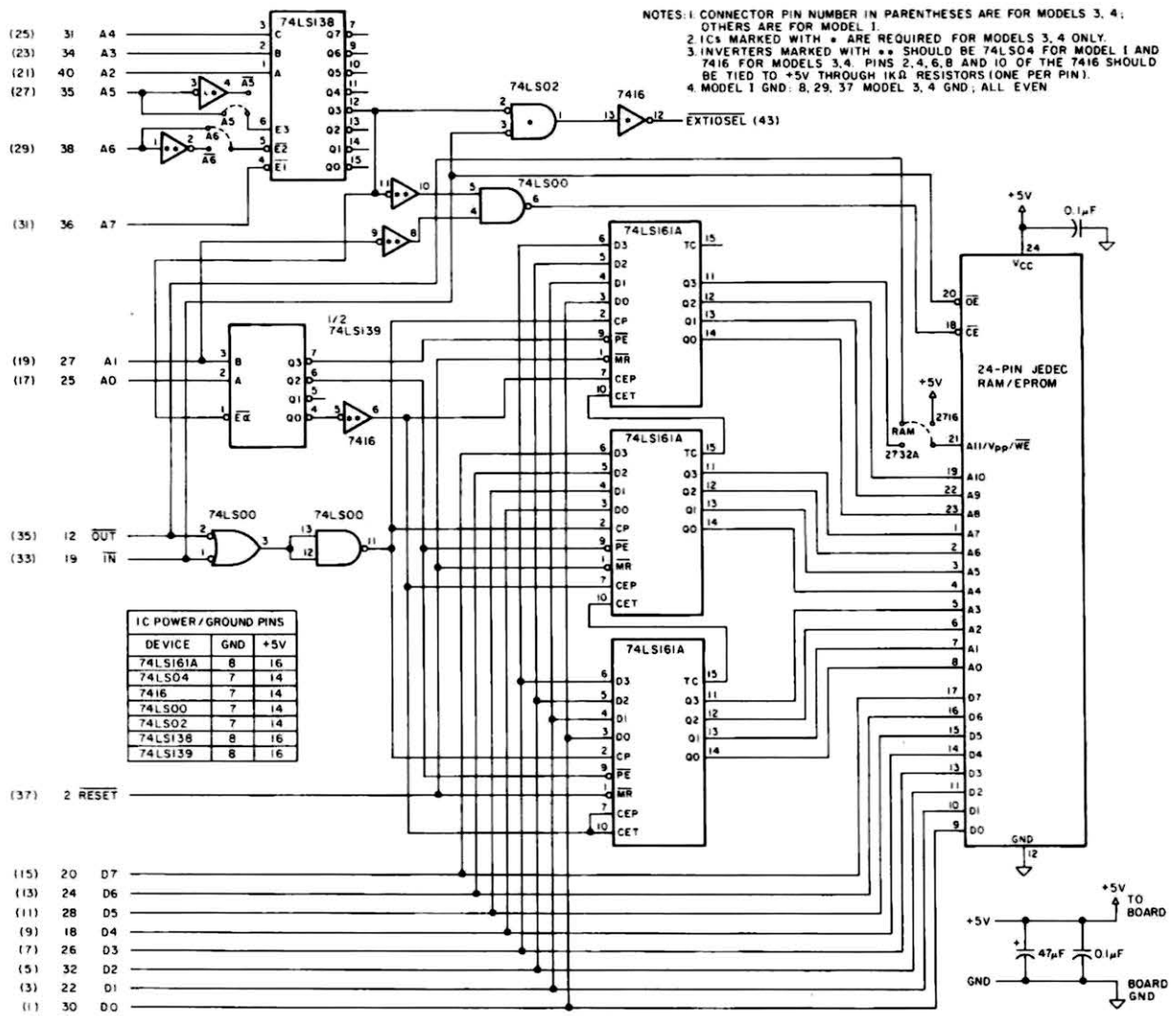


Figure 2. Schematic of I/O-accessed memory board.

Program Listing. Basic memory test for the JEDEC memory board.

```
2 '*****************************************************
3 '* PROGRAM TO TEST 2K RAM CHIP ON I/O-ACCESSED JEDEC   *
4 '* DEVICE BOARD. A PATTERN IS WRITTEN TO THE DEVICE,   *
5 '* THEN IS READ BACK FOR VERIFICATION.                 *
6 '*                                                     *
7 '*        WRITTEN BY ROGER C. ALFORD                   *
8 '*****************************************************
9 '
10 CLS : PRINT "WRITING TEST PATTERN TO RAM"
20 OUT 46,0 : OUT 47,0          'SET STARTING RAM ADDR @ 000H
30 FOR I=1 TO 8          'BREAK COUNTING INTO 8 256-BYTE BLOCKS
40 FOR J=1 TO 256      'LOOP COUNTER FOR CURRENT BLOCK
50 B=J+I-1 : IF B>255 THEN B=B-255  'GET TEST PATTERN
60 OUT 44,B            'WRITE THE TEST PATTERN AND INC PTR ADDR
70 NEXT J
80 NEXT I
90 PRINT "CHECKING DATA"
100 OUT 46,0 : OUT 47,0          'SET STARTING RAM ADDR @ 000H
110 FOR I=1 TO 8        'BREAK COUNTING INTO 8 256-BYTE BLOCKS
120 FOR J=1 TO 256       'LOOP COUNTER FOR CURRENT BLOCK
130 B=J+I-1 : IF B>255 THEN B=B-255     'CREATE TEST PATTERN
140 A=INP(44)        'GET RAM VALUE AND INCREMENT PTR ADDRESS
150 IF A=B THEN 170 ELSE PRINT "ERROR (ADDR/EXP/ACT): ";
160 PRINT (I-1)*256+J-1;"/";B;"/";A
170 NEXT J
180 NEXT I
190 PRINT "MEMORY TEST DONE"
200 END
```

End

Hitachi IC Memory Data Book
(describes 6116 RAM and other JEDEC memory devices):
Hitachi America Ltd.
Semiconductor and IC Sales Division
1800 Bering Drive
San Jose, CA 95112
408-292-6404

Mostek Corporation (Zeropower RAM):
1215 W. Crosby Road
Carrollton, TX 75006.
214-242-0444

Signetics TTL Logic manual 1982
(describes 74161/74LS161A differences):
Signetics Corporation
811 E. Arques Ave.
P.O. Box 409
Sunnyvale, CA 94086
408-739-7700

Intel Memory Components Handbooks (JEDEC memory device data sheets):
Intel Corporation
3065 Bowers Ave.
Santa Clara, CA 95051.
408-987-8080

Figure 3. JEDEC manufacturers and information sources.

Project Corrections For the Models III And 4

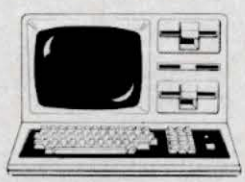
In previous projects designed to accommodate the Models III and 4/4P, I included circuitry to generate the EXTIOSEL/ signal as required for those machines.

It has been brought to my attention that I overlooked an important detail in generating the EXTIOSEL/ signal; the Models III and 4/4P have an internal 150-ohm pull-up resistor on the line. While I knew of the pull-up, I didn't know that it had such an unusually low value.

With such a low resistor, the device generating the EXTIOSEL/ signal must be able to sink approximately 30 milliamps of current. This is more current than LS-TTL devices are designed for, though they will do the job (and have in units that I have built).

Now that I know of this problem, a correction is in order. If you have built Model III or 4/4P boards using an LS-TTL device to generate the EXTIOSEL/ signal, replace the LS device with a standard TTL device (for example, replace a 74LS32 with a 7432).

The standard TTL device is capable of supplying enough current to pull EXTIOSEL/ low without undo stress on the chip. Future projects will incorporate the appropriate current-sinking devices. ■



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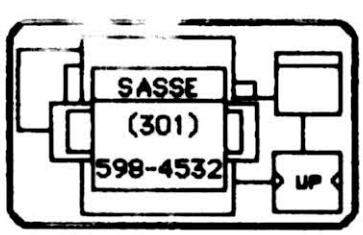

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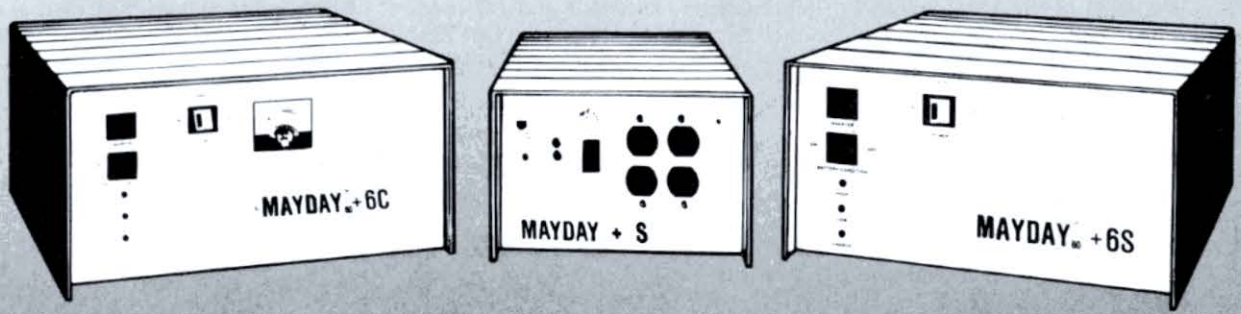

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Double-Spaced Out: Tackling Printer Woes

Many new users of Tandy's MS-DOS encounter minor problems with their Epson printers. In particular, they're finding that they're getting unwanted line feeds. I've spent some time walking through the forest of printer compatibility, and have managed to clear some of the underbrush. Here's a summary of what your Tandy and Epson might be doing, along with a set of problem-solving guidelines.

If you experience similar problems with a non-Epson printer, read on; some of this information might still apply to you.

Tandy software sends control code 13 (0D hexadecimal [hex]) to Tandy printers to start a new line. Tandy calls the resulting carriage return/line feed New Line, even though 13 is the ASCII code for Carriage Return (CR) only. Other micro manufacturers, including IBM, use control code 13 followed by 10 (Line Feed [LF]) to start a new text line. The Tandy 1000 and 1200 also use this combination for IBM compatibility.

An IBM PC-compatible printer responds to codes 13 and 10 first with a carriage return to the left margin, then with a line feed to the new line.

Some printers (my Okidata, for example) may also respond to code 10 alone with a CR/LF. A printer set for auto line-feed—to use with a Model 4, for example—responds to the 13/10 combo with two line feeds. That's why you might get unwanted double-spacing with your 1000.

You can set the newer Tandy printers and most other printers to respond to code 13 with either CR or CR/LF using DIP switches. Some printers also provide a switch for true Line Feed, instead of CR/LF.

If you often move between TRSDOS and MS-DOS, leave your printer set for auto line-feed. The 1000 has a software solution for the extra line feed: the Mode command's LF option. Typing in LF, then MODE LFOFF, from DOS usually eliminates unwanted double-spacing by controlling the DOS printer-driver routine. Invoke LPINST from DOS to put that command sequence in your AUTOEXEC batch file permanently, so that the computer modifies the printer driver every time you boot from that disk.

To examine the workings of the MODE LFOFF option, I wrote a small machine-language routine that sends various combinations of the CR and LF codes mixed in with text characters. (I first tried Basic, but CHR$(10) and CHR$(13) both invoke a CR/LF when put in LPRINT statements.) I found that the LFOFF option strips out any code 10 that immediately follows a 13. If your printer is then set for auto line-feed, 13/10 triggers only one line feed, because the computer ignores the tailing LF. The code sequence 13/10/10 produces two line feeds because the machine strips out only the first LF code. But if an LF precedes a CR (10/13), you'll get two line feeds.

Epson printers (and their clones) generate extra line feeds in still another way. Printer connector pin 14 is labelled

System Requirements

Models 1000, 1200, and 2000
GW-Basic

Program Listing. Subroutine for checking printer port status.

```
1000 REM Subroutine checks printer port for status. If you have a
1010 REM multi-function board with additional printer ports, change
the
1020 REM value for the variable PRINTER when changing ports. For
example,
1030 REM when checking LPT2:, assign PRINTER=2.
2000 PRINTER=1:DEF SEG=&H40:PRINTPORT = (PRINTER * 2) + 6
2010 IF PEEK(PRINTPORT) = 0 THEN PRINT "Tandy 1000 printer
interface circuitry not working.":RETURN
2020 STATUS=INP(PEEK(PRINTPORT) + PEEK(PRINTPORT + 1) * 256 + 1)
2030 IF STATUS = 223 THEN PRINT "Printer ready."
2040 IF STATUS = 207 THEN PRINT "Printer not ready."
2050 IF STATUS = 79 THEN PRINT "Out of paper."
2060 IF STATUS = 95 THEN PRINT "Printer not on."
2070 RETURN
```

End

Illustration by Hal Mayforth

AUTO FEED XT. A low signal on line 14 causes automatic line feeds after carriage returns, regardless of any DIP switch settings. The signal overrides the DIP switch for auto line-feed. It just so happens that Tandy computers (and printers) ground line 14, providing a persistent double-spacing with Epson printers unless you cut line 14 on the printer cable. The person I spoke to at Epson suggested cutting line 14 at the printer end of the cable in case the signal doesn't originate from 14 at the computer end.

Line 14 isn't necessary for Epson operation; you can still get auto line-feed by setting the DIP switch.

Working with the information above, you can use the following logical steps to eliminate unwanted double-spacing.

- Check for a DIP switch on your printer that turns auto line-feed off.
- If you have an Epson printer, the DIP switch 2-3 won't work unless you cut line 14. Make sure it's line 14 from the printer's point of view. On my cable that's the eighth wire from the uncolored edge. Note that my instructions for cutting the wire in "The Tandy 1000 Tip Sheet" (June 1985, p. 38) were incorrect.
- If your printer doesn't have a DIP switch or you don't want to change it and you have a 1000, use LF.COM and MODE LFOFF from DOS (or LPINST; see p. 7 of DeskMate tutorial).

If you have a 1200 and want to use it with an older Radio Shack printer without DIP switches for AUTO LINE-FEED, Larry Boxx of Fort Lauderdale, FL, offers a solution. He reports that Radio Shack Service Centers can modify some printers (e.g., the LP-III and DW 2B) so they don't respond to code 13 with automatic LF.

Printer problems have still other, less likely, causes. Some software inserts itself into the printing process at a level lower than the Mode command, bypassing its effects. PC-DOS's Graphics.COM, for instance, intercepts the low-level print-screen interrupt. The only solution in a case like this might be to modify the software (see the patch in "The Tandy 1000 Tip Sheet"). Printer-switching boxes can also affect what gets to the printer, either causing problems or, in one case I've heard of, solving them.

If you own one of the early 1000s, and any of the PFS software series tells you your printer isn't ready when it is, you need a modification to your 1000's printer port. Most 1000s had the fix at manufacture.

The Bottom Line

The 25th screen-line problem I mentioned in my June article brought in several letters. All corrected my assertion that Locate doesn't work on the bottom line. If you've removed the function key display with Key Off, you can locate the cursor on the 25th line just like any other line. A simple PRINT STRING$(40,32) quickly clears the 25th line in the 40-column screen modes, as does PRINT STRING$(80," ") in an 80-column mode. If you try Locate 25,1 with the function key assignments displayed, an "Illegal Function Call" message will zap you. I should have consulted the IBM Basic manual on this matter. All the details are laid out in two pages. The Tandy manual simply states that the legal row range for Locate is 1–24.

Chan Shippy of Colome, SD, has laid the matter to rest: KEY OFF : VIEW PRINT 1 TO 25. "You can now use Locate 25 and graphics statements in any screen mode, and CLS will clear all 25 lines." I tried it in all modes and I'm convinced there's no better way (see "Sifting Through GW-Basic," August 1985, p. 46).

Status Symbol

From Charlie Milhans (stationed in the Pacific) comes the Program Listing, a Basic subroutine for the 1000 that returns your printer status. Line 2000 changes the bottom of Basic's data segment to 40 hex. (The 64K memory block addressed by POKE and PEEK will now start at absolute address 400 hex.) Segment 40 hex is the start of the ROM BIOS data area, where the computer stores all sorts of useful information for the BIOS and DOS to use. If you're using the normal printer port (PRINTER = 1), then the program assigns value 8 to variable PRINTPORT. The 2 bytes at offset 8 in the BIOS data area contain the port address for your printer (LPT1:). Line 2010 checks that this address isn't zero, which would indicate severe problems with the printer interface circuitry.

Line 2020 turns that 2-byte hex port address into a decimal value for the INP statement (with the least-significant byte first). The value the INP statement returns from that port is the printer status. Milhans found the values returned in lines 2030–2065 indicated the conditions printed by the appropriate Print statements. My Okidata 82A returns 95 when the printer is off (and when it is not ready), 119 when it is out of paper, and 207 when it is ready. The 8088 can only believe what the printer tells it, so you might have to figure out the error codes for your printer. I inserted a line 2065 PRINT STATUS to see what was coming back from that port.

The meaning of the returned value is determined as follows, according to the 1000 *Software Developer's Guide*:

bit 0 = timeout occurred
bit 1 = (unused)
bit 2 = (unused)
bit 3 = I/O error
bit 4 = selected
bit 5 = out of paper
bit 6 = acknowledge
bit 7 = not busy

I assume that these bit assignments are standard for Tandy printers.

Drive Woes

TNT Software's Bruce Tonkin, author of The Creator and My Word!, has a woeful tale of worn drives. He bought two 1000s for software development, and was using them to copy a large number of disks. The Teac drives in both machines wore out after formatting 700 disks (more or less). That's a lot of formatting, but no more than the average Model 1000 owner might do during the life of his machine. The drives would still format some brands of disks, but not others. The local Tandy store replaced the Tandy drives.

Vincent Meyer of the Micro Clinic Service Network in New York state diagnosed the problem (over the phone) as worn heads. The signal picked up from the disk or head amplitude was starting to fall off, and results varied with the disk brand because of differences in their magnetic qualities. Sooner or later no disk will format properly. Meyer was not surprised, calling the Teacs "cheap, but adequate."

Tandy considers the drives "high quality," but price is also a consideration, according to Amy Arutt, public relations spokesperson for Tandy's MS-DOS line. If this turns out to be a real problem, you'd better follow Meyer's advice on drive care religiously ("Drive Ways," September 1984, p. 42). Garbage diskettes (improperly burnished) and "cleaning" diskettes will increase head wear.

Assemble This

Once converted from quad density to 1000 disk format (with IBM PC Maker), Tandy's MS-Assembler for the 2000 seems to work fine on the 1000 (and on the IBM PC for that matter). It's advertised in the catalog for all Tandy MS-DOS micros. I haven't tried conditional assembly or macros yet, but I've put together an 8K program with nine modules, using the assembler and the 1000 DOS's linker (LINK.EXE) without a bug.

Ken Shea of Lexington, OH, points out that you can modify machine-language files with the .EXE extension by renaming them with a different extension. So you can patch DeskMate.EXE to run on the 1200 with Debug (see "The Tandy 1000 Tip Sheet"). Modify the renamed program with Debug, then replace the file extension with the original EXE. ■

You can write to Dave Rowell at 80 Micro, 80 Pine St., Peterborough, NH 03458.

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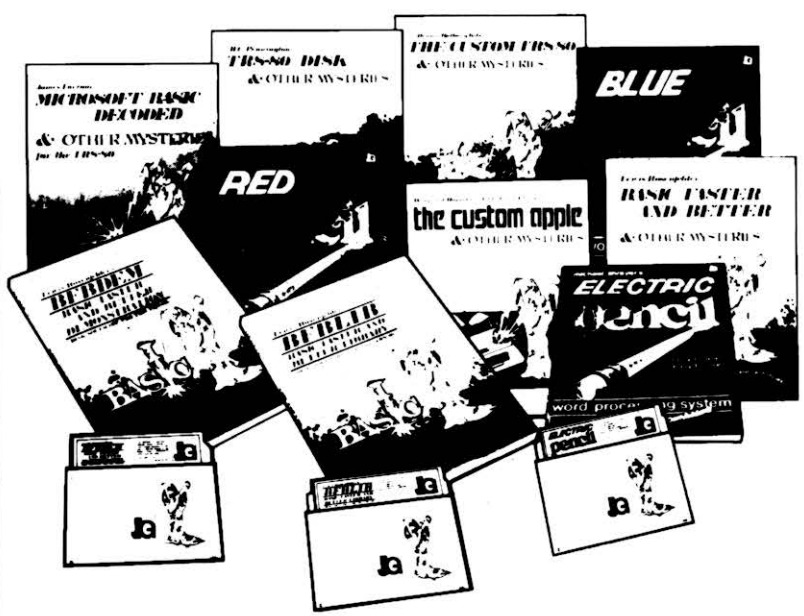

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All In Order: Using Sequential-Access Files

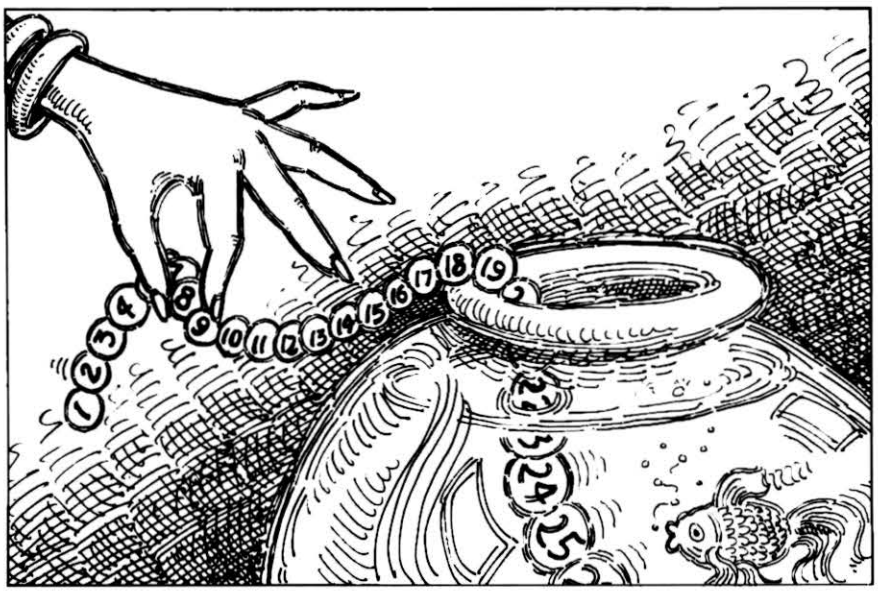

Illustration by Peter Bono

Basic can store data on a disk and let you retrieve it at any time. The beauty of this is that a small Basic program can work on large amounts of data: You can manipulate millions of bytes on hundreds of disks without straining your system's memory.

Basic handles two kinds of data files, sequential-access and direct-access. The former is like a string of beads in a goldfish bowl; you must take out the data in the same order in which you put it in. The latter is like the same beads without the string, poured loosely into the bowl, with the added magic that you can dip into the bowl and tweeze the very bead you want.

As you might think, direct-access files are more complex than sequential-access. But don't shy from learning both methods; each has its advantages.

This month I'll discuss how to create and handle sequential-access files. I'll cover direct-access files next month. At the end of this column I'll also tell you how you can receive a free program called WhereWolf, which you can use for scheduling and to study sequential-access programming methods.

Getting Started

Boot up a system disk, and format a fresh disk to hold data files. For formatting instructions, see pages 1–78 of the *Model 4/4P Disk System Owner's Manual*. Now enter Basic.

You can manipulate a file four ways: open it, put things into it, take things out, and close it. Let's start by opening a file.

Type in OPEN "O",1,"CLOWN" and press the enter key. The "O" is the letter O, standing for output. The 1 stands for buffer 1. I'll cover the meaning of buffer numbers later. "Clown" is the name of the data file you're creating.

System Requirements

Models I, III, and 4
32K RAM
Disk Basic

Program Listing 1. Day/BAS.

```
100 REM * Day File *
110 CLS: CLEAR: M$="OCT"
120 FOR X=1 TO 3
130 X$=MID$(STR$(X),2)
140 G$=M$+X$
150 PRINT "Opening day file "G$
160 OPEN "O",1,G$
170 CLOSE 1
180 NEXT X
190 END
```

End

Program Listing 2. Roster/BAS.

```
100 REM * Roster *
110 CLEAR
120 CLS
130 PRINT "MENU": PRINT "----"
140 PRINT "  1 - Open files A-Z for extending."
150 PRINT "  2 - Output new names to files."
160 PRINT "  3 - Input names for printing."
170 PRINT "  4 - End program run."
180 PRINT: PRINT "Choice: 1, 2, 3 or 4"
190 X$=INKEY$
200 IF X$="" OR INSTR("1234",X$)=0 THEN 190
210 X=VAL(X$)
220 ON X GOTO 240,360,500,620
230 REM *Creating files A-Z
240 CLS: FOR X=65 TO 90
250 PRINT "Opening letter file "CHR$(X)
260 OPEN "E",1,CHR$(X)
270 CLOSE 1: NEXT X
280 PRINT "Files A-Z now open."
290 GOTO 590
300 PRINT "Opening letter file "CHR$(X)
310 OPEN "E",1,CHR$(X)
320 CLOSE 1
330 NEXT X
340 GOTO 590
350 REM * Output new name
360 CLS
370 INPUT "Last name";L$
```

Listing 2 continued

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Listing 2 continued

```
380 INPUT "First name";F$
390 CLS
400 PRINT "<Y>es or <N>o, is this correct: "F$;CHR$(32);L$
410 Z$=INKEY$: IF Z$="" OR INSTR("YyNn",Z$)=0 THEN 410
420 IF Z$="N" OR Z$="n" THEN CLS: PRINT "Let's try it again": PRINT: GOTO 370
430 F1$=L$+"/"+F$
440 PRINT "Being filed as "F1$
450 OPEN "E",1,LEFT$(F1$,1)
460 WRITE #1,F1$
470 CLOSE 1
480 GOTO 590
490 REM * Input names from files
500 CLS: FOR X=65 TO 90
510 PRINT "Names in File "CHR$(X): PRINT STRING$(14,"-")
520 OPEN "I",1,CHR$(X)
525 PRINT LOC(1)
530 IF EOF(1) THEN CLOSE 1: GOTO 570
540 INPUT #1,N$
550 PRINT N$
560 GOTO 530
570 NEXT X
580 REM * BACK TO MENU ROUTINE
590 PRINT: PRINT "Tap key to return to menu."
600 V$=INKEY$
610 IF V$="" THEN 600 ELSE 120
620 PRINT "Run ended.": END
```

End

Now type in CLOSE 1 to close the file. This doesn't destroy it, but just turns it off.

To see if you've actually opened the file, go back to TRSDOS and call the directory (or you can type in SYSTEM "DIR" from Basic). Although it contains no data yet, you should see the file Clown.

You've opened a file in one of three possible ways. The other two are:

OPEN "E",1,"CLOWN". This opens an existing file named Clown so you can add material. The "E" stands for extend and ensures that the file retains the data already there. This differs from "O," which replaces any existing file named Clown and erases the material it holds.

OPEN "I",1,"CLOWN". This opens an existing file so you can remove data from it. The "I" stands for input.

Rolling Up Your Sleeves

Now, put these concepts to work. Program Listing 1, Day, creates three files for output: OCT1, OCT2, and OCT3. You could do an entire month by changing line 120 to read FOR X = 1 TO 31, but I've kept it simple.

This program introduces a new idea, that you can open a file using a variable. In this case, the key line is 160, OPEN "O",1,G$, with G$ containing the file name. G$ equals M$, which is always OCT, plus X$, which is the date. Since I used the same buffer number (1) throughout, you must close the file by buffer number, as in line 170, before you can open a new one.

Now that you've opened a file, you can put material in and take it out. Program Listing 2, Roster, offers a menu of four choices.

Choose option 1 when you first run the program. It automatically creates 26 files, one for each letter of the alphabet. Lines 240–330 do this by making a loop from 65 to 90, the ASCII values of all uppercase letters, and then creating each file as CHR$(ASCII number).

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Choice 2, in lines 360–470, lets you enter and send a new name to the letter file matching the first letter of the last name.

Option 3, lines 500–570, opens each file and prints all names in it.

Roster uses sequential-access functions I haven't discussed, so let me briefly tell you about them. PRINT # sends data to a file. The form is PRINT #1,N$, with the 1 standing for the buffer number and N$ the string variable holding the material you want sent. It's similar to WRITE # (see below), and when used as PRINT # USING will format data items in the same ways PRINT USING does on the screen.

WRITE # also sends data to a file; this is the form Roster uses. It delimits string values by putting them within quotes and includes commas between items sent to disk.

INPUT # reads a value from the disk. See line 540 of Roster for an example. The program can read a literal, but a variable value is more handy so the program can return to this point as often as needed, sending new values of the same variable to the disk file.

Line Input is an alternative to Input and lets you type up to 254 characters into a variable value that you can then send to disk using WRITE #. It differs from Input because it accepts commas and quotes as part of the string, accepts input for the value of but one variable value, and includes leading blanks.

EOF stands for end of file. Programs use an EOF marker to recognize the end of a sequential file. You'll find it in line 530, which translates, "If the end of file 1 has been reached, then close the file and go to line 570 for the next file." Unless a program has an EOF statement, you'll get an error when the program inputs values and tries to find material past the end of the sequential file.

LOC is a sector counter. The command PRINT LOC(1), with 1 standing for the buffer number, will print the number of sectors—256-byte blocks—that you have written to or read from a file since you opened it. Line 525 of Roster returns a zero.

You can think of the buffer numbers 1 to 15 as code numbers for files. In Roster, I've used buffer 1 for all examples, and that's why I was always careful to close the file (CLOSE 1) before opening another under the same buffer number. In more complex programs, you can open several files at once under different buffer numbers, and send data flying back and forth among all these files. For example, you can open an address file as 1, load its contents into the system as string array entries, sort by zip code and send to a zip file as 2.

Is this all there is to sequential-access? No, but it will get you into the experimental stage. And what I've covered this month is prelude to next month's look at direct-access disk files.

WhereWolf

Now for some free software. WhereWolf is a Model 4/4P meeting scheduler suitable for creating calendars for events and the like. It sorts by time, adds and deletes items, line prints, recognizes scheduling conflicts, and has a few other features that may help you learn sequential-access techniques. To get it, send a formatted Model 4/4P disk, along with a self-addressed mailer or envelope bearing $1.10 in stamps. Canadians, coins are OK. I'll save the program on your disk and return it along with documentation.■

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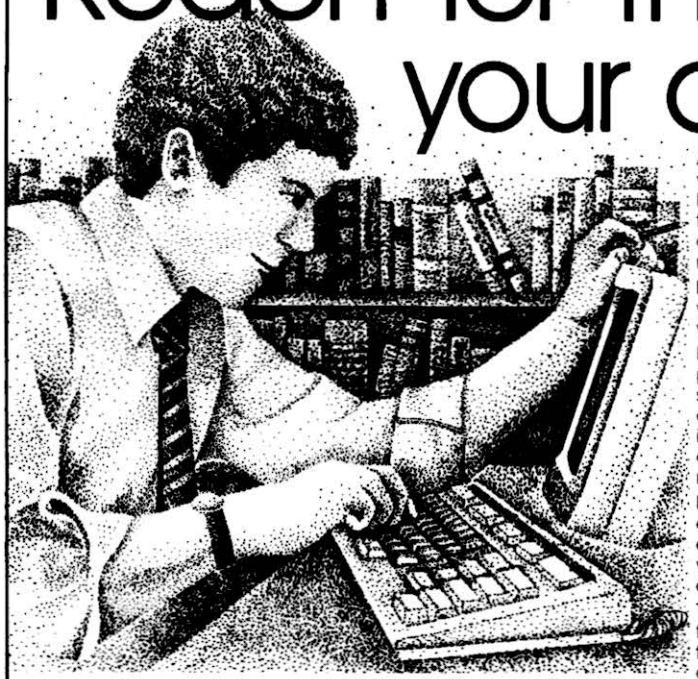

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Getting a Line On Your TRS-80

Drawing a straight line on paper is as simple as connecting two points. But drawing one on a computer screen can be marvelously complicated. While you can easily draw smooth horizontal and vertical lines, the block-like picture elements (pixels) of your display often make other lines look like stair steps.

This month's program lets you draw uniform graph lines with a Model I, III, or 4 (in Model III mode). The first time I ran this program, I was astounded at the quality of graphics I could get, and I spent a couple of hours playing with it. Unless you've been spoiled by a specialized graphics package, you'll probably feel the same way.

The Theory

Program Listing 1, the line-drawing subroutine, uses an algorithm that first determines the ideal line between two points and then translates that ideal into pixels. As the program picks each pixel, it calculates the pixel's distance from the ideal; when that difference becomes too great, the program picks a neighboring pixel to straighten out the line and keep it running in the right direction. The result is a line that's as smooth and thin as possible.

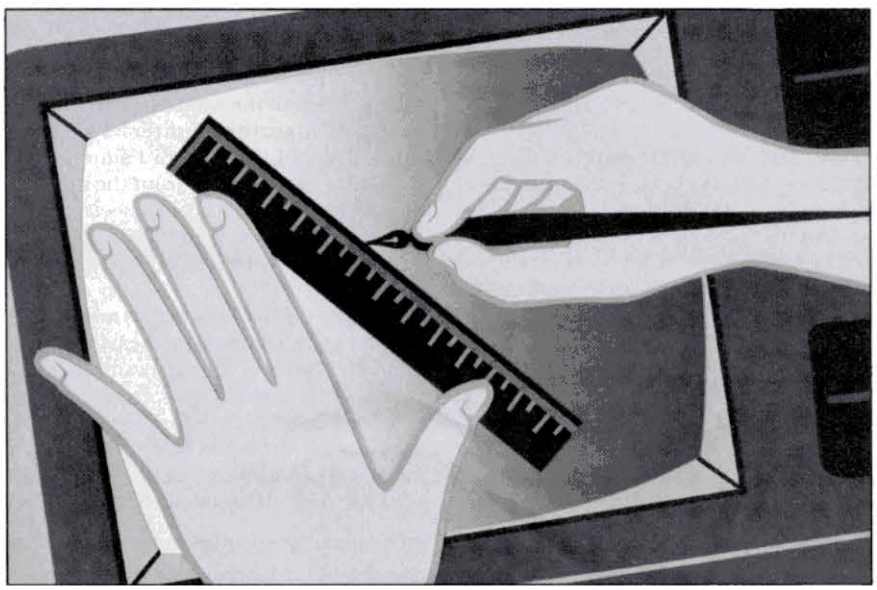
The Model I/III screen comprises a grid of 128 horizontal by 48 vertical pixels. In Basic, you can address any of these pixels with the Set, Reset, and Point commands by its horizontal (x) and vertical (y) coordinates, where x is a value between zero and 127 and y a value between zero and 47. This month's program uses the same addressing conventions.

Suppose you want to draw a line from the screen's upper left-hand corner (point 0,0) to the lower right-hand corner (point 127,47). The pixels must have

LOAD 80

System Requirements

Models III and 4
Disk Basic
Assembly language
Editor/assembler



Program Listing 1. The line-drawing subroutine.

```
00001   ;*************************************************************
00002   ;     Model I/III Line Generator
00003   ;
00004   ;     Calling sequence: DIM Array%(7): I% = varptr(Array%(0))
00005   ;       Z = USR(I%)
00006   ;               Array%(0) = x1, Array(1) = x2
00007   ;               Array%(2) = x2, Array%(3)=y2
00008   ;               Array%(4) = 0 or -1 (0  =  set line )
00009   ;                                   (-1 = reset line)
00010   ;             x1,y1 is the starting point of the line
00011   ;             x2,y2 is the ending point of the line
00012   ;                (0 <= x1,x2 <= 127)
00013   ;                (0 <= y1,y2 <= 47)
00014   ;*************************************************************
00015   ERROR   EQU     1E4AH           ;Illegal function call
00016   ;
00017           ORG     0F000H          ;Will relocate
00018           CALL    0A7FH           ;Get argument in HL
00019           PUSH    HL              ;Transfer array address
00020           POP     IX              ;  to IX
00021   ;-------------------------------------------------------------
00022   ;  Check range of arguments
00023   ;-------------------------------------------------------------
00024           LD      A,(IX+1)        ;Get MSB of x1
00025           OR      (IX+3)          ;Merge MSB of y1
00026           OR      (IX+5)          ;Merge MSB of x2
00027           OR      (IX+7)          ;Merge MSB of y2
00028           JP      NZ,ERROR        ;Error if not all 0
00029   ;
00030           LD      A,(IX+0)        ;Get LSB of x1
00031           OR      (IX+4)          ;Merge LSB of x2
00032           CP      80H             ;Both less than 128?
00033           JP      NC,ERROR        ;Error if not
00034   ;
00035           LD      A,(IX+2)        ;Get LSB of y1
00036           CP      30H             ;Less than 48?
00037           JP      NC,ERROR        ;Error if not
00038           LD      A,(IX+6)        ;Get LSB of y2
00039           CP      30H             ;Less than 48?
00040           JP      NC,ERROR        ;Error if not
00041   ;-------------------------------------------------------------
00042   ;  Pick up x1,y1 and x2,y2 and determine slope
00043   ;-------------------------------------------------------------
00044           LD      D,(IX+0)        ;Get x1
00045           LD      E,(IX+2)        ;Get y1//DE=starting point
00046           LD      H,(IX+4)        ;Get x2
00047           LD      L,(IX+6)        ;Get y2  HL=end point
00048           PUSH    DE              ;Save start
```

Listing 1 continued

Illustration by John Pirman

Listing 1 continued

```
00049   ;
00050           LD      A,H             ;A = x2
00051           LD      H,1             ;1 = positive step
00052           SUB     D               ;A = x2 - x1
00053           JR      NC,LINE10       ;Go if x2 > x1
00054           NEG                     ;A = x1 - x2
00055           LD      H,-1            ;-1 = negative step
00056   LINE10  LD      B,A             ;B = x distance
00057   ;
00058           LD      A,L             ;Now get y2
00059           LD      L,1             ;1 = positive y step
00060           SUB     E               ;A = y2 - y1
00061           JR      NC,LINE20       ;Go if y2>y1
00062           NEG                     ;A = y1 - y2
00063           LD      L,-1            ;-1 = negative step
00064   LINE20  LD      C,A             ;C = y distance
00065   ;
00066           LD      DE,0            ;D = alternate x step
00067                                   ;E = regular y step
00068           CP      B               ;Is dx > dy?
00069           JR      C,LINE30        ;Go if dx > dy
00070           LD      C,B             ;Else dx in c
00071           LD      B,A             ;and dy in B  B >= C
00072           EX      DE,HL           ;exchange steps
00073   ;---------------------------------------------------------------
00074   ;Now    B = larger distance
00075   ;       C = shorter distance
00076   ;       H = regular x step
00077   ;       D = alternate x step
00078   ;       E = regular y step
00079   ;       L = alternate y step
00080   ; all steps are 1,0, or -1
00081   ;
00082   ;       Save all values
00083   ;---------------------------------------------------------------
00084   LINE30  LD      (IX+10),H       ;Save regular x step
00085           LD      (IX+11),D       ;  alternate x step
00086           LD      (IX+12),E       ;  normal y step
00087           LD      (IX+13),L       ;  alternate y step
00088           LD      L,B             ;L has long distance
00089           LD      H,C             ;H has short distance
00090           LD      C,B             ;C also has long dist.
00091           SRL     C               ;C = long dist / 2
00092           INC     B               ;B = # of points on long axis
00093           POP     DE              ;DE has starting point
00094   LINE40  PUSH    HL              ;Save distances
00095           PUSH    BC              ;And counters
00096   ;---------------------------------------------------------------
00097   ;   Calculate screen location of y coordinate
00098   ;---------------------------------------------------------------
00099           LD      L,-1            ;Initialize for quotient
00100           LD      A,E             ;Get y coordinate
00101                                   ;divide y by 3
00102   LINE50  INC     L               ;Start with L = 0
00103           SUB     3               ;A = A - 3
00104           JR      NC,LINE50       ;Loop until A < 0
00105           ADD     A,3             ;A = 0,1, or 2
00106           LD      C,A             ;C has remainder
00107           LD      H,0             ;HL = screen line
00108   ;---------------------------------------------------------------
00109   ;  Multiply HL * 64
00110   ;---------------------------------------------------------------
00111           LD      B,6             ;Counter
00112           OR      A               ;Clear carry flag
00113   LINE60  RL      L               ;L = L * 2
00114           RL      H               ;HL = HL * 2
00115           DJNZ    LINE60          ;Do (HL*2) * 6
00116           LD      A,3CH           ;Screen starts at 3C00H
00117           ADD     A,H             ;Add MSB of screen line
00118           LD      H,A             ;HL==> beg. of screen line
00119   ;---------------------------------------------------------------
00120   ;  Now find address of x coordinate
00121   ;---------------------------------------------------------------
00122           LD      A,D             ;Get x coordinate
00123           SRL     A               ;A = x/2, CF has remainder
00124           RL      B               ;Remainder to B
00125           ADD     A,L             ;Add line position to L
00126           LD      L,A             ;HL==> correct pixel
00127   ;---------------------------------------------------------------
00128   ;  Find pixel at HL
00129   ;---------------------------------------------------------------
00130           RL      C               ;C = C * 2
00131           LD      A,C             ;Get value from C
00132           ADD     A,B             ;A has bit number (0-5)
00133           LD      B,A             ;Pixel number to B
00134           INC     B               ;B = bit number + 1 (1-6)
00135           XOR     A               ;A = 0
00136           SCF                     ;Carry flag has bit
00137   LINE70  RLA                     ;Rotate carry bit until
00138           DJNZ    LINE70          ;  bit is correctly positioned
00139   ;---------------------------------------------------------------
00140   ;  Make HL a graphics character if it isn't already
00141   ;---------------------------------------------------------------
00142           BIT     7,(HL)          ;Is high bit set?
00143           NOP                     ;Pause for 32-c;Go if dx > dy
00144           LD      C,B             ;Else dx in c
00145           LD      B,A             ;and dy in B  B >= C
00146           EX      DE,HL           ;exchange steps
00147   ;---------------------------------------------------------------
00148   ;Now    B = larger distance
00149   ;       C = shorter distance
00150   ;       H = regular x step
00151   ;       D = alternate x step
00152   ;       E = regular y step
00153   ;       L = alternate y step
```

Listing 1 continued

128 x and 48 y values. The algorithm first recognizes that the x value changes more often than the y value. It defines a "normal" step from one pixel to the next as "Add 1 to the last x position; add zero to the last y position." However, the program takes the normal step only five out of every eight times. It uses an alternate step the other three: "Add 1 to the last x position; add 1 to the last y position."

The program determines whether to take a normal or an alternate step by adding up the cumulative error of the actual line from the ideal line after every step. When the error is smaller than half a pixel, the algorithm selects a normal step to find the next position to set. But when the error is larger than half the width of a pixel, the program selects the alternate step and reduces the error sum.

The Program

I designed the source code so you could add it to the Basic program in Program Listing 2. To call the routine, you must dimension an integer array of at least seven elements. Put the starting x value in array element zero, the starting y value in element 1, the ending x value in element 2, and the ending y value in element 3. You should put a zero in element 4 if you want to turn on ("set") all the pixels in the line; put a -1 in element 4 if you want to turn off ("reset") the line. The program needs elements 5 and 6 for a storage buffer. Be sure you include them in the array or the line routine might change other values stored in memory.

Lines 240–490 check the values you've sent to the program and ensure that they're within the screen's limits. If the program finds a value that would take the line off the screen, it jumps to the ROM routine that reports an illegal function call and stops the program.

Next, in lines 530–810, the routine calculates the x and y steps for your line. Either the regular or alternate step for each direction will be a zero; the other will be a 1 or a -1 depending on the direction of the line. The same section determines the error correction ratio, which it stores in the B and C registers.

Starting in line 930, the program saves the step values in the extra two elements of the array, puts the error ratio in the HL register pair, and holds the number of steps needed for the full line in the B register. The program will use the value in the C register to calculate when it should select alternate steps. Finally, it recovers the starting point of the line from the stack and saves the error ratio and counters.

The middle section of the program, lines 1080–1750, finds the memory address of a screen pixel and whether that pixel is on or off. You might have trouble

understanding this section—writing math functions in Assembly language can be complex.

First, the program divides the y coordinate by 3 to find the correct screen row. A subtraction loop that starts on line 1110 does the division. The HL register pair holds the quotient and the C register holds the remainder.

The routine then determines how far the beginning of that screen row is from the start of the screen by multiplying the value in HL by the 64 characters per row. Since 64 is 2 to the sixth power, the program multiplies HL by 2 six times. Finally, the program adds the result of the multiplication to 3C00 hexadecimal (hex), the beginning address of screen memory; by line 1270, HL points to the beginning of the correct row on the screen.

Once the routine finds the row, it has to determine which column in that row holds the correct pixel. The program divides the x coordinate by 2 and adds the result to HL, and HL finally points to the correct byte. However, you still have to find out which pixel to set or reset.

The C register still holds the remainder of the first division and it must be zero, 1, or 2. The program multiplies that value by 2, adds the remainder of the second division (either zero or 1), and ends up with a pixel number in the range of zero to 5. The routine completes calculations by rotating a single bit through the A register until it moves into position to address the necessary screen pixel.

By line 1510, the HL register points to the correct byte in video memory, and the A register has the necessary value to turn on the pixel addressed by the x and y coordinates. The hardest part is finally over.

Two tests, beginning in line 1510, determine whether the screen displays an ASCII character or graphics character at the current location. If the program finds an ASCII character, it erases the character and replaces it with a graphics blank.

Then, in line 1640, the program tests the fifth array element to find out whether it should turn the pixel on or off. In either case, a simple logic operation either sets or resets the correct bit, and the program has finally taken care of one point on the line. The last section of the program, from lines 1790–2070, decides whether the program takes the regular or alternate step and adjusts the DE register accordingly. Then the program loops back to find the next pixel on the line.

Using and Modifying The Line Routine

Program Listing 2 shows how you can load, initialize, and call the line routine from a Model III Basic program. Lines 25 to 90 demonstrate how fast this program

Listing 1 continued

```
00154   ; all steps are 1,0, or -1
00155   ;
00156   ;       Save all values
00157   ;-----------------------------------------------------------------
00158   LINE30  LD      (IX+10),H       ;Save regular x step
00159           LD      (IX+11),D       ;  alternate x step
00160           LD      (IX+12),E       ;  normal y step
00161           LD      (IX+13),L       ;  alternate y step
00162           LD      L,B             ;L has long distance
00163           LD      H,C             ;H has short distance
00164           LD      C,B             ;C also has long dist.
00165           SRL     C               ;C = long dist / 2
00166           INC     B               ;B = # of points on long axis
00167           POP     DE              ;DE has starting point
00168   LINE40  PUSH    HL              ;Save distances
00169           PUSH    BC              ;And counters
00170   ;-----------------------------------------------------------------
00171   ;   Calculate screen location of y coordinate
00172   ;-----------------------------------------------------------------
00173           LD      L,-1            ;Initialize for quotient
00174           LD      A,E             ;Get y coordinate
00175                                   ;divide y by 3
00176   LINE50  INC     L               ;Start with L = 0
00177           SUB     3               ;A = A - 3
00178           JR      NC,LINE50       ;Loop until A < 0
00179           ADD     A,3             ;A = 0,1, or 2
00180           LD      C,A             ;C has remainder
00181           LD      H,0             ;HL = screen line
00182   ;-----------------------------------------------------------------
00183   ;  Multiply HL * 64
00184   ;-----------------------------------------------------------------
00185           LD      B,6             ;Counter
00186           OR      A               ;Clear carry flag
00187   LINE60  RL      L               ;L = L * 2
00188           RL      H               ;HL = HL * 2
00189           DJNZ    LINE60          ;Do (HL*2) * 6
00190           LD      A,3CH           ;Screen starts at 3C00H
00191           ADD     A,H             ;Add MSB of screen line
00192           LD      H,A             ;HL==> beg. of screen line
00193   ;-----------------------------------------------------------------
00194   ;  Now find address ot x coordinate
00195   ;-----------------------------------------------------------------
00196           LD      A,D             ;Get x coordinate
00197           SRL     A               ;A = x/2, CF has remainder
00198           RL      B               ;Remainder to B
00199           ADD     A,L             ;Add line position to L
00200           LD      L,A             ;HL==> correct pixel
00201   ;-----------------------------------------------------------------
00202   ;  Find pixel at HL
00203   ;-----------------------------------------------------------------
00204           RL      C               ;C = C * 2
00205           LD      A,C             ;Get value from C
00206           ADD     A,B             ;A has bit number (0-5)
00207           LD      B,A             ;Pixel number to B
00208           INC     B               ;B = bit number + 1 (1-6)
00209           XOR     A               ;A = 0
00210           SCF                     ;Carry flag has bit
00211   LINE70  RLA                     ;Rotate carry bit until
00212           DJNZ    LINE70          ;  bit is correctly positioned
00213   ;-----------------------------------------------------------------
00214   ;  Make HL a graphics character if it isn't already
00215   ;-----------------------------------------------------------------
00216           BIT     7,(HL)          ;Is high bit set?
00217           NOP                     ;Pause for 32-char. mode
00218           JR      Z,LINE80        ;Go if not set
00219   ;
00220           BIT     6,(HL)          ;Is this bit reset?
00221           NOP                     ;32-char. mode pause
00222           JR      Z,LINE90        ;Go if already graphics
00223   ;
00224   LINE80  LD      (HL),80H        ;Make a graphics blank
00225           NOP                     ;Another 32-char. pause
00226   ;-----------------------------------------------------------------
00227   ;  Set or reset correct bit
00228   ;-----------------------------------------------------------------
00229   LINE90  BIT     0,(IX+8)        ;Get Set/Reset flag
00230           JR      NZ,LIN100       ;Go to reset
00231           OR      (HL)            ;OR pixel with set bit
00232           NOP                     ;Pause
00233           JR      LIN110          ;And skip reset code
00234   ;
00235   LIN100  CPL                     ;Complement A for reset
00236           AND     (HL)            ;Mask out our pixel
00237           NOP                     ;Pause
00238   ;
00239   LIN110  LD      (HL),A          ;Set new value on screen
00240           NOP                     ;One more pause
00241   ;-----------------------------------------------------------------
00242   ;  One pixel is set -- find x,y address of next
00243   ;-----------------------------------------------------------------
00244           POP     BC              ;Recover counters
00245           POP     HL              ;Recover distances
00246           LD      A,D             ;Get current x coordinate
00247           ADD     A,(IX+10)       ;Add regular x step
00248           LD      D,A             ;Store new x coordinate
00249   ;
00250           LD      A,E             ;Get current y coordinate
00251           ADD     A,(IX+12)       ;Add regular y step
00252           LD      E,A             ;Store new y coordinate
00253   ;-----------------------------------------------------------------
00254   ;  Is it time for alternate step?
00255   ;-----------------------------------------------------------------
00256           LD      A,C             ;Get check value
00257           ADD     A,H             ;Add short distance
```

Listing 1 continued

Listing 1 continued

```
00258           LD      C,A             ;Save back in C register
00259           CP      L               ;Compare long distance
00260           JR      C,LIN120        ;Don't adjust if L > C
00261   ;-----------------------------------------------------------
00262   ;  Adjust with alternate steps
00263   ;-----------------------------------------------------------
00264           SUB     L               ;A = C-L: adjust check value
00265           LD      C,A             ;Store new check value
00266           LD      A,D             ;Get new x coordinate
00267           ADD     A,(IX+11)       ;Adjust by alternate step
00268           LD      D,A             ;Save as new x coordinate
00269   ;
00270           LD      A,E             ;Get new y coordinate
00271           ADD     A,(IX+13)       ;Adjust by alternate step
00272           LD      E,A             ;Save as new y coordinate
00273   ;-----------------------------------------------------------
00274   ;  Repeat until line is drawn, then return to Basic
00275   ;-----------------------------------------------------------
00276   LIN120  DJNZ    LINE40          ;Loop until B = 0
00277           RET                     ;Back to Basic
00278   ;
00279           END
EOF
```

End

Program Listing 2. The Basic demonstration program.

```
1 'Model I/III Line-Drawing
    Demonstration Program

10 CLS: DIM A%(7),I%,K%
20 GOSUB 60100: DEFUSR=VARPTR(Q%(0))
21 ' Warning!
    If you use any variables that have not already been
    given a value or DIMensioned, you MUST redefine
    the USR address: DEFUSR = VARPTR(Q%(0))

25 A%(4)=0
30 FOR K% = 0 TO 47
31   A%(0)=0: A%(1)=0: A%(2)=127-K%*2.7: A%(3)=K%
32   I%=USR(VARPTR(A%(0)))
33 NEXT K%
34 FOR K%=47 TO 0 STEP -1
35   A%(0)=127:A%(1)=47:A%(2)=127-K%*2.7:A%(3)=K%
36   I%=USR(VARPTR(A%(0)))
37 NEXT K%
38 A%(4)=-1
39 FOR K% = 1 TO 47 STEP 4
40   A%(0)=0: A%(1)=K%: A%(2)=127: A%(3)=K%
41   I%=USR(VARPTR(A%(0)))
42 NEXT K%
43 FOR K% = 1 TO 127 STEP 4
44   A%(0)=K%: A%(1)=0: A%(2)=K%: A%(3)=47
45   I%=USR(VARPTR(A%(0)))
46 NEXT K%
90 CLS: GOTO 25
100 '


60000 ' Data for line-drawing routine
60001 DATA  32717,  -6902,  -7715,  32477,  -8959,    950
60002 DATA -18723,  -8955,   1974,  19138,  -8930,    126
60003 DATA -18723,   -508, -11648,   7754,  32477,   -510
60004 DATA -11728,   7754,  32477,   -506, -11728,   7754
60005 DATA  22237,  -8960,    606,  26333,  -8956,   1646
60006 DATA  31957,    294,  12434,  -4860,   9796,  18431
60007 DATA  11901, -27903,   1072,  17645,   -210,   4431
60008 DATA      0,  14520,  18435,  -5305,  29917,  -8950
60009 DATA   2930,  29661,  -8948,   3445,  24936, -13496
60010 DATA   1081,  -6703,  11973,  31743, -10708,  12291
60011 DATA -14597,  20227,     38,   1542, -13385, -13547
60012 DATA   4116,  16122, -31684,  31335,  16331,   4299
60013 DATA  28549,   4555, -32647,   1095,  14255,   4119
60014 DATA -13315,    126,   1320,  30411,  10240,  13827
60015 DATA    128, -13347,  17928,   1056,    182,    792
60016 DATA -22993,  30464, -16128,  31457, -31011,  22282
60017 DATA  -8837,   3206,  31071,  20356,  14525, -27380
60018 DATA  31311, -31011,  22283,  -8837,   3462,   4191
60019 DATA -13930
60100 DIM Q%(108): RESTORE
60101 T=0
60110 FOR I%=0 TO 108:
        READ Q%(I%):
        T=T+Q%(I%):
      NEXT I%
60115 IF T <> 439331 THEN
        PRINT "Checksum error -- Verify Data":
        STOP
60120 RETURN
```

End

can draw 140 lines on the screen.

You can use essentially the same routine on a Model 4 with a few modifications. The error-checking section will have to allow x values between zero and 159, and y values between zero and 71, for example. You will also have to decide how the routine should address video memory. You have at least three choices:

- You can dedicate a 1,920-byte buffer (perhaps an integer array of 960 elements or a series of file buffers) to hold an image of the screen, use the @VDCTL SVC to copy the screen there, draw the entire line, and then copy the buffer back to the screen. You would have to ensure that the buffer begins at address 0EC00 hex or lower.
- You can determine the row and column, but not the absolute address, of each pixel and then use @VDCTL to get a copy of a single byte. You would then set the correct pixel in that byte and again call @VDCTL to put the new byte back in screen memory.
- If you're adventurous, you can use the information in the hardware section of the Model 4 technical manual to bring video and keyboard memory into the top 3K of addressable memory space and deal with the screen directly. If you take that approach, be sure to turn off all interrupts until you restore the normal memory configuration.

Model 4 graphics present one problem that is impossible to solve without completely rewriting the line-drawing algorithm. Model I/III pixels are all the same size but the Model 4 has two different sizes in each byte. Therefore, any line you draw will look slightly out of proportion.

You might also want to rewrite Listing 1 slightly so that you can call it from another machine-language routine. You would need to put the line's parameters into a buffer that the routine can find, and then call it. You would only have to change the first few lines of Listing 1 to do so.

Depending on your own programming needs, you may or may not find the line routine useful on a day-to-day basis, but you will probably enjoy experimenting with it. And you might want to use the program to educate your friends who may mistakenly think that the TRS-80 is incapable of displaying graphics.■

You can contact Hardin Brothers through CompuServe. Go PCS-117 to the Writers' and Editors' SIG (WESIG) and leave your message addressed to him. Feel free to join in discussions started by others.

You can also write to Hardin at 280 N. Campus Ave., Upland, CA 91786. Enclose a stamped, self-addressed envelope if you want a reply.

On Your Marks: Your Spreadsheet as Gradebook

by Doug Peterson

As a teacher, I find a good spreadsheet invaluable for calculating and printing out my students' marks. I can update marks whenever I want or monitor a student's progress throughout a term. Because my computer does the averaging, it's as easy to process a test with 27 questions as one with 50.

My VisiCalc template, Report Card, calculates student marks based on tests, assignments, and class performance (see Fig. 1). Once you understand how the entries work, you can customize the template to suit your own grading system.

The Setup

Start by entering the relative weighting for tests in cell C5. Type in weightings for assignments and class marks in cells C6 and C7. Enter students' last names in column A and first names in column B. If you need more room, use the global command /GC# to adjust column width.

Type in each student's grade on test 1 in column C. In cell C18, type in the test total; that is, the number of questions or maximum possible score. Repeat this procedure for each test and assignment, and for class performance.

The Formulas

Report Card calculates the average test 1 score in cell C17 using the formula @AVERAGE(C11...C15). The command /F$ formats the result to show only two decimal places.

Since the formula is the same for the rest of the tests, assignments, and class marks, replicate this formula for cells D17 through K17, using /F$ to format each answer. Figure 2 shows Report Card's formula listing.

Because my VisiCalc version limits formula lengths, the template calculates the test and assignment totals in separate cells. To calculate the test total, enter the formula @SUM(C18...F18) in cell M1. Enter the formula for the assignments total, @SUM(G18...I18), in cell M2. Because they're so far to the right,

	A	B	C	D	E	F	G	H	I	J	K
1	Period 3	1985 #1 #1									
2											
3	Weightings										
4	==========										
5	Tests		60%								
6	Assignments		30%								
7	Class Marks		10%								
8											
9	Name		Test 1	Test 2	Test 3	Test 4	Assign 1	Assign 2	Assign 3	Class	Average
10	==========		==========	==========	==========	==========	==========	==========	==========	==========	==========
11	Able,	Joan	20	8	47	19	39	21	27	7	87.68
12	Brown,	Barry	24	7	25	18	37	22	21	8	75.15
13	Carney,	Mary	21	8	38	17	40	24	29	6	82.92
14	Dent,	Gerry	23	9	39	17.5	40	18	30	7	84.88
15	Edwards,	Eddy	18	10	41	11	32	12	20	8	73.49
16											
17	Average		21.20	8.40	38.00	16.50	37.60	19.40	25.40	7.20	80.82
18	Total		25	10	50	21	40	25	30	10	100
19											
20	Highest Mark =====>		87.68								
21	Lowest Mark =====>		73.49								

Figure 1. Report Card template.

Illustration by Vinoy Laughner

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```
Cell                Formula

A4, A10--K10        /--
C17                 /F$ @AVERAGE(C11...C15)
D17                 /F$ @AVERAGE(D11...D15)
...                 ...
K17                 /F$ @AVERAGE(K11...K15)
D5, D6, D7          /FL
C20                 @MAX(K11...K15)
C21                 @MIN(K11...K15)
M1                  @SUM(C18...F18)
M2                  @SUM(G18...I18)
K11                 /F$ @SUM(C11...F11)/M1*C5+(@SUM(G11...I11)/M2*C6)+(J11/J18*C7)
K12                 /F$ @SUM(C12...F12)/M1*C5+(@SUM(G12...I12)/M2*C6)+(J12/J18*C7)
...                 ...
K15                 /F$ @SUM(C15...F15)/M1*C5+(@SUM(G15...I15)/M2*C6)+(J15/J18*C7)
```

Figure 2. Report Card's formula listing.

$$\frac{(ST*W1)}{TT} + \frac{(SA*W2)}{TA} + \frac{(CM*W3)}{TC}$$

ST = Number of tests
TT = Maximum possible test score
W1 = Weighting for tests
SA = Number of assignments
TA = Maximum possible assignments score
W2 = Weighting for assignments
CM = Student's class mark
TC = Maximum possible class mark
W3 = Weighting for class mark

Figure 3. The formula for student averages.

cells M1 and M2 don't show up when you print out the template.

Now you can enter each student's average. Figure 3 shows the formula and describes the variables. Format cell K11 with the command /F$ and enter the formula @SUM (C11...F11)/M1*C5 + (@SUM (G11...I11)/ M2*C6) + (J11/J18 *C7). The spreadsheet calculates and displays the first student's average. Replicate the formula for each student.

To determine the highest mark, enter the formula @MAX(K11...K15) in cell C20; use the formula @MIN(K11...K15) in cell 21 to find the lowest mark. Again, you should format these cells as /F$.■

Doug Peterson teaches data processing at Sandwich Secondary School in Windsor, Ontario. You can contact him at 62 Boardwalk, Amherstburg, Ont., Canada N9V 3H3.

Send your templates or spreadsheet tips to Spreadsheet Beat, 80 Micro, 80 Pine St., Peterborough, NH 03458. We'll pay $50 for each one we publish.

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System Requirements

VisiCalc

Circle 470 on Reader Service card.

96K MODEL 100

The *PG Design* 64K RAM module adds two additional 32K RAM banks to your existing Model 100. The firmware that comes in your Model 100, BASIC, TEXT, TELCOM, ADDRSS, SCHEDL, are all present in each additional RAM bank.

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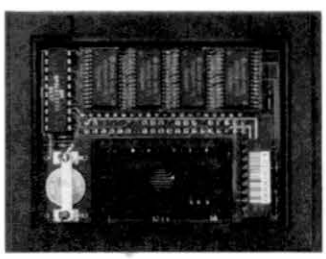

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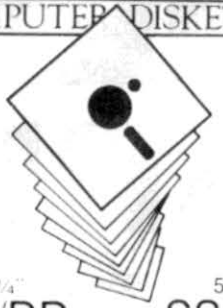

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See opposite page ▶▶▶▶▶▶

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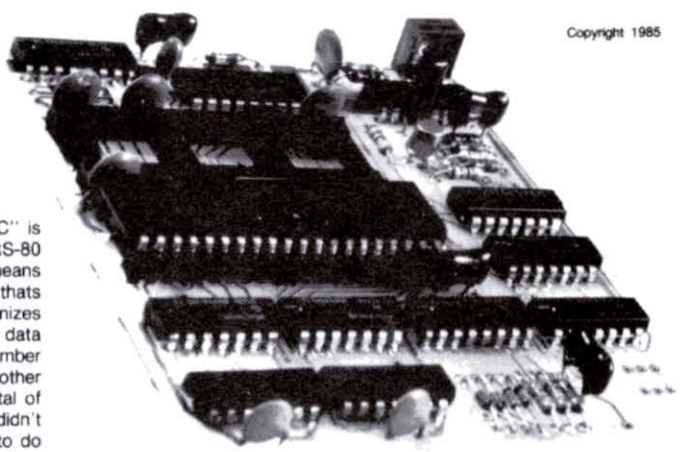

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The Story

Some products have what it takes to seem to last forever. Our "DDC" is one of those products. What it does is allow you to operate your TRS-80 Model 1 disk system in double density. In this case double density means almost doubling the storage capacity of your diskettes. Single density, thats the way Radio Shack designed your Model I expansion interface, organizes your disk into 10 sectors per track. Each sector contains 256 bytes of data for a total storage capacity of 2,560 bytes or 2.5K per track times the number of tracks your drive is capable of adressing. Double density, on the other hand, writes 18 sectors per track each containing 256 bytes for a total of 4,608 bytes or 4.5K. That is 80% more data in the same space. Why didn't Radio Shack do that in the beginning, you ask? Well it costs money to do double density because it is more difficult to do than single density and the data is harder to capture reliably. That means more cost and the Model I was meant to be a low-cost computer for the masses. Therefore, no double density for the original Model I.

The Facts

Other companies introduced double density controllers for the Model I but they were not so good. We waited and waited but, even new models failed to correct problems with data separation that kept cropping up. So we went to work and came up with a new design to cure the old problem. At last! A double density controller for the Model I with a higher probability of data recovery than with any other double density controller on the market then or since. Our analog design phase lock loop data separator has a wider capture window than the digital types the others use. This allows high resolution data centering. Our "DDC" analog circuit allows infinately variable tuning. The attack and settling times are optimum for 5.25" diskettes. The oft-stated fears of adjustment problems rumored by digital dilettantes have been proved groundless by thousands of satisfied users the world over. The bottom line here is state-of-the-art performance and reliability.

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Continued from p. 34

Teach Your TRS-80 Some New Tricks

by Terry Kepner

★★★★

Teach Your TRS-80 To Program Itself by David Busch. Tab Books Inc., Blue Ridge Summit, PA 17214. ISBN 0-8306-1798-1. $11.50. A disk of the programs costs $16.

Writing:	★★★★☆
Organization:	★★★★☆
Thoroughness:	★★★★★
Understandability:	★★★★☆

While *Teach Your TRS-80 to Program Itself* doesn't really do what the title implies, it does reduce some of the drudgery involved in writing programs by supplying modules and utilities that do part of the work for you.

For example, designing visually appealing program menus is always a chore: You have to count message lengths and put in tabs to center the text horizontally, then center it vertically. That task would be much simpler if you could design a screen with a word processor and tell a program to generate the code necessary to reproduce that screen.

Your computer can do this and dozens of other similar tasks, but it doesn't. That's where Busch's book comes in. It provides programs that do the task mentioned above and more. In all, *Teach Your TRS-80* provides 16 utilities to simplify your programming. *Teach Your TRS-80* is designed for the NEWDOS/80 system, but you can use it with most other DOSes. The programs work on the Models I and III and the Lobo Max-80.

The Programs

In addition to the screen formatting utility cited above, *Teach Your TRS-80* includes a word counter to determine the number of words in a text or ASCII file, a boiler-plate data base management generator, a print routine that prints out programs with a right-hand margin and indented continuation lines, a master menu program that lets you load and run any one of 26 programs, and an error-trap routine you merge with your programs so you get full text explanations instead of just "Illegal function call" errors. There are also programs that let you specify DOS or program zaps and check for entry errors before invoking the fixes, that let you program in Spanish, and a utility that scans text files and produces a list of the words used (for indexes and glossaries).

Teach Your TRS-80 also includes utilities to remove remark statements from a program, automatically add a title to your programs (for copyright statements), scan your program and automatically calculate the tabs needed to center indicated prompts and messages, generate program documentation, and proofread your programs for syntax errors in Basic reserved words. You can also create a graphics screen (mixed alphanumeric and graphics blocks) for visual presentations, and scan your program for a specified string and replace it with a new one (global search and replace).

Some of these programs require that you answer some prompts. The boiler-plate data base manager asks you a few questions about the size of your data, how you want it stored, the number of menu choices, and so forth. From this information, you create a boiler-plate program with a main menu, disk save and load capabilities, and screen-clearing code already in place. All you add are the data input, update, and start routines.

The master menu program is simply a program in which you put the names of frequently used programs (such as the ones in this book) and use it to select the particular one you want to use at a given time (sort of a disk menu program).

The chain zap program is designed mostly for NEWDOS/80 users, but you can adapt it to other DOSes. When you run it, you specify the file you want zapped, the starting location of the zap, and the replacement code. After you finish specifying these parameters, the program creates a chain file that automatically loads the NEWDOS/80 zap program and steps through the entire zap procedure. This is a real time-saver and much more accurate than trying it yourself, especially if you're not sure how to use the NEWDOS/80 zap program.

Compatibility

You can adapt many of *Teach Your TRS-80*'s concepts, if not the actual programs, to other computers. The only problems will be with the programs that use the PEEK command to read the screen (the screen editing program and the graphics screen program) and the error-trap program (the error numbers will be wrong).

Conclusion

As far as program errors are concerned, I found remarkably few in either the text or the programs. For convenience, a variables list, with explanations, comes with each program so you can easily make alterations. Overall, I liked the book very much. And while the book doesn't really teach your computer to program itself, it provides enough useful programs to make it a worthwhile purchase.■

Getting Some Answers

by Gary A. Shade

★★★½

Brainstormer runs on the Model III (48K) and requires two disk drives. Soft Path Systems, c/o Cheshire House, 105 N. Adams, Eugene, OR 97402. 503-342-3429. $75 single-user license; $100 institutional license.

Easy to use:	★★★☆☆
Good docs:	★★★☆☆
Bug free:	★★★★★
Does the job:	★★★☆☆

If you've ever been stuck with a problem and couldn't figure out a solution, Brainstormer can help. It's a combination thought organizer and mind jogger that lets you figure possible solutions to problems. Brainstormer provides a structured environment in which you break a problem down into its component parts and indicate factors that affect those parts. By pairing a problem's components and influences in different combinations, Brainstormer gives you new insights and perspectives on the problem.

While I found the program well thought out, its rigid structure limits its flexibility in suggesting problem solutions.

Starting Out

Figure 1 demonstrates how Brainstormer considers a problem. First, you name the problem of interest. I wanted to use Brainstormer in my job as a systems integrator to figure out the different ways I could combine computer products from various manufacturers into a complete system.

Once you state the problem, you define components of the problem ("themes") and factors that affect those components ("variations"). You can define up to 10 themes (each with up to 10 relative factors) for a maximum of 3,628,000 permutations. The program refers to these permutations as probes.

Figure 2 lists the themes I used in testing Brainstormer, the hardware that comprises a computer system. Figure 3 contains the different types of central processor to which I have access (those with VME-bus CPU boards that Motorola, Signetics, and Mostek manufacture). Figure 4 represents the program's final suggested solution for integrating a system.

The probability of a particular CPU card appearing in a given configuration is 1 in 10 (.010) because I listed 10 different cards. You can edit these probability numbers to prohibit a variation from appearing in the probe by setting the prob-

1 Problem of Interest
Themes —> Variations —> Probes

```
1  xxxxx
              1  xxxx
              2  xxxx
              - -              1
              - -
             10  xxxx
2  xxxx
              1  xxxx
              2  xxxx
              - -              2
              - -
             10  xxxx
- -                            3
- -                            4
- -                            5
- -                            6
- -                            7
- -                            8
- -                            9
10 xxxx
              1  xxxx
              2  xxxx
              - -             10
              - -
             10  xxxx
```

Figure 1. The levels at which you can state a given problem using Brainstormer.

ability to zero. Naturally, the sum total of all the probabilities must equal 1.

You can easily move about within the program by selecting the proper screen or area of the program. You execute commands through the mode screen with a help screen explaining the mode commands. Brainstormer controls disk access through a file screen and a separate help screen elaborates on the file commands.

Negatives

Although the software was helpful in providing additional ways to view a problem, it really did nothing more than mix and match themes and variations. I found this two-dimensional matrix of combinations limiting in describing large and complex problems.

Also, since you're limited to 10 themes and variations each, you're further restricted in certain applications, those where the total number of themes or variations exceeds 10.

In the application I used, I could easily expand the total number of themes by including specialized board-level products, like optically isolated digital input and output modules or tape controllers. In fact, I couldn't configure a complete system with the 10-theme limitation Brainstormer imposes.

I would suggest that after you buy Brainstormer you read the manual from beginning to end as you use it. Completely work the examples presented before attempting to enter your own application file. You'll find the process of stating and working with a particular problem much easier after working with the examples provided.

Theme : CPUlBoard **Max probes: 3,628,800**

Variation number	Variation name	Variation probability
1	MVME 110–1	0.10
2	MVME 101	0.10
3	MVME 115M	0.10
4	MVME 120	0.10
5	MVME 128	0.10
6	MVME 130	0.10
7	SMVME 2000	0.10
8	SMVME 2010	0.10
9	VME-SBC	0.10
10	MK75602	0.10

Theme command : MFACDRO?

Figure 2. Theme screen for making a system configuration.

Interest : System configurations **Max probes: 3,628,800**

Theme number	Theme name	Number of variations
1	Host computer	3
2	Remote system(s)	4
3	CPU board	10
4	RAM board	9
5	System controller	4
6	Serial board	4
7	Parallel board	7
8	Mass storage controller	5
9	Disk drives	6
10	Printer(s)	0

Interest command : MIFACDO/NQ

Figure 3. Variation screen of the CPU boards.

Probe for interest area : System configurations

Theme	Variation
Host computer	VME/10
Remote system(s)	ISI 5160
CPU board	SMVME 2000
RAM board	MVME 211
System controller	MVME 050
Serial board	MVME 331
Parallel board	MVME 625
Mass storage controller	MVME 320
Disk drives	TM 65-4L

Probe command : MFGCO?

Figure 4. A probe by Brainstormer of a possible system configuration.

Conclusion

I would recommend Brainstormer to those who can state their problems within the program's constraints. The manual states that you can use the program in two areas of the problem-solving process: problem description and idea generation. Strategy selection, testing, and implementation are left to more specialized software.

Brainstormer's concept is fascinating, but I wish that the authors had taken Brainstormer to a level beyond the simple permutations. ■

The Offix Personal Office System

★★★★

The Offix Personal Office System runs on the Tandy 2000 (256K) and requires two disk drives. Emerging Technology, 2031 Broadway, Boulder, CO 80302. Radio Shack catalog number 26-5325. $99.95.

Offix integrates a word processor, file manager, and report generator in a single package. It features a clever display of drawers and filing cabinets on-screen, making it easy to find and search through your files. The most surprising thing about Offix is that it doesn't have any external documentation and doesn't need any.

To use Offix, you open the drawers and flip through the folders, take a folder out, and open it to see what's inside. The folders contain either text files or forms.

A function key calls up a help screen for the current operation, while a pop-up menu summarizes the commands available for the next operation.

Offix's full-featured word processor provides advanced features like block move/copy, document merge, full cursor control, and complete page formatting.

You use Offix's word processor to design the data base forms. Each folder contains one blank form you can modify without losing information on the other records in a file.

Offix's forms selection and reporting features are particularly powerful and an unexpected plus in such an inexpensive package. You generate reports by indicating on a blank form what information you want to retrieve. You can select records for review or for either the report generation system or form letters.

While Offix supports Tandy printers, I don't appreciate their philosophy of not supporting non-Tandy printers for their software.

Offix is software protected, requiring the master disk in drive B to load the software properly. There is no restriction to copying the software to a back-up disk or to a fixed disk but you still have to put your only master in the computer each time you use Offix.

Color implementation on the Tandy 2000 uses the high-resolution graphics color mode and is slow. If you use this mode with any MS-DOS version other than 2.11.XX, you'll surely return to black-and-white mode.

Offix's ease of operation is due in large part to its superior tutorials and help files. It's perfect for people who don't have a lot of time to learn an advanced system.

—John B. Harrell III

IDEA!

★★★★

IDEA! runs on the Models 100 and 200. Traveling Software, 11050 Fifth Ave. N.E., Seattle, WA 98125. $49.95.

Just as a word processor stores, manipulates, and organizes words, so IDEA! handles ideas. It provides a framework for generating organized lists. You can add as many levels as you need, with as much room for elaboration as you require. IDEA! copies, moves, expands, or deletes any particular item and subideas associated with it.

You receive a package of three programs—one provides the full-featured IDEA! package (9.5K); another is a smaller version (8K) with fewer features; and the third is a memory-management program, MEMMGR (2.5K), for managing .DO files. MEMMGR lists IDEA!'s file names and their sizes with easy-to-use options for making the files invisible, visible, and renaming or killing them.

Like the Model 100/200 built-in software, IDEA! is simple and logical in operation. You invoke all commands with function keys.

The primary difference between the Model 100 and the Model 200 versions is that the Model 200 version lets you see more headings at one time and view two paragraphs simultaneously (but you can only edit one at a time).

Unfortunately IDEA! has several problems. The first is size. The program uses almost 12K when running (not counting the size of the file you're editing), severely restricting its use with other files or programs in memory. In fact, you can't load MEMMGR.BA, IDEA!.BA, and the IDEAS.DO sample file in the same memory bank on the Model 200.

The second problem is speed. As your files get larger (8K or more), you'll notice a marked reduction in speed. This is due primarily to using Basic instead of machine-language for IDEA!.

I like IDEA! despite its problems and recommend it to anyone who must make lists or wants to organize ideas, plans, or their writing. Its organizational advantages outweigh its disadvantages. I just wish I could get a version for my Model 4P so I could directly swap files between the Model 100 and my desktop.

—Terry Kepner

HomeworD

★★★★★

HomeworD runs on the Tandy 1000 and 1200 (128K) and requires two disk drives. Tandy/Radio Shack, One Tandy Center, Fort Worth, TX 76102. Radio Shack catalog number 25-1116. $69.95.

If you feel that DeskMate's word processor doesn't cut the mustard, but you don't want to shell out much money for a replacement, consider HomeworD. HomeworD is inexpensive but powerful and capable of performing extensive word processing.

Menu-driven HomeworD uses icons to represent printer control, document layout, customizing, file manipulation, editing, and program exit. (The control key with other keys alternatively provides the same functions.) Each icon has a submenu of special functions.

The display starts out in 40-column text mode with a small box in the lower right-hand corner called the Page Sketch section. This displays a miniature representation of your printed page, with the selected margins and spacing assignments.

The Print icon displays submenu selections consisting of document printing, dumping to the screen, printing to disk, and selecting the starting page number. Some of these selections require you to go to the Customize menu and answer specific setup questions.

The Edit icon lets you erase, copy, move, find and/or replace and insert erased text. HomeworD highlights the text so you know exactly how much to erase or edit.

The File icon takes care of all normal document file-handling tasks such as retrieve, save, erase, and insert documents. You use the arrow keys to scan the directory, and hit the enter key to select documents.

The Layout icon lets you dictate document alignment, top/bottom margins, line spacing, tab stops, side margins, headings/footings, and page numbering. You can also select the print style such as boldface, normal, and underline.

With the Customize icon, you can change the selected document drive (A or B), make back-up documents, toggle 40-/80-column text, assign the type of printer, and change preset layout or margins, and tabs. You may also save any customized setup to disk to use at a later date.

Function keys invoke special functions such as changing the current directory. File conversion utilities are also supplied with which you can convert non-HomeworD files to use with HomeworD and vice versa. Which conversion routine you use depends entirely on the type of document you're converting.

HomeworD is easy to learn and use, bug free, and the addition of an audio instruction cassette is an excellent idea. The manual is well done and to the point. This is a very capable word processor at a reasonable cost.

—David Engelhardt

EXPRESS CHECKOUTS

Inside CP/M Plus: A Guide for Users

★★★★★

Inside CP/M Plus: A Guide for Users. By David Cortesi. Holt, Rinehart, and Winston. 383 Madison Ave., New York, NY. $18.45.

David Cortesi has written extensively on CP/M and his earlier books were invaluable guides to this hard-to-use operating system. His new book takes you on a detailed tour of this new version of CP/M and I found it well suited to the beginner.

Inside is organized into three parts: a basic introduction to computer hardware and software, an introduction to the operating system with simple commands and their applications, and detailed explanations of the more difficult concepts in CP/M Plus.

The first two sections tell you how a computer works and how to make it start working for you. They introduce you to simple commands and their functions, like DIR and Date, with numerous examples to help you understand the other commands available.

You learn other more complex commands as you explore the file system, such as extensions to DIR and other commands that let you use the file structure to your advantage.

Cortesi fully explains complex commands in CP/M Plus so you can use your system to its fullest capacity (such as file attributes and user areas).

PIP (peripheral interchange program) is a difficult utility to understand because it's far more than a simple copying utility. This powerful utility is clearly explained with particularly useful examples.

Many operating systems can automatically execute system commands, but few books really explain that process well. Cortesi not only addresses the use of Submit, he follows up with examples to illustrate its features including the complex concepts of parameters, special characters, conditional command lines, and program input from the command file.

The last part of the book covers advanced topics of system management: disk organization, data integrity, and data security. If you haven't used a computer before, this area is particularly helpful and points out many ideas for your implementation.

I thoroughly enjoyed reading another of the fine works on CP/M by David Cortesi. He avoids using unnecessary terminology and clearly identifies all aspects of the system. He makes CP/M Plus easy to understand.

—John B. Harrell III

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Listing 2 continued from p. 55

```
61102 DIM Q1%(21): FOR Q%=0 TO 21: READ Q1%(Q%): NEXT
      Q%
61103 '
61200 ' Routine 2 -- Strip blanks from string
61201 DATA 32717, -6902, 9038, 9086, 28518, 6, 11017,
      -386, 8224, 11012, 8205, -7689, -13967
61202 DIM Q2%(12): FOR Q%=0 TO 12: READ Q2%(Q%): NEXT
      Q%
61203 '
61300 ' Routine 3 -- Convert to upper case
61301 DATA 32717, 17930, 32291, 26147, 32367, 25086,
      1848, 31742, 816, 24550, 9079, -3824, 201
61302 DIM Q3%(12): FOR Q%=0 TO 12: READ Q3%(Q%): NEXT
      Q%
61303 '
61600 ' Routine 6 -- Full Screen input
61601 DATA 3646, 13261, -13056, 73, 8190, -2528, 201
61602 DIM Q6%(6): FOR Q%=0 TO 6: READ Q6%(Q%): NEXT
      Q%
61603 '
61700 ' Routine 10 -- Screen Swap Use ONLY on a Model
      4/4P in Model III Mode!
61701 DATA 32717, 15882, -11508, -20600, 7627,
      -11489, 6020, 5911, -11497, -13943
61702 DIM Q9%(9): FOR Q%=0 TO 9: READ Q9%(Q%): NEXT
      Q%
61703 '
61800 ' Create space for necessary variables:
61801 Q1%=1: Q2%=1: DIM Q$(16): RETURN
```

End

Program Listing 3. Assembly-language source code for Model 4 subroutines.

```
00100 ;*****************************************************************
00110 ;    MODEL 4 -- Subroutines for Basic programs
00120 ;*****************************************************************
00130 ;SVCs used
00140 @DSP    EQU     2
00150 @FLAGS  EQU     101
00160 @KEY    EQU     1
00170 @KEYIN  EQU     9
00180 @VDCTL  EQU     15
00190 ;---------------------------------------------------------------
00200 ;   Model 4 -- Formatted input routine
00210 ;    Calling sequence:  CALL ROUTINE% (I%)
00220 ;    I% is varptr of string of proper length+1
00230 ;    Be sure that cursor position is set before CALL
00240 ;---------------------------------------------------------------
00250         ORG     0F100H
00260         LD      A,(HL)          ;Point HL to string varptr
00270         INC     HL
00280         LD      H,(HL)          ;MSB in H
00290         LD      L,A             ;LSB in L
00300         PUSH    HL              ;Save address of varptr
00310         LD      B,(HL)          ;Get length+1 in B
00320         INC     HL              ;HL==> string address
00330         LD      A,(HL)          ;Move address to HL
00340         INC     HL
00350         LD      H,(HL)          ;MSB in H
00360         LD      L,A             ;HL==> string
00370         DEC     B               ;B = input len
00380         PUSH    BC              ;Save input length
00390         PUSH    BC              ;  twice
00400         LD      C,'.'           ;C holds field character
00410 ;
00420 F1      LD      A,@DSP          ;Set up for SVC call
00430         RST     28H             ;Call @DSP SVC
00440         DJNZ    F1              ;Display input field
00450 ;
00460         POP     BC              ;Recover field length
00470         LD      C,18H           ;C holds backspace character
00480 ;
00490 F2      LD      A,@DSP          ;Set up for SVC call
00500         RST     28H             ;Call @DSP SVC
00510         DJNZ    F2              ;Backspace to beg. of field
00520 ;
00530         POP     BC              ;Recover field length
00540         LD      A,@KEYIN        ;Set up for SVC call
00550         RST     28H             ;Let DOS handle input
00560 ;
00570         JR      C,FERROR        ;Go if <break> pressed
00580         JR      NZ,FERROR       ;Go if input error
00590         LD      A,B             ;Else get input length in A
00600         JR      F3              ;And jump over error
00610 FERROR  LD      A,0             ;No string if <break> or <error>
00620 F3      POP     HL              ;Recover varptr address
00630         LD      (HL),A          ;Set length of string
00640         RET
00650 ;
00660 ;---------------------------------------------------------------
00670 ;  MODEL 4 -- Strip trailing blanks from string
00680 ;  Calling sequence: A$ = USR(A$)
00690 ;---------------------------------------------------------------
00700         ORG     0F200H
00710         PUSH    DE              ;Save varptr address
00720         EX      DE,HL           ;And move to HL
00730         LD      C,(HL)          ;String length in C
00740         INC     HL              ;HL==> string address
00750         LD      A,(HL)          ;Move string address to HL
00760         INC     HL
00770         LD      H,(HL)          ;MSB in H
00780         LD      L,A             ;LSB in L
00790         LD      B,0             ;BC = String length
00800         ADD     HL,BC           ;HL==> End of string+1
00810         DEC     HL              ;HL==> last char. of string
00820 ;
00830 S1      LD      A,(HL)          ;Get character in A
00840         CP      ' '             ;Is it a space?
00850         JR      NZ,S2           ;Go if not
00860         DEC     HL              ;Else move back a character
00870         DEC     C               ;Decrement count
00880         JR      NZ,S1           ;Loop back until done
00890 ;
00900 S2      POP     HL              ;Recover varptr address
00910         LD      (HL),C          ;Set new string length
00920         RET
00930 ;
00940 ;---------------------------------------------------------------
00950 ;   MODEL 4 -- Change all lowercase characters to
00960 ;              uppercase in a string
00970 ;     Calling sequence: A$ = USR(A$)
00980 ;---------------------------------------------------------------
00990         ORG     0F300H
01000         EX      DE,HL           ;HL==> string varptr
01010         LD      B,(HL)          ;String length in B
01020         INC     HL              ;HL==> string address
01030         LD      A,(HL)          ;Move address to HL
01040         INC     HL
01050         LD      H,(HL)          ;MSB in H
01060         LD      L,A             ;LSB in L
```

Listing 3 continued

Listing 3 continued

```
01070 ;
01080 U1      LD      A,(HL)          ;Get character in A
01090         CP      'a'             ;Less than 'a' ?
01100         JR      C,U2            ;Go if yes
01110         CP      'z'+1           ;Greater than 'z'?
01120         JR      NC,U2           ;Go if yes
01130         AND     5FH             ;Else change to lowercase
01140         LD      (HL),A          ;And put back in string
01150 ;
01160 U2      INC     HL              ;Point to next character
01170         DJNZ    U1              ;Repeat for entire string
01180         RET
01190 ;
01200 ;-----------------------------------------------------------------
01210 ;  Model 4 -- CAPS Lock Utility
01220 ;  Calling sequence:  CALL ROUTINE% (N%)
01230 ;               if N% = 0 then turn caps off
01240 ;               if N% = 1 then turn caps on
01250 ;               if N% = 2 then return value of caps
01260 ;                         (-1 = on, 0 = off)
01270 ;-----------------------------------------------------------------
01280         ORG     0F400H
01290         LD      A,@FLAGS        ;Set for @FLAGS SVC
01300         RST     28H             ;FLAGS address to IY
01310         LD      A,(HL)          ;Get LSB of n% value
01320         SUB     1               ;C flag if 0, Z flag if 1
01330         LD      A,(IY+'K'-'A')  ;Get KFLAG$ value
01340         JR      C,RESET         ;Go if reset request
01350         JR      Z,SET           ;Go if set request
01360 ;
01370         BIT     5,A             ;Test current value
01380         LD      A,0             ;Show "off"
01390         JR      Z,C1            ;Go if "off"
01400         DEC     A               ;Else show "on"
01410 C1      LD      (HL),A          ;Load into Basic's variable
01420         INC     HL              ;Point to MSB
01430         LD      (HL),A          ;Set both bytes
01440         RET                     ;And return
01450 ;
01460 RESET   RES     5,A             ;Reset caps bit
01470         JR      C2              ;And go
01480 ;
01490 SET     SET     5,A             ;Set caps bit
01500 C2      LD      (IY+'K'-'A'),A  ;Put value back in flag
01510         RET                     ;And return
01520 ;
01530 ;-----------------------------------------------------------------
01540 ;   Model 4 -- Scroll protect routine
01550 ;      Sets up to 7 lines at the top of the screen to protect
01560 ;        from scrolling.
01570 ;   Calling sequence:  Z% = USR(I%) where I% is number of lines
01580 ;                                     to protect (0 - 7)
01590 ;-----------------------------------------------------------------
01600         ORG     0F500H
01610         LD      C,(HL)          ;Get LSB of argument
01620         LD      B,7             ;Function: Set scroll protect
01630         LD      A,@VDCTL        ;Set up for SVC call
01640         RST     28H             ;Call @VDCTL SVC
01650         RET
01660 ;
01670 ;-----------------------------------------------------------------
01680 ; MODEL 4 -- Simple screen editor
01690 ;-----------------------------------------------------------------
01700         ORG     0F600H
01710 E1      LD      A,@KEY          ;Set up for SVC
01720         RST     28H             ;Wait for a keystroke
01730         JR      NZ,E1           ;Loop back if no key or error
01740         CP      31              ;Was it <Shift><Clear>?
01750         RET     Z               ;Return if yes
01760         CP      26              ;Was it <Shift><Down>?
01770         JR      NZ,E2           ;Go if not
01780         LD      E,A             ;Save character
01790         LD      B,4             ;Function: get cursor
01800         LD      A,@VDCTL        ;Set up for SVC
01810         RST     28H             ;Get cursor posn in HL
01820         LD      A,H             ;Row in A
01830         CP      23              ;Bottom of screen?
01840         LD      A,E             ;Recover character
01850         JR      Z,E1            ;Get next key if at bottom
01860 E2      LD      C,A             ;Else put character in C
01870         LD      A,@DSP          ;Set up for SVC call
01880         RST     28H             ;Display character in C
01890         JR      E1              ;Loop back
01900 ;
01910 ;-----------------------------------------------------------------
01920 ;   Model 4 -- Copy video row into string
01930 ;    Calling sequence: CALL ROUTINE (I%,J%)
01940 ;       I% is varptr of 80-char. string
01950 ;       J% is row on screen
01960 ;-----------------------------------------------------------------
01970         ORG     0F700H
01980         LD      A,(HL)          ;Point HL==> string varptr
01990         INC     HL
02000         LD      H,(HL)          ;MSB in H
02010         LD      L,A             ;LSB in L
02020 ;
02030         LD      B,(HL)          ;String length (80) in B
02040         INC     HL              ;HL==> string address
02050         LD      A,(HL)          ;Point HL==> string
02060         INC     HL
02070         LD      H,(HL)          ;MSB in H
02080         LD      L,A             ;LSB in L
02090         EX      DE,HL           ;HL==> row #
02100         LD      H,(HL)          ;Row # in H
02110         LD      L,0             ;Start in column 0
02120 ;
02130 R1      PUSH    BC              ;Save character count
02140         PUSH    DE              ;And string address
02150         LD      B,1             ;Function: get char. at H/L
02160         LD      A,@VDCTL        ;Set up for SVC call
02170         RST     28H             ;Call @VDCTL
02180         POP     DE              ;Recover string pointer
02190         LD      (DE),A          ;Save character
02200         INC     DE              ;Next position in string
02210         INC     L               ;Next position on screen
02220         POP     BC              ;Recover character count
02230         DJNZ    R1              ;Loop until done
02240         RET
02250 ;
02260         END
```

End

Program Listing 4. Assembly-language source code for Model III subroutines.

```
00010 ;*****************************************************************
00020 ;   MODEL III -- Subroutines for Basic programs
00030 ;*****************************************************************
00040 ;
00050 ;-----------------------------------------------------------------
00060 ;   Model III formatted input routine
00070 ;   Call:  Z = USR(I%) with I% being varptr of
00080 ;                string of proper len+1
00090 ;-----------------------------------------------------------------
00100         ORG     0F100H
00110         CALL    0A7FH           ;Get varptr in HL
```

Listing 4 continued

Listing 4 continued

```
00120         LD      DE,(4020H)      ;Get cursor posn
00130         PUSH    HL              ;Save varptr
00140         PUSH    DE              ;Save cursor
00150         LD      B,(HL)          ;P/u length
00160         DEC     B               ;B = input length
00170         INC     HL              ;HL==>string address
00180         LD      A,(HL)          ;Address to HL
00190         INC     HL
00200         LD      H,(HL)          ;MSB to H
00210         LD      L,A             ;LSB to L
00220         PUSH    BC              ;Save length
00230         LD      A,'.'           ;Field character to A
00240 ;
00250 F1      CALL    0033H           ;Print field character
00260         DJNZ    F1              ;Until field full
00270 ;
00280         POP     BC              ;Recover field length
00290         POP     DE              ;Recover cursor position
00300         LD      (4020H),DE      ;Set cursor position
00310         CALL    0040H           ;Let ROM/DOS handle input
00320         JR      C,BREAK         ;Go on <break>
00330         LD      A,B             ;Input length to A
00340         JR      F2              ;Skip BREAK
00350 BREAK   LD      A,0             ;Set length to 0
00360 F2      POP     HL              ;Recover varptr address
00370         LD      (HL),A          ;Set string length
00380         RET
00390 ;
00400 ;-----------------------------------------------------------------
00410 ;   Model III -- Strip blanks from string
00420 ;   Calling Sequence: Z = USR(I%)
00430 ;                     I% is varptr of string
00440 ;-----------------------------------------------------------------
00450         ORG     0F200H
00460         CALL    0A7FH           ;Varptr address to HL
00470         PUSH    HL              ;Save addr. of varptr
00480         LD      C,(HL)          ;Get length in C
00490         INC     HL              ;HL==> string address
00500         LD      A,(HL)          ;String address to HL
00510         INC     HL
00520         LD      H,(HL)          ;MSB to H
00530         LD      L,A             ;LSB to L
00540         LD      B,0             ;BC = length of string
00550         ADD     HL,BC           ;HL==> end of string +1
00560         DEC     HL              ;HL==> last char in string
00570 ;
00580 S1      LD      A,(HL)          ;Get character
00590         CP      ' '             ;Is it a space?
00600         JR      NZ,S2           ;Go if not
00610         DEC     HL              ;Else move back one posn
00620         DEC     C               ;Decrease char. count
00630         JR      NZ,S1           ;And check again
00640 ;
00650 S2      POP     HL              ;Recover varptr address
00660         LD      (HL),C          ;Set new string length
00670         RET
00680 ;
00690 ;-----------------------------------------------------------------
00700 ;   Model III -- Change all lowercase characters in
00710 ;     string to uppercase
00720 ;   Calling sequence: Z = USR(I%)
00730 ;                     I% is varptr of string
00740 ;-----------------------------------------------------------------
00750         ORG     0F300H
00760         CALL    0A7FH           ;Get varptr address in HL
00770         LD      B,(HL)          ;Get length in B
00780         INC     HL              ;HL==> string address
00790         LD      A,(HL)          ;String address to HL
00800         INC     HL
00810         LD      H,(HL)          ;MSB in H
00820         LD      L,A             ;LSB in L
00830 ;
00840 U1      LD      A,(HL)          ;Get character in A
00850         CP      'a'             ;Less than 'a' ?
00860         JR      C,U2            ;Go if yes
00870         CP      'z'+1           ;Greater than 'z' ?
00880         JR      NC,U2           ;Go if yes
00890         AND     5FH             ;Else make Uppercase
00900         LD      (HL),A          ;And store back in string
00910 ;
00920 U2      INC     HL              ;Point to next character
00930         DJNZ    U1              ;Repeat for entire string
00940         RET
00950 ;
00960 ;-----------------------------------------------------------------
00970 ;  Model III -- Simple screen editor
00980 ;  CALL: Z = USR(0)
00990 ;-----------------------------------------------------------------
01000         ORG     0F600H
01010         LD      A,0EH           ;Cursor-on character
01020 E1      CALL    0033H           ;Print it
01030         CALL    0049H           ;Get a key
01040         CP      31              ;Is it <Clear>?
01050         JR      NZ,E1           ;Loop back if not
01060         RET
01070 ;
01080 ;-----------------------------------------------------------------
01090 ;  Model 4 in Model III Mode -- Swap Video Screens
01100 ;  CALL: Z = USR(n)
01110 ;            page brought into view is determined by
01120 ;             bit 0 of n
01130 ;-----------------------------------------------------------------
01140         ORG     0F700H
01150         CALL    0A7FH           ;Get argument
01160         LD      A,0CH           ;Paging value
01170         OUT     (88H),A         ;Send to CRTC
01180         XOR     A               ;A = 0
01190         RR      L               ;Page to Carry Flag
01200         RRA                     ;A=0 or 80H
01210         OUT     (84H),A         ;Set cursor page
01220         RLA                     ;Page to Carry Flag
01230         RLA                     ;A=0 or 1
01240         RLA                     ;A=0 or 2
01250         RLA                     ;A=0 or 4
01260         OUT     (89H),A         ;Set page
01270         RET
01280 ;
01290         END
```

End

Program Listing 5. Translates machine-language routine to integer values.

```
1  'Translate machine-language routine to integer values.
   Machine-language program must be in memory.
10 A% = &HF100          'Starting address of routine
20 B% = &HF12C          'Last byte used by routine
30 FOR I% = A% TO B%-1 STEP 2:
     V% = CVI(CHR$(PEEK(I%))+CHR$(PEEK(I%+1))):
     PRINT V%;:
   NEXT I%
```

End

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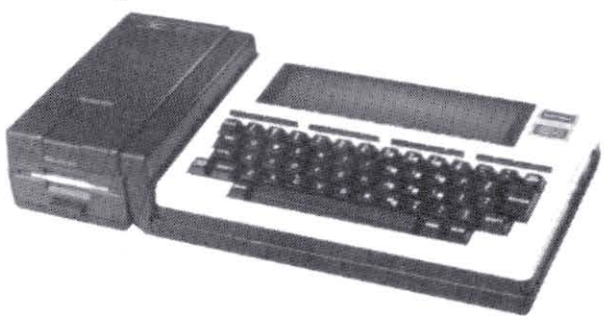

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Listing 1 continued from p. 63

```
910 OO=1:ST=0:EN=6.28:GOSUB 160  :GOTO 880
920 IF FF<>8 THEN 980  ELSE GOSUB 80
930 GOSUB 20
940 IF KE AND 128 THEN 180
950 OO=0:GOSUB 80
960 X0=R:Y0=LR:GOSUB 100  :LR=Y0:R=X0:IF R<=0 THEN R=1
970 OO=1:GOSUB 80   :GOTO 930
980 IF FF<>9 THEN 1100 ELSE 1050
990 GOSUB 20
1000 IF KE AND 128 THEN 180
1010 IF LC=0 THEN ST=0:EN=6.28
1020 IF LC>0 THEN ST=3.14:EN=6.28
1030 IF LC<0 THEN ST=0:EN=3.14
1040 OO=0:GOSUB 160  :X0=CR:Y0=LC:GOSUB 100  :LC=Y0:CR=X0
1050 IF LC=0 THEN ST=0:EN=6.28
1060 IF LC>0 THEN ST=3.14:EN=6.28
1070 IF LC<0 THEN ST=0:EN=3.14
1080 IF CR<1 THEN CR=1
1090 OO=1:GOSUB 160  :GOTO 990
1100 IF FF<>10 THEN 1150 ELSE GOSUB 90
1110 GOSUB 20
1120 IF KE AND 128 THEN 180
1130 OO=0:GOSUB 90   :X0=R:Y0=LR:GOSUB 100  :LR=Y0:R=X0:IF R<=0 TH
EN R=1
1140 OO=1:GOSUB 90   :GOTO 1110
1150 IF FF<>11 THEN 1200 ELSE OO=1:ST=0:EN=6.28:GOSUB 150
1160 GOSUB 20
1170 IF KE AND 128 THEN 180
1180 OO=0:ST=0:EN=6.28:GOSUB 150  :X0=LC:Y0=CR:GOSUB 100  :LC=X0:C
R=Y0:IF CR<1 THEN CR=1
1190 OO=1:ST=0:EN=6.28:GOSUB 150  :GOTO 1160
1200 IF FF<>13 THEN 1320 ELSE 1270
1210 GOSUB 20
1220 IF KE AND 128 THEN 180
1230 IF LC=0 THEN ST=0:EN=6.28
1240 IF LC>0 THEN ST=4.71:EN=1.57
1250 IF LC<0 THEN ST=1.57:EN=4.71
1260 OO=0:GOSUB 150  :X0=LC:Y0=CR:GOSUB 100  :CR=Y0:LC=X0
1270 IF LC=0 THEN ST=0:EN=6.28
1280 IF LC>0 THEN ST=4.71:EN=1.57
1290 IF LC<0 THEN ST=1.57:EN=4.71
1300 IF CR<1 THEN CR=1
1310 OO=1:GOSUB 150  :GOTO 1210
1320 IF FF=12 THEN RL$="R" :GOTO 1340 :ELSE IF FF=14 THEN RL$="L":
GOTO 1340
1330 IF FF<>12 OR FF<>14 THEN 1390
1340 GOSUB 60
1350 GOSUB 20
1360 IF KE AND 128 THEN 180
1370 OO=0:GOSUB 60   :X0=LR:Y0=R:GOSUB 100  :LR=X0:R=Y0:IF R<1 THE
N R=1
1380 OO=1:GOSUB 60   :GOTO 1350
1390 IF FF<>19 THEN 1430  ELSE IF Y1>9 AND X1<540 AND Y1<210 THEN
XB=120:YB=60:PUT(X1,Y1-7),SC,XOR:OO=1:GOSUB 70   ELSE 180
1400 GOSUB 20
1410 IF KE AND 128 AND XB*YB<=7600 AND X1+XB<567 AND Y1+YB<219 THE
N PUT(X1,Y1-7),SC,XOR:OO=0:GOSUB 70   :GET(X1,Y1)-(X1+XB,Y1+YB),GB
:GOTO 180
1420 OO=0:GOSUB 70   :X0=XB:Y0=YB:GOSUB 100  :XB=X0:YB=Y0:OO=1:GOS
UB 70   :GOTO 1400
1430 IF FF<>20 THEN 1450  ELSE GOSUB 1930 :IF CF=1 THEN 1440  ELSE
 PUT(X1,Y1),GB,PSET
1440 GOTO 180
1450 IF FF<>21 THEN 1470  ELSE GOSUB 1930 :IF CF=1 THEN 1460  ELSE
 PUT(X1,Y1),GB,PRESET
1460 GOTO 180
1470 IF FF<>22 THEN 1490  ELSE GOSUB 1930 :IF CF=1 THEN 1480  ELSE
 PUT(X1,Y1),GB,AND
1480 GOTO 180
1490 IF FF<>23 THEN 1510  ELSE GOSUB 1930 :IF CF=1 THEN 1500  ELSE
 PUT(X1,Y1),GB,OR
1500 GOTO 180
1510 IF FF<>24 THEN 1530  ELSE GOSUB 1930 :IF CF=1 THEN 1520  ELSE
 PUT(X1,Y1),GB,XOR
1520 GOTO 180
1530 IF FF<>27 THEN 1620  ELSE POKE 120,135:GOSUB 1970 :CLS:SCREEN
 1:PRINT "CONFIGURATION":PRINT:PRINT TAB(5);"1) CURSOR":PRINT:PRIN
T TAB(5);"2) 'GPRINT'":PRINT:PRINT TAB(5);"3) 'GPRT2'":PRINT
1540 PRINT TAB(5);"4) 'GPRT3'":PRINT:PRINT TAB(5);"5) RETURN":PRIN
T
1550 INPUT "TYPE 1-5 ";MC:IF MC<1 OR MC>5 THEN 1550
1560 CLS:ON MC GOTO 1570 ,1580 ,1590 ,1600 ,1610
1570 INPUT "TYPE 1-20 ";CA:IF CA<1 OR CA>20 THEN 1570  ELSE 1610
1580 PR$="GPRINT":GOTO 1610
1590 PR$="GPRT2":GOTO 1610
1600 PR$="GPRT3":GOTO 1610
1610 POKE 120,134:SCREEN 0:GOTO 180
1620 IF FF<>26 THEN 1770  ELSE POKE 120,135:GOSUB 1970 :GD=0
1630 IF X1<=6 OR X1>=567 OR Y1>=214 OR Y1<=16 THEN KE$=CHR$(13):GO
TO 1710
1640 KE$=INKEY$:IF KE$="" THEN 1640
1650 IF KE$=CHR$(8) OR KE$=CHR$(9) OR KE$=CHR$(10) OR KE$=CHR$(11)
 THEN VIEW(1,181)-(29,194):CLR
1660 VIEW(0,0)-(639,239):IF KE$=CHR$(8) THEN GD=2:X1=X1+8:PUT(12,1
85),CW,PSET
1670 IF KE$=CHR$(9) THEN GD=0:X1=X1-8:PUT(12,185),CE,PSET
1680 IF KE$=CHR$(10) THEN GD=1:Y1=Y1-8:PUT(15,185),CS,PSET
1690 IF KE$=CHR$(11) OR KE$=CHR$(91) THEN GD=3:Y1=Y1+8:PUT(15,185)
,CN,PSET
1700 VIEW(61,1)-(638,219)
1710 IF KE$=CHR$(13) THEN POKE 120,134:VIEW(0,0)-(639,239):PUT(1,1
80),CO,PSET:GOTO 180
1720 IF GD=2 THEN X1=X1-8:IF X1<=6 THEN KE$=CHR$(13):GOTO 1710
1730 IF GD=0 THEN X1=X1+8:IF X1>=567 THEN KE$=CHR$(13):GOTO 1710
1740 IF GD=1 THEN Y1=Y1+8:IF Y1>=214 THEN KE$=CHR$(13):GOTO 1710
1750 IF GD=3 THEN Y1=Y1-8:IF Y1<=16 THEN KE$=CHR$(13):GOTO 1710
1760 GLOCATE(X1,Y1),GD:PRINT#-3,KE$:GOTO 1640
1770 IF FF<>28 THEN 1790  ELSE POKE 120,135:GOSUB 1970 :PUT(X1,Y1)
,CU,XOR:VIEW(0,0)-(639,239):CLS:SCREEN 1:INPUT "READY PRINTER & PR
ESS 'ENTER'";ZZ$:GOSUB 1990 :IF PEEK(120)=135 THEN SYSTEM PR$ ELSE
 CMD"I",PR$
1780 RC=1:GOSUB 2340 :RC=0:SCREEN 0:POKE 120,134:GOTO 180
1790 IF FF<>29 THEN 1810  ELSE POKE 120,135:GOSUB 1970 :VIEW(0,0)-
(639,239):CLS:SCREEN 1:INPUT "ENTER FILENAME ";FI$:GOSUB 1990 :FI$
="GSAVE "+FI$: IF PEEK(120)=135 THEN SYSTEM FI$ ELSE CMD"I",FI$
1800 RC=1:GOSUB 2340 :RC=0:SCREEN 0:POKE 120,134:GOTO 180
1810 IF FF<>30 THEN 1830  ELSE IF PEEK(120)<>134 THEN 180
1820 PUT(X1,Y1),CU,XOR:VIEW(0,0)-(639,239):CLS:POKE 120,135:GOSUB
```

Listing 1 continued

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Listing 1 continued

```
1970 :SCREEN 1:SYSTEM "DIR /$R":PRINT:PRINT:INPUT "ENTER FILENAME
  ";FI$:FI$="GLOAD "+FI$:SYSTEM FI$:RC=1:GOSUB 2340 :RC=0:SCREEN 0:
POKE 120,134:GOTO 180
1830 IF FF<>31 THEN 1840  ELSE VIEW(0,0)-(639,239):POKE 120,135:SC
REEN 1:CLS:IF PEEK(120)=135 THEN SYSTEM ELSE CMD"S"
1840 IF FF<>32 THEN 180  ELSE VIEW(70,1)-(638,219):CLR:VIEW(0,0)-(
639,239):GOTO 180
1850 T$(2)=CHR$(255):T$(3)=CHR$(65)+CHR$(34)+CHR$(20)+CHR$(8)+CHR$
(20)+CHR$(34)+CHR$(65)+CHR$(0):T$(4)=CHR$(255)+CHR$(255)+CHR$(0)+C
HR$(0):T$(5)=CHR$(3)+CHR$(12)+CHR$(48)+CHR$(192):T$(6)=CHR$(48)+CH
R$(12)+CHR$(3):T$(7)=CHR$(204)
1860 T$(8)=CHR$(153)+CHR$(102):T$(9)=CHR$(240):T$(10)=CHR$(146)+CH
R$(146)+CHR$(255):T$(11)=CHR$(85)+CHR$(170):T$(12)=CHR$(255)+CHR$(
255)+CHR$(219)+CHR$(219):T$(13)=CHR$(192)+CHR$(48)+CHR$(12)+CHR$(3
):T$(14)=CHR$(129)+CHR$(0)+CHR$(0)
1870 T$(15)=CHR$(60)+CHR$(60)+CHR$(255)+CHR$(255):T$(16)=CHR$(255)
+CHR$(0):T$(17)=CHR$(255)+CHR$(32)+CHR$(32)+CHR$(32)+CHR$(32):RETU
RN
1880 IF X1>=567 THEN X1=567
1890 IF X1<=0 THEN X1=1
1900 IF Y1<=1 THEN Y1=1
1910 IF Y1>=215 THEN Y1=215
1920 RETURN
1930 CF=0
1940 IF X1+XB>567 THEN CF=1
1950 IF Y1+YB>219 THEN CF=1
1960 RETURN
1970 FOR K=1 TO 100:ZZ$=INKEY$:NEXT:RETURN
1980 IF TF$="D" THEN Y1=Y1+8:GLOCATE(X1,Y1),1
1990 VIEW(0,0)-(68,239):CLR:VIEW(68,221)-(639,239):CLR:VIEW(0,0)-(
639,239):RETURN
2000 IF PF=1 THEN 2030
2010 FOR K=2 TO 17:IF PF=K THEN PAINT(X1,Y1),T$(K),1
2020 NEXT
2030 RETURN
2040 IF PF=1 THEN GLOCATE(80,229),0:PRINT#-3,"EXIT" ELSE IF PF=2 T
HEN PUT(70,225),T2,PSET:PUT(94,225),T2,PSET ELSE IF PF=3 THEN PUT(
70,225),T3,PSET:PUT(94,225),T3,PSET
2050 IF PF=4 THEN PUT(70,225),T4,PSET:PUT(94,225),T4,PSET ELSE IF
PF=5 THEN PUT(70,225),T5,PSET:PUT(94,225),T5,PSET ELSE IF PF=6 THE
N PUT(70,225),T6,PSET:PUT(94,225),T6,PSET
2060 IF PF=7 THEN PUT(70,225),T7,PSET:PUT(94,225),T7,PSET ELSE IF
PF=8 THEN PUT(70,225),T8,PSET:PUT(94,225),T8,PSET ELSE IF PF=9 THE
N PUT(70,225),T9,PSET:PUT(94,225),T9,PSET
2070 IF PF=10 THEN PUT(70,225),T0,PSET:PUT(94,225),T0,PSET ELSE IF
 PF=11 THEN PUT(70,225),TT,PSET:PUT(94,225),TT,PSET ELSE IF PF=12
THEN PUT(70,225),TU,PSET:PUT(94,225),TU,PSET
2080 IF PF=13 THEN PUT(70,225),TV,PSET:PUT(94,225),TV,PSET ELSE IF
 PF=14 THEN PUT(70,225),TW,PSET:PUT(94,225),TW,PSET ELSE IF PF=15
THEN PUT(70,225),TX,PSET:PUT(94,225),TX,PSET
2090 IF PF=16 THEN PUT(70,225),TY,PSET:PUT(94,225),TY,PSET ELSE IF
 PF=17 THEN PUT(70,225),TZ,PSET:PUT(94,225),TZ,PSET
2100 RETURN
2110 DIM T2(15),T3(15),T4(15),T5(15),T6(15),T7(15),T8(15),T9(15),T
0(15),TT(15),TU(15),TV(15),TW(15),TX(15),TY(15),TZ(15)
2120 K=0:FOR X0=135 TO 615 STEP 30:K=K+1:IF K=1 THEN GLOCATE(136,2
29),0:PRINT#-3,"EX":GOTO 2130  ELSE PAINT(X0,230),T$(K),1
2130 NEXT:IF RC=1 THEN RETURN
2140 GET(160,225)-(185,239),T2:GET(190,225)-(215,239),T3:GET(220,2
25)-(245,239),T4:GET(250,225)-(275,239),T5:GET(280,225)-(305,239),
T6:GET(310,225)-(335,239),T7:GET(340,225)-(365,239),T8:GET(370,225
)-(395,239),T9:GET(400,225)-(425,239),T0
2150 GET(430,225)-(455,239),TT:GET(460,225)-(485,239),TU:GET(490,2
25)-(515,239),TV:GET(520,225)-(545,239),TW:GET(550,225)-(575,239),
TX:GET(580,225)-(605,239),TY:GET(610,225)-(635,239),TZ:RETURN
2160 IF FF=1 THEN PUT(1,1),DR,PSET ELSE IF FF=13 THEN PUT(1,91),C4
,PSET ELSE IF FF=11 THEN PUT(1,76),C3,PSET ELSE IF FF=9 THEN PUT(1
,61),C2,PSET ELSE IF FF=3 THEN PUT(1,16),TR,PSET ELSE IF FF=4 THEN
 PUT(31,16),BO,PSET
2170 IF FF=2 THEN PUT(31,1),LI,PSET ELSE IF FF=5 THEN PUT(1,31),CI
,PSET ELSE IF FF=6 THEN PUT(31,31),PO,PSET ELSE IF FF=8 THEN PUT(3
1,46),YU,PSET ELSE IF FF=10 THEN PUT(31,61),YD,PSET ELSE IF FF=7 T
HEN PUT(1,46),C1,PSET
2180 IF FF=14 THEN PUT(31,91),CL,PSET ELSE IF FF=12 THEN PUT(31,76
),CR,PSET ELSE IF FF=19 THEN PUT(1,136),SC,PSET ELSE IF FF=20 THEN
 PUT(31,135),PP,PSET ELSE IF FF=21 THEN PUT(1,150),IN,PSET
2190 IF FF=22 THEN PUT(31,150),AN,PSET ELSE IF FF=23 THEN PUT(1,16
5),RO,PSET ELSE IF FF=24 THEN PUT(31,165),XO,PSET ELSE IF FF=25 TH
EN PUT(1,180),CO,PSET ELSE IF FF=26 THEN PUT(31,180),AB,PSET ELSE
IF FF=27 THEN PUT(1,195),BP,PSET
2200 IF FF=28 THEN PUT(31,195),PR,PSET ELSE IF FF=29 THEN PUT(1,21
0),SD,PSET ELSE IF FF=30 THEN PUT(31,210),LD,PSET ELSE IF FF=31 TH
EN PUT(1,225),TC,PSET ELSE IF FF=32 THEN PUT(31,225),GC,PSET
2210 RETURN
2220 IF FF=1 THEN PUT(1,1),DR,PRESET ELSE IF FF=13 THEN PUT(1,91),
C4,PRESET ELSE IF FF=11 THEN PUT(1,76),C3,PRESET ELSE IF FF=9 THEN
 PUT(1,61),C2,PRESET ELSE IF FF=3 THEN PUT(1,16),TR,PRESET ELSE IF
 FF=4 THEN PUT(31,16),BO,PRESET
2230 IF FF=2 THEN PUT(31,1),LI,PRESET ELSE IF FF=5 THEN PUT(1,31),
CI,PRESET ELSE IF FF=6 THEN PUT(31,31),PO,PRESET ELSE IF FF=8 THEN
 PUT(31,46),YU,PRESET ELSE IF FF=10 THEN PUT(31,61),YD,PRESET ELSE
 IF FF=7 THEN PUT(1,46),C1,PRESET
2240 IF FF=14 THEN PUT(31,91),CL,PRESET ELSE IF FF=12 THEN PUT(31,
76),CR,PRESET ELSE IF FF=19 THEN PUT(1,136),SC,PRESET ELSE IF FF=2
0 THEN PUT(31,135),PP,PRESET ELSE IF FF=21 THEN PUT(1,150),IN,PRES
ET ELSE IF FF=22 THEN PUT(31,150),AN,PRESET
2250 IF FF=23 THEN PUT(1,165),RO,PRESET ELSE IF FF=24 THEN PUT(31,
165),XO,PRESET ELSE IF FF=25 THEN PUT(1,180),CO,PRESET ELSE IF FF=
26 THEN PUT(31,180),AB,PRESET ELSE IF FF=27 THEN PUT(1,195),BP,PRE
SET ELSE IF FF=28 THEN PUT(31,195),PR,PRESET
2260 IF FF=29 THEN PUT(1,210),SD,PRESET ELSE IF FF=30 THEN PUT(31,
210),LD,PRESET ELSE IF FF=31 THEN PUT(1,225),TC,PRESET ELSE IF FF=
32 THEN PUT(30,225),GC,PRESET
2270 RETURN
2280 DIM CU(3),IC(5),PC(6),DC(6),CE(3),CW(3),CN(3),CS(3),E1(6),E2(
6),DR(14),LI(14),BO(14),CI(14),TR(14),PO(14),CR(14),CL(14),TC(14),
GC(14),SD(15),LD(15),BP(15),PR(15),AB(15),SC(15),PP(15),IN(15),RO(
15),XO(15),AN(15),CO(15),YU(15),YD(15)
2290 DIM C1(15),C2(15),C3(15),C4(15)
2300 GOSUB 1990 :LINE(0,0)-(10,0):LINE(10,0)-(10,5):LINE(0,5)-(5,3
):LINE(0,0)-(10,5):PAINT(3,1),1,1:GET(0,0)-(10,5),CU:PUT(2,6),CU,P
RESET:LINE(1,5)-(12,11),,B:GET(1,5)-(12,11),IC
2310 LINE(1,19)-(6,24),,BF:LINE(3,18)-(4,18):LINE(4,18)-(15,18),,,
&HCCCC:LINE(4,18)-(17,21),,,&HCCCC:PSET(17,18):GET(1,18)-(17,24),P
C:GOSUB 1990 :LINE(0,27)-(10,27):LINE(10,27)-(8,25):LINE(10,27)-(8
,29):GET(0,25)-(10,29),CE:GET(38,2)-(51,11),E2
2320 LINE(0,32)-(10,32):LINE(0,32)-(2,30):LINE(0,32)-(2,34):GET(0,
30)-(10,34),CW:LINE(2,40)-(2,45):LINE(2,40)-(0,42):LINE(2,40)-(4,4
```

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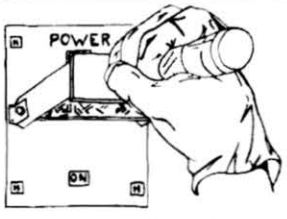

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Tidbit #27

Here is a Model 4 Basic sort routine (lines 1100–1540) that I find useful for printing out information from large data bases. The remark statements contain the data statements' source code.

Lines 10–70 demonstrates how to use the sort routine; "file name" represents an existing disk file.

First, GOSUB the sort routine to install the machine-language sort. Dimension an array with one more element than the number of records you want to sort and define the last element as " ". Load the array with character strings long enough for a satisfactory sort (e.g., 10 characters for a last name), and concatenate the string with MKI$(R), where "R" is the record number from which you get the data.

To invoke the sort, use the command CALL SORT(A$(S)), where A$ is the array you want sorted and S is the location within the array where the sort begins. When the sort is done, use CVI to get the records in sorted order from the disk file.

Edward F. De Mers
El Cajon, CA

```
10 GOSUB 1110
20 DIM A$(16) : A$(16)=""
30 OPEN "R",1,"filename":FIELD 1, 15 AS X$, 10 AS Y$
40 FOR R=1 TO 15: GET 1, R:A$(1)=LEFT$(X$,10)+MKI$(R): NEXT R
50 CALL SORT(A$(1))   :REM call sort routine
60 FOR K=1 TO 15:G=CVI(RIGHT$(A$(K),2):GET 1,G:PRINT X$, Y$:NEXT K
70 CLOSE: END
1110 SZ=82:D$=STR$(SZ,0):DIM E(SZ):F=VARPTR(D$)
1120 FOR X=0 TO SZ-1:READ E(X):NEXT X
1130 LS=256*PEEK(K+2)+PEEK(K+1):IF LS>32767 THEN LS=LS-65536:SORT=LS
1140 FOR X=0 TO SZ-1:POKE LS+X,E(X):NEXT X:RETURN
1150 DATA       &HE5          :REM BEGIN      PUSH    HL      Pointer Array
1160 DATA       &HFD,&HE1     :REM            POP     IY      Stored here
1170 DATA       &HFD,&HE5     :REM AGIN       PUSH    IY      Recover Start
1180 DATA       &HDD,&HE1     :REM            POP     IX      Working pointer
1190 DATA       &H0E,0        :REM            LD      C,0     Clear Exch Flag
1200 DATA       &HDD,&H7E,3   :REM NEXT       LD      A,(IX+3) Element Length
1210 DATA       &HB7          :REM            OR      A       Set Flags
1220 DATA       &H28,&H3E     :REM            JR      Z,LSTLN Last Element
1230 DATA       &HD6,2        :REM            SUB     2       Cut off 2 bytes
1240 DATA       &H47          :REM            LD      B,A     Set elem.length
1250 DATA       &HDD,&H6E,1   :REM            LD      L,(IX+1) Addr 1st string
1260 DATA       &HDD,&H66,2   :REM            LD      H,(IX+2)
1270 DATA       &HDD,&H5E,4   :REM            LD      E,(IX+4) Addr nxt string
1280 DATA       &HDD,&H56,5   :REM            LD      D,(IX+5)
1290 DATA       &H1A          :REM LOOP       LD      A,(DE)  Byte to reg A
1300 DATA       &HBE          :REM            CP      (HL)    Comp. set flags
1310 DATA       &H28,4        :REM            JR      Z,EQAL  Jump on equal
1320 DATA       &H30,6        :REM            JR      NC,NOSWP Already order
1330 DATA       &H38,12       :REM            JR      C,SWAP  Exchange elem.
1340 DATA       &H23          :REM EQAL       INC     HL      Point next byte
1350 DATA       &H13          :REM            INC     DE      in strings
1360 DATA       &H10,&HF4     :REM            DJNZ    LOOP    Comp next byte
1370 DATA       &HDD,&H23     :REM NOSWP      INC     IX      Add three to
1380 DATA       &HDD,&H23     :REM            INC     IX      pointer
1390 DATA       &HDD,&H23     :REM            INC     IX
1400 DATA       &H18,&HD7     :REM            JR      NEXT    Do next pair
1410 DATA       &H48          :REM SWAP       LD      C,B     Set exch flag
1420 DATA       &HDD,&H66,2   :REM            LD      H,(IX+2)
1430 DATA       &HDD,&H6E,1   :REM            LD      L,(IX+1) Exchange
1440 DATA       &HDD,&H56,5   :REM            LD      D,(IX+5) pointers
1450 DATA       &HDD,&H5E,4   :REM            LD      E,(IX+4) to the
1460 DATA       &HDD,&H72,2   :REM            LD      (IX+2),D string
1470 DATA       &HDD,&H73,1   :REM            LD      (IX+1),E data
1480 DATA       &HDD,&H74,5   :REM            LD      (IX+5),H
1490 DATA       &HDD,&H75,4   :REM            LD      (IX+4),L
1500 DATA       &H18,&HDD     :REM            JR      NOSWP   Do next pair
1510 DATA       &H79          :REM LSTLN      LD      A,C     Get exch flag
1520 DATA       &HB7          :REM            OR      A       Jiggle flags
1530 DATA       &HC8          :REM            RET     Z       If 0 all done
1540 DATA       &H18,&HB1     :REM            JR      AGIN    Run thru array
```

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```
2):GET(0,40)-(4,45),CN:LINE(2,50)-(2,55):LINE(2,55)-(0,53):LINE(2,
55)-(4,53):GET(0,50)-(4,55),CS
2330 PUT(6,0),CN,OR:PUT(5,3),CE,OR:PUT(6,5),CS,OR:PUT(0,3),CW,OR:G
ET(0,0)-(15,10),DC:GOSUB 1990
2340 LINE(0,0)-(59,239),,B:LINE(30,0)-(30,239):X1=1:X2=59:FOR Y=15
 TO 230 STEP 15:LINE(X1,Y)-(X2,Y):NEXT:LINE(69,225)-(120,239),,B:L
INE(129,225)-(639,239),,B:Y1=225:Y2=239:FOR X=159 TO 639 STEP 30:L
INE(X,Y1)-(X,Y2):NEXT
2350 VIEW(0,106)-(59,134):CLR:VIEW(0,0)-(639,239):LINE(69,0)-(639,
220),,B:IF RC=1 THEN GOSUB 2120  ELSE GOSUB 2110
2360 LINE(4,13)-(26,2):LINE(38,2)-(48,10),,B:LINE(51,3)-(51,11):LI
NE(40,11)-(51,11):LINE(48,2)-(51,3):LINE(38,10)-(40,11):LINE(5,27)
-(16,16):LINE-(27,27):LINE-(5,27):LINE(34,18)-(48,27),,B:LINE(38,2
0)-(53,23),,B
2370 CIRCLE(16,37),11:CIRCLE(16,37),12,,,,.17:CIRCLE(16,37),6,,,,2
:LINE(35,38)-(39,34):LINE(35,38)-(39,42):LINE(55,38)-(51,34):LINE(
55,38)-(51,42):LINE(39,34)-(51,34):LINE(39,42)-(51,42):X1=15:Y1=47
:OO=1:CR=6:LC=9:ST=0:EN=6.28:GOSUB 160
2380 X1=45:Y1=49:LR=7:R=6:OO=1:GOSUB 80   :X1=15:Y1=62:OO=1:CR=6:L
C=9:ST=3.14:EN=6.28:GOSUB 160  :X1=45:Y1=64:LR=7:R=6:OO=1:GOSUB 90
   :X1=5:Y1=82:OO=1:CR=5:LC=15:ST=0:EN=6.28:GOSUB 150  :RL$="R":OO
=1:R=5:LR=10:X1=40:Y1=82:GOSUB 60
2390 X1=5:Y1=97:OO=1:CR=5:LC=15:ST=4.71:EN=1.57:GOSUB 150  :RL$="L
":OO=1:R=5:LR=10:X1=40:Y1=97:GOSUB 60
2400 LINE(5,140)-(25,147):LINE(5,145)-(25,138):CIRCLE(5,139),3:CIR
CLE(5,146),3:GLOCATE(41,141),0:PRINT#-3,"p":LINE(39,140)-(51,147),
,B:LINE(46,137)-(46,140):LINE(43,139)-(48,139):LINE(44,138)-(47,13
8)
2410 GLOCATE(11,157),0:PRINT#-3,"i":LINE(9,155)-(21,162),,B:LINE(1
6,152)-(16,155):LINE(13,154)-(18,154):LINE(14,153)-(17,153):LINE(9
,163)-(21,163),0:GLOCATE(41,155),0:PRINT#-3,"a":LINE(39,155)-(51,1
62),,B:LINE(46,152)-(46,155)
2420 LINE(43,154)-(48,154):LINE(44,153)-(47,153):GLOCATE(11,170),0
:PRINT#-3,"o":LINE(9,170)-(21,177),,B:LINE(16,167)-(16,170):LINE(1
3,169)-(18,169):LINE(14,168)-(17,168)
2430 GLOCATE(41,170),0:PRINT#-3,"x":LINE(39,170)-(51,177),,B:LINE(
46,167)-(46,170):LINE(43,169)-(48,169):LINE(44,168)-(47,168):PUT(8
,182),DC,PSET
2440 GLOCATE(41,180),0:PRINT#-3,"a":GLOCATE(36,187),0:PRINT#-3,"b"
:GLOCATE(45,187),0:PRINT#-3,"c":LINE(31,180)-(59,180):GLOCATE(3,19
5),0:PRINT#-3,"con":LINE(1,195)-(30,195):GLOCATE(3,202),0:PRINT#-3
,"fig"
2450 LINE(35,200)-(55,207),,B:LINE(51,202)-(53,205),,B:LINE(38,197
)-(47,203),,B:PAINT(39,198),1,1:PAINT(46,202),1,1:GLOCATE(12,212),
0:PRINT#-3,"s":LINE(5,213)-(25,222),,B:LINE(15,219)-(15,222),,B:LI
NE(24,216)-(25,217),,B
2460 GLOCATE(42,212),0:PRINT#-3,"L":LINE(35,213)-(55,222),,B:LINE(
45,219)-(45,222),,B:LINE(35,212)-(55,212),0:LINE(54,216)-(55,217),
,B:GLOCATE(12,227),0:PRINT#-3,"T":GLOCATE(12,231),0:PRINT#-3,"c":L
INE(2,239)-(9,232):LINE(2,225)-(9,232)
2470 LINE(29,224)-(22,231):LINE(29,239)-(22,232):CIRCLE(45,228),5,
,,,.1:LINE(40,229)-(50,237),,B:PAINT(45,230),CHR$(17),1:RETURN
2480 GET(1,1)-(29,14),DR:GET(31,1)-(59,14),LI:GET(38,2)-(51,11),E1
:GET(1,16)-(29,29),TR:GET(31,16)-(59,29),BO:GET(1,31)-(29,44),CI:G
ET(31,31)-(59,44),PO:GET(1,46)-(29,59),C1:GET(1,61)-(29,74),C2:GET
(31,46)-(59,59),YU:GET(31,61)-(59,74),YD
2490 GET(1,76)-(29,89),C3:GET(31,76)-(59,89),CR:GET(1,91)-(29,104)
,C4:GET(31,91)-(59,104),CL:GET(1,136)-(29,149),SC:GET(31,135)-(59,
149),PP:GET(1,150)-(31,164),IN:GET(31,150)-(59,164),AN:GET(1,165)-
(31,179),RO:GET(31,165)-(59,179),XO
2500 GET(1,180)-(31,194),CO:GET(31,180)-(59,194),AB:GET(1,195)-(29
,209),BP:GET(31,195)-(59,209),PR:GET(1,210)-(29,224),SD:GET(31,210
)-(59,224),LD:GET(1,225)-(29,238),TC:GET(31,225)-(59,238),GC:SCREE
N 0:RETURN
2510 IF PEEK(120)=135 OR PEEK(120)=134 THEN CLEAR,-3073:POKE 120,1
34:KP=&HF440:ELSE KP=14400
2520 GF=1:CLS:PRINT "INITIALIZING . . . please wait":GOTO 10
```

End

Program Listing 2. Screen grid generator.

```
10 'SCRNGRID/BAS
20 'A full line grid for screen incremented 10 pixels on x,y coord
inates for laying out screen graphics
30 CLR:SCREEN0:IC=10:X=0:Y=0
40 'Y axis lines
50 LINE(X,Y)-(640,Y)
60 Y=Y+IC:IFY=260THEN90
70 GOTO50
80 ' X axis lines
90 LINE(0,239)-(639,239):X=0:Y=0
100 LINE(X,Y)-(X,240)
110 X=X+10:IFX=660THEN130
120 GOTO100
130 LINE(639,0)-(639,240)
140 IFINKEY$=""THEN140
```

End

Program Listing 3. Hexagon design.

```
110 ' HEXTRI/BAS
130 CLR:CLS:SCREEN0
140 'OUTSIDE PERIMETER
150 LINE(140,110)-(220,40)  'AO
160 LINE-(400,40)  'BO
170 LINE-(480,120)  'CO
180 LINE-(400,195)  'DO
190 LINE-(220,195)  'EO
200 LINE-(140,110)  'FO
210 'LINES TO HUB
220 LINE(220,40)-(310,120) 'H1 (C=CENTER-310,120)
230 LINE(480,120)-(310,120) 'H3
240 LINE(220,195)-(310,120) 'H6
250 'TURNS OUTSIDE PERIMETER INTO BARS
260 LINE(163,110)-(220,60) 'AM1
270 LINE(185,110)-(230,70) 'A1
280 LINE(260,55)-(390,55) 'BM1
290 LINE(270,65)-(365,65) 'B1
300 LINE(390,55)-(450,110) 'CM1
310 LINE(380,70)-(425,110) 'C1
320 LINE(445,130)-(380,185) 'DM1
330 LINE(420,130)-(380,165) 'D1
340 LINE(380,185)-(260,185) 'EM1
350 LINE(367,175)-(270,175) 'E1
360 LINE(220,175)-(163,110) 'FM1
```

Listing 3 continued

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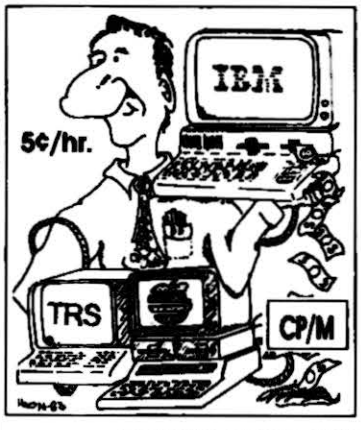

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Listing 3 continued

```
370 LINE(235,165)-(195,120) 'F1
380 'INSIDE LINES THAT DO NOT GO TO HUB
390 LINE(163,110)-(297,110) 'P1 TOP
400 LINE(195,120)-(310,120) 'P1 MID
410 LINE(205,130)-(297,130) 'P1 BOT
420 LINE(220,60)-(270,110) 'P2L
430 LINE(365,65)-(310,120) 'H2
440 LINE(260,55)-(308,100) 'H1R
450 LINE(340,65)-(297,110) 'H2L
460 LINE(390,55)-(335,120) 'H2R
470 LINE(450,110)-(343,110) 'H3T
480 LINE(220,175)-(275,130)  'H5L
490 LINE(380,185)-(297,130) 'H4L
500 LINE(380,165)-(310,120) 'H4
510 LINE(335,120)-(390,155) 'H4R
520 LINE(445,130)-(349,130) 'H3BOT
530 LINE(314,139)-(260,185) 'H5R
540 'PAINT
550 PAINT(142,110),CHR$(&H03)+CHR$(&H05),1 'LEFT OUTSIDE
560 PAINT(230,42),CHR$(&HAE),1  'RIGHT OUTSIDE
570 PAINT(398,193),CHR$(&H05),1 'RIGHT BOTTOM OUTSIDE
580 PAINT(310,122),CHR$(&HAA),1  'BOTTOM INSIDE L
590 PAINT(313,118),CHR$(&HAA),1 'TOP L
600 PAINT(307,118),CHR$(&HAA),1 'LEFT L
610 PAINT(170,105),CHR$(&H0A)+CHR$(&HA0),1 'TOP SHORT
620 PAINT(387,70),CHR$(&H0A)+CHR$(&HA0),1 'RIGHT TOP SHORT
630 PAINT(270,180),CHR$(&H0A)+CHR$(&HA0),1 'BOTTOM SHORT
640 PAINT(209,127),CHR$(&H0F)+CHR$(&HF0),1 'IS1
650 PAINT(380,160),CHR$(&H0F)+CHR$(&HF0),1 'IS2
660 PAINT(345,70),CHR$(&H0F)+CHR$(&HF0),1 'IS3
670 IFINKEY$=""THEN670
680 SCREEN1
690 CLS
```

End

Program Listing 4. Computer design.

```
5 'COMPUTER/BAS
10 CLR:SCREEN0
20 LINE(60,30)-(450,30)
30 LINE-(450,160)
40 LINE-(60,160)
50 LINE-(60,30)
60 ' OUTER PROFILE
62 CIRCLE(55,25),20,,1.57,3.14 'UPPERLSF CORNER
64 CIRCLE(590,25),20,,0,1.57
70 LINE(50,15)-(595,15) 'TOP LINE
80 LINE(610,25)-(610,180)
90 LINE-(635,220)
100 LINE-(635,230)
110 LINE-(10,230)
120 LINE-(10,220)
130 LINE-(35,180)
140 LINE-(35,25)  'LSF SIDE LINE
150 'DISK DRIVES (TOP)
160 LINE(460,40)-(590,40)
170 LINE-(590,85)
180 LINE(460,85)-(590,85)
190 LINE(460,85)-(460,40)
200 LINE-(460,40)
210 'BOTTOM DRIVE
220 LINE(460,106)-(590,106)
230 LINE-(590,150)
240 LINE-(460,150)
250 LINE-(460,106)
260 LINE(590,90)-(590,100) 'LINE TO RIGHT OF LOG0
270 LINE-(460,100)  'LINE UNDER LOGO
280 LINE-(460,90) 'LINE TO LEFT OF LOGO
290 LINE-(590,90)
300 GLOCATE(462,92),0
310 PRINT0-3," TRS-80 MOD III"
320 LINE(590,126)-(460,129),,BF 'BOTTOM DR BAR
330 LINE(515,129)-(535,137),,BF
340 LINE(515,116)-(535,126),,B
350 LINE(590,63)-(460,66),,BF 'TOP DR BAR
360 LINE(515,66)-(535,74),,BF
370 LINE(515,53)-(535,66),,B
380 GLOCATE(560,140),0:PRINT0-3,"0"
390 CIRCLE(490,73),4
400 GLOCATE(560,76),0:PRINT0-3,"1"
410 CIRCLE(490,136),4:PAINT(490,136),CHR$(&HFF),1
420 'KEYS
430 Y=180
440 FORR=1TO4
450 FORX=60 TO 450 STEP 30
460 IFR=1 OR R=3 THEN X=X+5
470 CIRCLE(X,Y),10,,,,.3
475 PAINT(X,Y),CHR$(&HA0)+CHR$(&H0A)+CHR$(0),1
480 NEXTX
490 Y=Y+6
500 NEXTR
510 LINE(90,205)-(400,212),,B  'SPACE BAR
515 PAINT(95,208),CHR$(&HAA),1
520 'NUMERIC KEYS
530 Y=180
540 FORR=1TO4
550 FORX=495TO570 STEP 28
560 CIRCLE(X,Y),10,,,,.3
565 PAINT(X,Y),CHR$(&HA0)+CHR$(&H0A)+CHR$(0),1
570 NEXT
580 Y=Y+6
590 NEXTR
600 LINE(43,175)-(595,175)     'BOX AROUND KEYS
610 LINE-(595,180)
612 LINE-(610,217)
613 LINE-(30,217)
614 LINE-(43,180)
615 LINE-(43,175)
650 'BOTTOM LOWER PORTION CASE
660 LINE(10,233)-(635,233)
670 LINE-(630,239) 'RIGHT END
680 LINE-(15,239)
690 LINE-(10,233)
695 PAINT(12,234),CHR$(&HA0)+CHR$(&H0A),1
696 PAINT(50,162),CHR$(&H0A)+CHR$(&HA0),1
2000 IFINKEY$=""THEN2000
```

End

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For more information, contact EduSoft, P.O. Box 2560, Berkeley, CA 94702, 800-338-7638.

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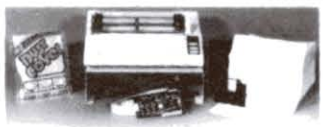

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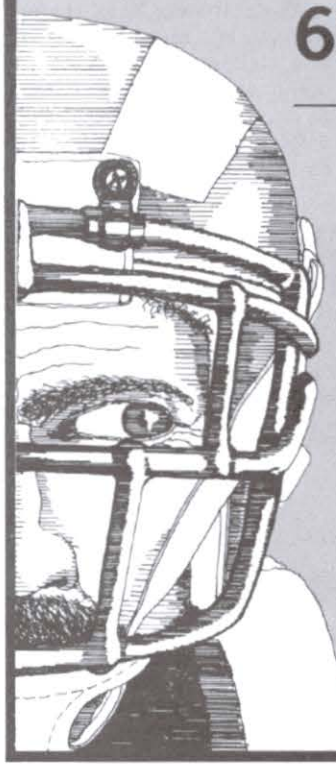

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GD. Gold Dog Analysis™
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Professional software designed to provide a thorough analysis of all trotter and pacer races in North America and Canada. **$159.95** complete
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NEW PRODUCTS

Epson's DX-10 and DX-20 daisy-wheel printers provide letter-quality printing.

select functions such as send/receive files, capture information, help, and baud/parity changes.

For more information, contact Pacific Software Consultants, P.O. Box 5, San Luis Rey, CA 92068, 619-439-2577.

Circle 559 on Reader Service card.

Handsome Prints

Epson offers two letter-quality daisy-wheel printers priced under $500. The DX-10 ($399) is an 82-column, 10 characters-per-second (cps) parallel printer. It also offers friction paper feed and bidirectional logic-seeking.

The DX-20 ($499), a 110-column printer, prints at 20 cps and includes all the features of the DX-10 plus a Diablo all-purpose interface (for RS-232C, IEEE-488 and parallel connections) and a 1K print buffer (expandable to 7K). An optional keyboard lets the printer function as a typewriter.

Both printers provide proportional spacing, underlining, bold print, double strike, bold double strike, superscripts, and subscripts.

For more information, contact Epson America Inc., Computer Products Division, 2780 Lomita Blvd., Torrance, CA 90505, 800-421-5426.

Circle 552 on Reader Service card.

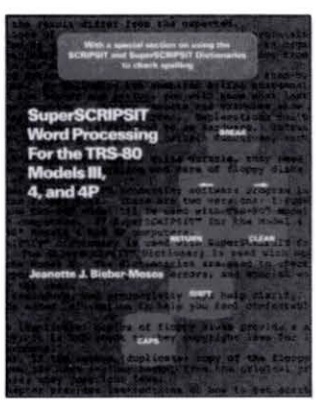
Word it Right

Jeanette J. Bieber-Moses' *SuperScripsit Word Processing for the TRS-80 Models III, 4, and 4P* describes the ins and outs of SuperScripsit, covering everything from basic word processing to advanced applications.

It also contains detailed advice on how to use the Scripsit and SuperScripsit dictionaries, time-saving productivity tips, and a help section with over 100 solutions to common computer problems.

The softcover book costs $17.95. For more information, contact Scott, Foresman and Company, 1900 E. Lake Ave., Glenview, IL 60025, 312-729-3000.

Circle 558 on Reader Service card.



All about SuperScripsit for the Models III, 4, and 4P.

Tandy 1000

Circle 455 on Reader Service card.

TanPak™

The Ultimate Expansion for the Model 1000!

The TanPak expansion board has been designed to allow expansion beyond the scope of the standard Model 1000. Seven of the most needed functions/features have been combined into one package using only one expansion slot. Your remaining spaces are left free for future expansion needs. And the best part of all, it will save you money over the Tandy Boards.

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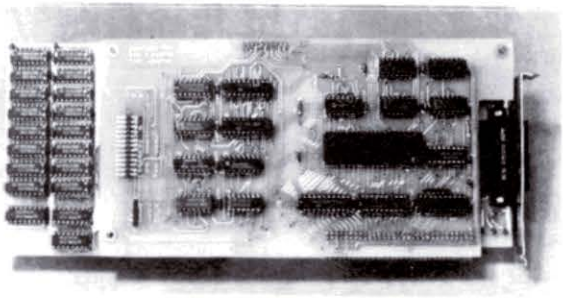

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Clock/Calendar
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TanPak features include:
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TanPak™ Secondary

Made to work with a Tandy 1000 memory board as the second memory board. Featuring a Serial Port, Clock/Calendar, Memory Expansion to 256K, Printer Spooler, and Memory disk.

TanPak™ Secondary . . . . . **$249.**

Tandy 1000 Hard Drives

HDS Hard Drives for the Tandy 1000 allow booting directly from the Hard Drive using the Tandy DOS. All units are complete with controller, ready to plug in and use. The Internal Hard Drive Units replace the top disk drive inside the 1000, or request an external unit for only $150. more.

10 Meg Internal . . . . . **$549.**
20 Meg Internal . . . . . **$749.**
30 Meg Internal . . . . . **$1349.**

TanTel

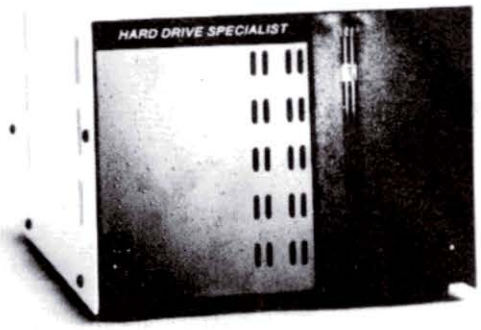
Internal 300/1200 Baud Modem **$299**

8087 Board

8087 Math Co-processor board for the Model 1000. Plugs in internally but does not use one of the 3 expansion slots . . . . . $249.

(Available Fall 85')

Model 1, 3, 4 Hard Drives



Model 1, 3, 4 Hard Drives

	Primary	Secondary
5 Megabyte	**$795.**	**$595.**
10 Megabyte	**$1095.**	**$895.**
20 Megabyte	**$1295.**	**$1095.**
30 Megabyte	**$1895.**	**$1695.**

(Model 1 add $50)

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Mount Hold'n Fold copyholder to the right or left of your monitor.

Holding and Folding

The Hold'n Fold CRT Copyholder from Charles Leonard Information Processing Supplies provides a stand for papers or a book to free up your hands for typing. It mounts on the left or right side of your monitor.

The holder doesn't take up any desk space as it folds against the monitor when not in use. Alternatively, you can remove it from the CRT mount and use it as a free-standing tabletop unit.

Hold'n Fold costs $34.95. For more details, contact Charles Leonard Inc., 79-11 Cooper Ave., Glendale, NY 11385, 718-894-4851.

Circle 555 on Reader Service card.

Key Change

Data-Cals ($14.85/set) let you relabel keyboard keys for specific job functions, to meet software program requirements, or to remove present data with matched blanks.

Two formats are available: opaque Data-Cals for changing or covering up present keys and transparent Data-Cals for adding information to existing keys.

For more information, contact Aspen Graphics, Overlay Division, 1032 W. 23rd St., Tempe, AZ 85282, 602-829-8443.

Circle 554 on Reader Service card.

Data-Cals give your keyboard a new appearance.

Educational Directory

Educational Resources for Microcomputers: The 1984 Software Directory is available from Information Inc. for $27.50.

The information in the directory is from The Microsearch Database, the largest on-line data base in the country devoted to microcomputers and microcomputer products. The directory covers educational software released in 1984 and combines product specifications with objective product reviews from micro-related magazines. It contains about 900 abstracts of information from 265 software publishers, and digests of software reviews from over 60 publications

Circle 227 on Reader Service card.

CP/M-68K

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that cover educational software.

The directory comes indexed by microcomputer and/or operating system, manufacturer, product name, publication, and general subject classification. For more details, contact Information Inc., 1725 K Street, N.W., Suite 1006, Washington, DC 20006, 202-833-1174.

Circle 565 on Reader Service card.

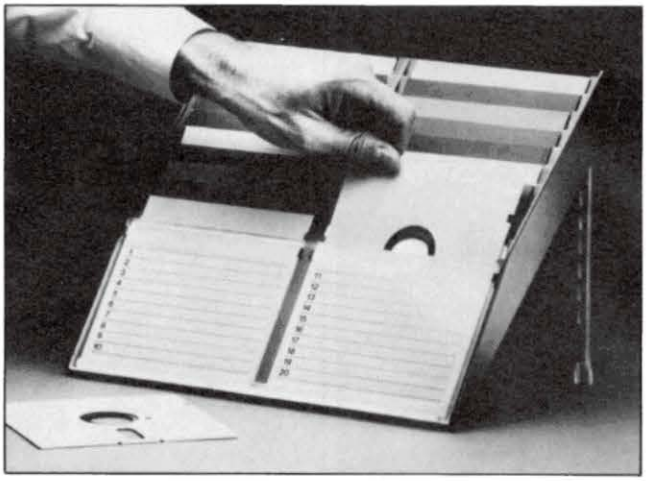
Get Organized

DiskPorter ($29.95) from Potomac Industries uses a stairstep design to store up to 20 disks with the labels exposed.

When you open its cover, DiskPorter stands up as an easel; closed, it fits into a desk drawer or on a bookshelf. Mounting brackets let you hang DiskPorter on the wall.

For more information, contact Potomac Industries Ltd., 2300 M Street NW, Suite 400, Washington, DC 20037, 202-955-9797.

Circle 560 on Reader Service card.



Keep DiskPorter on the desk, in the drawer, or on the wall.

Code Name

Code Quest, a new release from Sunburst Communications for the Models III and 4 (48K), focuses on children's fascination with codes to develop problem-solving skills and strategies. The program is suitable for grades 4 to adult.

Code Quest encourages users to develop discrimination, classification, and pattern identification skills through codes composed of letters, numbers, and pictures. A special option lets students or teachers create their own mystery objects and clues.

For $55 you receive a disk, back-up disk, and teacher's guide. Contact Sunburst Communications Inc. (39 Washington Ave., Pleasantville, NY 10570, 800-431-1934) for more information.

Circle 557 on Reader Service card.

Ship Ahoy

Clear For Action is a new 48K Model I/III/4 game from Microcomputer Games, a division of Avalon Hill Game Co.

You are the admiral of epic sea battles in the age of wooden ships and iron men. You command up to five cannon-laden sailing vessels and attempt to out-sail and outgun an opponent or the computer. Clear For Action has 11 predefined scenarios available, or you can design your own.

A cassette is $25. For further information, contact Microcomputer Games Inc., 4517 Harford Road, Baltimore, MD 21214, 301-254-9200.

Circle 561 on Reader Service card.

Circle 152 on Reader Service card.

NEW PRINTERS ADDED! FIND YOURS BELOW. Good This Month

RIBBON SALE

EXACT REPLACEMENTS

PRINTER (MAKE, MODEL NUMBER. Contact us if your printer is not listed. We have many more in stock. We can probably RELOAD your old cartridges)	RIBBON SIZE (Inches by Yards)	NEW CARTRIDGES (From the various manufacturers or made in our own shop. Ready to use)			RELOADS (You SEND your used CARTRIDGES to us. WE put OUR NEW INSERTS in them)			INSERTS EZ-LOAD™ (DROP IN. NO WINDING! EXACT REPLACEMENTS made in our own shop. Cartridges NOT included)		
BASE 2, DIP 81-82-84-85, MPI 88-99-GX	1/2 x 20	$20/2	$57/6	$108/12	$7/1	$6 ea	2 or more	$15/3	$54/12	$288/72
C ITOH Prowriter 1550-8510, NEC 8023-8025, APPLE DMP-IMAGEW	1/2 x 18	$15/2	$42/6	$ 78/12	$7/1	$6 ea	2 or more	$15/3	$54/12	$288/72
C ITOH STARWRITER F-10-40 — Carbon Film Black	5/16 x 130	$18/3	$60/12	$342/72	$5 ea 3-11	$4 ea	12 or more	$24/6	$42/12	$234/72
DIABLO HYTYPE II — Fabric Black	NOT EZ LOAD 5/16 x 17	$18/2	$51/6	$ 96/12	$8/1	$7 ea	2 or more	$21/3	$78/12	$432/72
RADIO SHACK-TOSHIBA-COMMODORE-PANASONIC-RICOH										
Carbon Film - DWP 210 (Hytype II) Black (1445)	5/16 x 145	$18/3	$60/12	$342/72	$5 ea 3-11	$4 ea	12 or more	$24/6	$42/12	$234/72
DW II, DWP 410-510, RICOH 1200-1300-1600 Black (1419)	1/4 x 145	$18/3	$60/12	$342/72	$5 ea 3-11	$4 ea	12 or more	$24/6	$42/12	$234/72
Red, Green, Blue, Brown Colors (1419)	1/4 x 130	$21/3	$72/12	$420/72	$6 ea 3-11	$5 ea	12 or more	$30/6	$54/12	$234/72
Fabric (Long Life), DWP 210 (Hytype II) Black (1458)	5/16 x 17	$18/2	$51/6	$ 96/12	$8/1	$7 ea	2 or more	$21/3	$78/12	$432/72
DW II, DWP 410-510, RICOH 1200-1300-1600 Black (1449)	NOT EZ LOAD 1/4 x 25	$18/2	$51/6	$ 96/12	$8/1	$7 ea	2 or more	$21/3	$78/12	$432/72
DMP-100, LP VII, COMMODORE 1525, GORILLA BANANA (1424)	Inker Loop	$18/2	$51/6	$ 96/12						
DMP-200, 120, (430 Inserts & Reloads Only) (1296) (1483)	1/2 x 20	$20/2	$57/6	$108/12	$7/1	$7 ea	2 or more	$15/3	$54/12	$288/72
DMP-400-420, LP VI-VIII, PANASONIC KXP-130 (1418)	5/16 x 14	$15/2	$42/6	$ 78/12	$7/1	$6 ea	2 or more	$15/3	$54/12	$288/72
DMP-500 (1482)	1/2 x 20	$22/2	$63/6	$120/12	$7/1	$6 ea	2 or more	$15/3	$54/12	$288/72
DMP-2100, TOSHIBA P1340-1350-1351 (1442)	1/2 x 20	$15/2	$42/6	$ 78/12	$7/1	$6 ea	2 or more	$15/3	$54/12	$288/72
LP-I-II-IV, CENTRONICS 730-737-739-779 (Zip Pack) (1413)	9/16 x 16							$12/3	$45/12	$252/72
LP III-V (1414)	1/2 x 15	$15/2	$42/6	$ 78/12	$7/1	$6 ea	2 or more	$15/3	$54/12	$288/72
EPSON LQ 1500	1/2 x 14	$22/2	$63/6	$120/12	$7/1	$6 ea	2 or more	$15/3	$54/12	$288/72
MX-FX-RX 70-80, IBM PC (Standard Paper)	1/2 x 20	$14/2	$36/6	$ 66/12	$7/1	$6 ea	2 or more	$15/3	$54/12	$288/72
MX-FX-RX 100, IBM PC (Wide Paper)	1/2 x 30	$18/2	$51/6	$ 96/12	$8/1	$7 ea	2 or more	$18/3	$66/12	$360/72
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NEC Spinwriter-Carbon Film-2000-3500 (Reloads BCCOMPCO Only)	5/16 x 145	$21/3	$78/12	$450/72	$5 ea 3-11	$4 ea	12 or more	$24/6	$42/12	$234/72
-5500-7700 (Can Reload Most Types)	1/4 x 145	$18/3	$60/12	$342/72	$5 ea 3-11	$4 ea	12 or more	$24/6	$42/12	$234/72
-Fabric -2000-3500 (Can Reload All)	1/2 x 14	$18/2	$51/6	$ 96/12	$8/1	$7 ea	2 or more	$15/3	$54/12	$288/72
-5500-7700 (Can Reload All)	1/2 x 13	$15/2	$42/6	$ 78/12	$8/1	$7 ea	2 or more	$15/3	$54/12	$288/72
OKIDATA Pacemark 2350-2410 Black	1/2 x 100		$32 each		$20/1	$18 ea	2 or more	36/3	$132/12	$720/72
Microline ML-80-82-83-92-93 (Call for ML-84 Prices)	1/2 x 16	Spool	$39/12	$216/72						
MANNESMAN-TALLY MT-160	9mm x 11	$19/2	$54/6	$102/12						
MT-180	9mm x 13	$20/2	$57/6	$108/12						
-Spirit 80 (SP80) COMMODORE 1526 (Multistrike)	1/2 x 35	$16/2	$45/6	$ 84/12						
PANASONIC KXP-1090-1091-1092-1093	5/16 x 3	$20/2	$57/6	$108/12						
BROTHER HR-15-25-35 — Carbon Film (Multistrike or Correctable)	5/16 x 82	$18/3	$60/12	$342/72						
COMREX DX-15, II — Fabric (Call for Comrex 420 Prices)	5/16 x 17	$15/2	$42/12	$ 78/72						

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Now you can **CROSS** the barrier between computers! Using **HYPERCROSS** you can **COPY** files between TRS-80 disks and those from many different **CP/M** and **IBM-PC** type computers. If you have access to more than one kind of computer, or you are changing to a new machine then you need **HYPERCROSS** to transfer your text files, BASIC, FORTRAN PASCAL or C programs, Viscalc files, general ledger and accounting files, data bases and even binary files.

HYPERCROSS lets you do this directly on your own **TRS-80** or **MAX-80** without using cables. Just put a disk from a CP/M or PC/MS-DOS (Tandy 1000, 1200, 2000 too) in one drive and a TRS-80 type DOS disk in another drive and you can copy files back and forth at will! You can copy multiple files in one go, and even copy directly from one alien disk format to another. You can also **FORMAT** an alien disk, display the **DIRECTORY,** and KILL files.

***Formats supported:** IBM-PC and MS-DOS compatibles include DOS 1.1, 2.x/3.0 single and double sided and Tandy 2000. CP/M from Aardvark to Zorba, including Cromemco, DEC, Epson, HP, IBM CP/M 86, Kaypro, LNW, MAX-80 Morrow, NEC, Osborne, Otrona, Sanyo, Superbrain, Teletek, Televideo, TRS-80: all Model I, III and IV CP/Ms, Xerox, Zenith plus many others. **New version XT/2.0-Plus supports an additional 100 formats including PC J-formats.**

Hardware required: 48K and 2 drives minimum, Model 1 needs a doubler. Some formats need double sided or 80 track drives. 80 track skip supported.

PRICES including disk, manual and shipping. We will match any advertised price.

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Please specify TRS-80 Model I, III, 4/4P, or MAX-80.

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Do you want to back up your precious copy of Copycat 3 or SU. Do you want to fix or modify a disk - if so then **you need HYPERZAP!** On the market for over 2 years, **HYPERZAP is more** than just another disk copying program - it is the program for analyzing, copying, repairing, creating floppy disks or all kinds. It will copy any TRS-80 format as well as many others such as CP/M, PC, CoCo etc. Specially designed to handle mixed density sectors on any track in any sequence. Many features for reading, writing, editing track and sector data. **Hyperzap** is **the** tool that lets you be in charge.

Make your own self booting disks. Take your own CMD file and turn it into a dual booting Mod 1/III/IV disk. **Autopilot mode** allows learn, saves and repeats procedures. Disk comes with fascinating examples.

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Sentry Supreme Media Safe comes in two models that cost $600 and $750. The safe is tested and classified by Underwriters Laboratories to protect the contents at temperatures up to 1,700 degrees Fahrenheit for one hour.

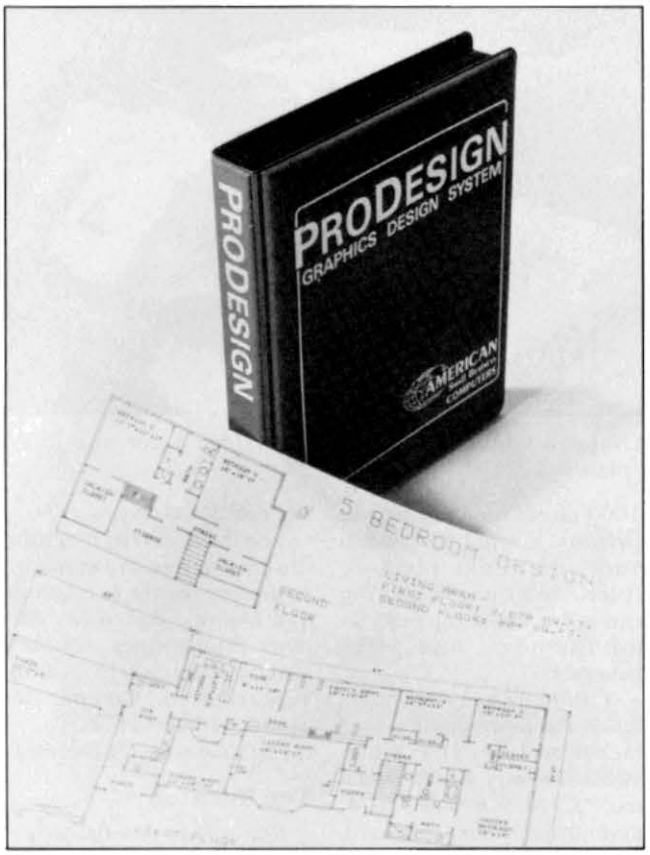
A three-number changeable combination lock and a bolting system adds security against theft. For more information, contact John D. Brush & Co. Inc., 900 Linden Ave., Rochester, NY 14625, 716-381-4900.

Circle 564 on Reader Service card.

New Products Index

Reader Service Number	Company	Page
554	Aspen Graphics	122
555	Charles Leonard Inc.	122
562	EduSoft	118
552	Epson America Inc.	120
551	Infocom Inc.	118
565	Information Inc.	122
564	John D. Brush & Co. Inc.	124
563	Kamasoft Inc.	118
556	LSR Learning Associates Inc.	118
561	Microcomputer Games Inc.	123
559	Pacific Software Consultants	118
560	Potomac Industries Ltd.	123
558	Scott, Foresman and Co.	120
557	Sunburst Communications Inc.	123
553	Traveling Software Inc.	118

New Products listings are based on information supplied in manufacturers' press releases. 80 Micro has not tested or reviewed these products and cannot guarantee any claims.



ProDesign II—designs on your computer.

Fine Lines

American Small Business Computers Inc. has a computer-aided design package, ProDesign II, available for the Model 1000 for $299.

ProDesign II is designed primarily for engineers and architects, but you can use it for interior design and presentation graphics. It supports a mouse and digitizing pads for data input, although they're not required. You can send drawings to most dot-matrix printers and plotters.

You draw on a "virtual screen," which gives you a drawing area four times the size of the physical screen. Drawing features include lines, curves, circles, ovals, arcs, area fill, and extensive text capabilities. ProDesign II has on-screen zoom and rotate, auto dimensioning, and complete editing capabilities. You can also move, copy, rotate, and expand or reduce sections of the drawings.

The program supports user-created symbol libraries and overlay capabilities. You need a 512K computer with color graphics, two drives, and a printer or a plotter. For more information, contact American Small Business Computers, 118 S. Mill St., Pryor, OK 74361, 918-825-4844.

Circle 578 on Reader Service card.

Show Your Depreciation

Depreciation Plus ($395) from Good Software Group is a fixed-asset management package for the Models 1000 and 1200. It provides three applications for fixed-asset management: asset control, accounting and depreciating assets for tax purposes, and accounting and depreciating assets for financial reports.

The package is available through Radio Shack. For more information, contact Good Software Group, 12900 Preston Road, Dallas, TX 75230, 214-239-6085.

Circle 574 on Reader Service card.

Board it Up

The TanPak from Hard Drive Specialist is a multifunction board for the Model 1000. It contains the Model

Circle 198 on Reader Service card.

FINALLY!
THE ULTIMATE ROM

For the Tandy Models 100 and 200 and NEC PC-8201

One ROM chip contains three acclaimed programs:
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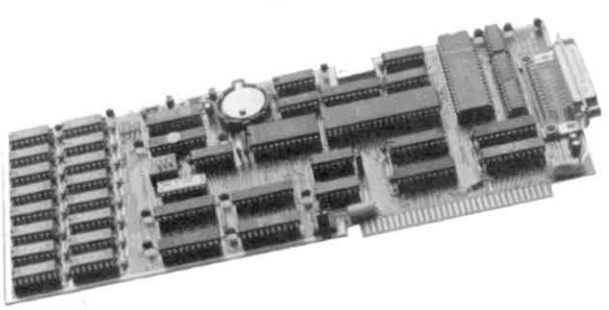
Traveling Software, Inc.
11050 Fifth Avenue N.E.
Seattle, WA 98125
(206) 367-8090

TRAVELING SOFTWARE

*Price after September 20, 1985 will be $229.85
Trademark: Guardian ROM, (C) 1985 Polar Engineering

Circle 414 on Reader Service card.

Introducing MFB-1000™



Designed for use with the new Tandy 1000 Personal Computer, the MFB-1000 contains three of the most needed functions on a single 10" expansion card. Using either 64K or 256K DRAM chips, the MFB-1000 can be populated with up to 512K of memory bringing the total system memory to 640K. Additionally, the board also includes an IBM compatible serial communications port (identified as COM1) and a battery backed real time clock/Calendar. As required by the design of the Tandy 1000, the MFB-1000 also contains its own DMA Controller. However, the DMA Controller can be disabled, making the MFB-1000 compatible with the Tandy 1200 as well as other IBM compatible machines.

■ **128K RAM $329.95** ■ **256K RAM $369.95** ■ **512K RAM $429.95**

ORDERING INFORMATION
Visa/Mastercard orders accepted. Allow 2 weeks for personal checks to clear. Add $3.00 shipping and handling. C.O.D. orders add $2.00. N.J. residents add 6% sales tax.

pbj INC.
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N. Bergen, NJ 07047
(201)330-1898

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Tandy 1000/1200 are registered trademarks of Tandy Corp.

THE RS-232

MODEL III **MODEL 4**

State of the art technology in board design, our direct replacement of Radio Shack's* internal RS-232 board, mounts inside the Model III or 4 on the existing brackets. All cables, screws and complete mounting instructions are included. Non-technical people will find that installation is quick, straight forward and simple requiring less than 15 minutes to complete.

Total compatability with Radio Shack* and all existing software is maintained. Software programmable baud rates from 50 to 19,200 baud are supported along with programmable word length, stop bits, and parity. May be utilized in either half of full duplex operation.

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MS-DOS NEW PRODUCTS

Enter a golf tournament on your computer and win prizes.

1000 direct memory access circuitry, a serial port, clock, and additional memory (128K, 256K, or 512K). You can get a 256K upgrade kit for the 128K and 256K boards.

The 128K version costs $399. For more details, contact Hard Drive Specialist, 16208 Hickory Knoll, Houston, TX 77059, 800-231-6671.
Circle 576 on Reader Service card.

Incorporate Yourself

ComputerLaw Inc.'s Forming Your Own Corporation ($25) for the Models 1000, 1200, and 2000 helps you incorporate your business without paying unnecessary legal fees.

The disk includes articles of incorporation, bylaws, minutes, sample corporate purposes, waivers, transmittal letters, addresses of state incorporation agencies, and a commentary to the language of incorporation forms so you can complete the paperwork necessary for incorporation without having to consult an attorney.

For more information, contact ComputerLaw Inc., 1087 Taft St., Rockville, MD 20850, 301-340-8100.
Circle 575 on Reader Service card.

Picture Show

Bottomline Graf ($99) produces graphics presentations in pie, bar, and line formats from numerical data on MS-DOS-compatible computers. It provides up to 12 intervals on the X- and Y-axes along with clustered or stacked bar graphs, multiple line graphs, and combined charts.

The menu-driven program can send output to a monitor, printer, or plotter. It requires 64K and one disk drive. For more information, contact Venture Software, 16200 Ventura Blvd., Encino, CA 91436, 818-986-4110.
Circle 573 on Reader Service card.

Tee Totaler

Golf's Best simulates the world's top golf courses on your MS-DOS computer. You challenge the course by selecting clubs, force of swing, direction, and so on.

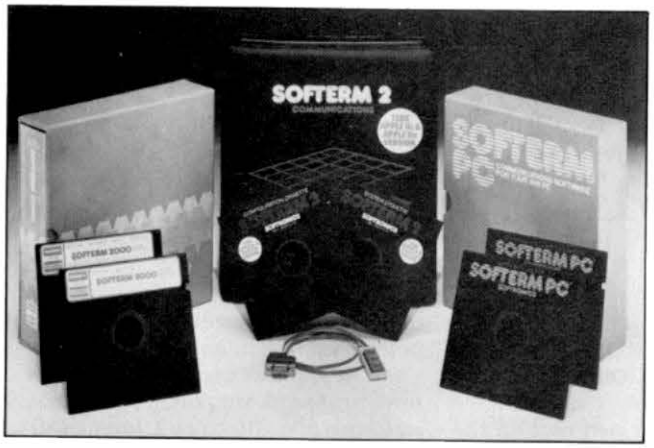
Golf's Best features color graphics, sound effects, close-ups, aerial views, regular and championship tees, periodic changes in pin placements, and scorecard.

The package comes with registration forms so you can enter the 1 STEP computer golf tournament. You play a specified course as many times as you want and send in your best score. 1 STEP Software offers trip and cash prizes.

One to four players can play Golf's Best. The package costs $49.95. For more information, contact 1 STEP Software Inc., Charlotte Plaza, Suite 1300, Charlotte, NC 28244, 800-525-4653.
Circle 577 on Reader Service card.

Convert That Basic

TRSTOMS ($50) lets you convert Basic programs for the Models II, III, 4, 12, 16, and 100 to PC-DOS and MS-DOS Basic. It saves you up to 90 percent of manual conversion time.



Softerm 2000 lets your computer do the talking.

MS-DOS New Products Index

Reader Service Number	Company	Page
577	1 STEP Software Inc.	126
578	American Small Business Computers	125
575	ComputerLaw Inc.	126
574	Good Software Group	125
576	Hard Drive Specialist	125
570	Ramona Enterprises Inc.	126
571	Softronics Inc.	127
573	Venture Software	126

New Products listings are based on information supplied in manufacturers' press releases. 80 Micro has not tested or reviewed these products and cannot guarantee any claims.

The program operates on any MS-DOS machine, including the Models 1000, 1200, and 2000. You must transfer a TRS-80 Basic program to an MS-DOS disk before you can use TRSTOMS on it. Then TRSTOMS changes most Basic instructions to conform to MS-DOS Basic. It converts file names, adds spaces where required, and converts instructions like PRINT@, OPEN "D", POS, and others. It also adjusts Tab and Locate commands to compensate for the different notation system.

TRSTOMS also prints out a conversion report indicating the conversions it made and flagging graphics or control codes that may present problems under MS-DOS.

You need a 64K MS-DOS machine with one disk drive and a printer to run TRSTOMS. You can buy a demo disk for $7 and later credit that to a future purchase. For more information, contact Ramona Enterprises Inc., 1087 Taft St., Rockville, MD 20850, 301-340-8100.

Circle 570 on Reader Service card.

Term Talk

Softronics Inc. offers their terminal program, Softerm, for the Model 2000. Softerm 2000 ($195) includes keyboard macros, a built-in phone book for automatic dialing, and simultaneous capture to print on disk. It also supports popular transfer protocols like Xmodem and emulates 24 popular terminals so you can access mainframe computers. An additional emulation lets the Model 2000 act as a terminal for a Model 16 Xenix multiuser system.

You can buy Softerm 2000 in your Radio Shack store, or contact Softronics Inc. (3639 New Getwell Road, Suite 10, Memphis, TN 38118, 901-683-6850) for more information.

Circle 571 on Reader Service card.

Circle 464 on Reader Service card.

Graphics Solutions

High-Resolution Software and Hardware

GBASIC 3.0 - Radio Shack Model 4/4P/III hi-res board owners take note of an enhanced graphics Basic; GBASIC 3.0 not only has an equivalent for each of the BASICG commands but adds a number of important new commands while using less memory. The hi-res screen can be printed on any of 20 popular printers or saved to or loaded from disk without leaving Basic. The software works with TRSDOS 1.3, 6.1.2, 6.2, LDOS, NEWDOS80, and DOSPLUS. The disk contains 40 graphics programs/files. Also included is a detailed manual which includes assembly language entry addresses. $49.95. (Specify Model 4 or III mode or add $10 for both.)

The following nine programs run on a Model 4/4P/III equipped with a Radio Shack graphics board and GBASIC 3.0 or a Micro-Labs Grafyx Solution board:

DRAW - A powerful full screen graphics drawing and editing program. $39.95.

BIZGRAPH - Create business graphs from hand-entered or VisiCalc data. $98.00.

xT.CAD - Professional drafting aid which outputs to a printer or plotter. $449.95.

CHESS - A very powerful program with 10 skill levels, 40 play options. $49.95.

REVERSI - Play Othello with 10 skill levels, 20 execution options. $39.95.

3D Tic-Tac-Toe - Play the computer or a friend on a 4 × 4 × 4 matrix. $29.95.

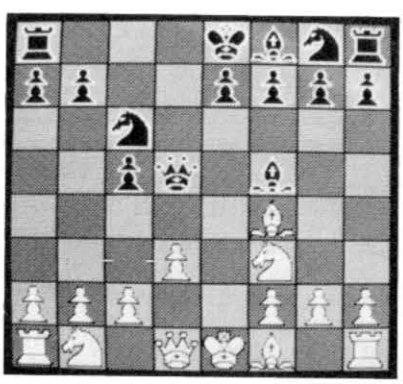
3D-PLOT - View three-dimensional data from any perspective or angle. $39.95.

MATHPLOT - Plot equations of the form Y=F(x) with auto scaling. $39.95.

SURFACE PLOT - Plot three-dimensional equations of the form Z=F(x,y). $39.95.

GRAFYX SOLUTION. Plug-in, clip-on board enhances any Model 4/4P/III to provide 640 × 240 / 512 × 192 dot graphics. Comes with over 40 programs and files including GBASIC 3.0 which adds over 20 new commands. $199.95.

JOY-MOUSE. Allows a Radio Shack CoCo joystick, mouse, or touch pad to be connected to any Model 4/4P/III. Hardware provides X, Y position values from 0 to 255. A built-in speaker produces sound from the cassette port. $129.95.



G.I.N.A. Software program for the Model 4/4P/III/I which uses the standard block graphics screen to display a window to a larger 65536 × 65536 dot tablet. The arrow keys are used to draw two or three-dimensional figures. The display can be scaled, shifted, or rotated in any dimension. The final picture is printed in hi-res on Radio Shack, Epson, Gemini, NEC 8023, or Prowriter printers. $75.00.

Please specify your exact system configuration when ordering or requesting information. Payment may be by check, Visa, Mastercard, or COD. Domestic shipping is free on pre-paid orders. Texas residents add 5½% sales tax.

MICRO-LABS, INC. 214-235-0915
902 Pinecrest, Richardson, Texas 75080

A Little Light Pen Musing

Send your questions dealing specifically with Tandy products, services, or policies to Ask Tandy, 80 Micro, 80 Pine St., Peterborough, NH 03458. Be sure to specify which model computer you use. A representative at Tandy's Fort Worth, TX, headquarters supplies all answers published here.

Q: I've waited breathlessly for an announcement about a light pen for the Tandy 1000. In the June 1985 Ask Tandy column, I read that Tandy is only "considering" bar code systems for computers other than the 100/200. Tell me it isn't so. Is this a change in intention, since Tandy included a light pen port on the 1000? Can I use other pens on the 1000 without modification?

A: *First of all, don't confuse a light pen, which works with your computer's screen, with a bar code reader, which reads those little encoded, printed stripes. One has nothing to do with the other.*

We included a light pen port on the 1000 for future expansion. Right now, we feel light pens are too expensive. When they get more cost effective, chances are good we'll have one. Sorry, I have no information about other light pens that might work.

Q: How long after buying a Tandy computer can I buy a service contract? After my equipment is repaired, can I see it before leaving the store?

A: *Service contracts are available any time. If your unit isn't still under warranty, we require a check-out at a fee of $25 per system. If we find any defects, you must have them repaired before you buy a contract.*

Small systems are easy to check out prior to your picking them up. Complex systems usually aren't in the store prior to delivery, but your store can probably work something out with you, depending on the circumstances. Check with them.

Q: You've traditionally offered computers in various configurations. Why no 128K version of the Model 4?

A: *A couple of reasons: First, since Basic won't address the second 64K except as a RAMdisk, we expected the 64K version to be far more popular. And, it would be prohibitively expensive to have our stores carrying two versions of a computer so easy to upgrade.* ■

THE CLASSIFIED 80micro

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Dollar Diskettes! DS/DD w/Hub ring. Dollar Brand are available in packs of 10 for $10.00. Add $2.00 postage and handling to total order. No minimum no maximum lifetime garuantee. 4831 S. Hampton, LB-41 Dallas, TX 75232.

SOFTWARE

Coin Collectors! Unique program uses built-in market value file and prices your U.S. collection. Brochure available. Compu-Quote 6914 Berquist, Canoga Park, CA 91307 (818) 348-3662.

Masonic Lodge Secretary's Programs. Models III and Native 4/4P versions. $65.00 ppd. John Taylor, 106 Busch Hill, Wetumpka, AL 36092.

Pageone—Quick, easy, Model I, III word processor. $49.95 or SASE for information. Roy Scott, Box 1508, Bakersfield, CA 93302-1508.

Powerful Mailing List Program. Completely menu driven. Specify LDOS, NEWDOS, TRSDOS, TRSDOS6. $19.95 Mail check or money order to: Zarchy Data Processing, P.O. Box 1012, Woodbridge, NJ 07095. BBS support at 201-494-3558.

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PUBLICATIONS

Close-out Sale! TRS-80 Encylcopedia by Wayne Green Inc. 10 volume hardcover was $199.50 now $79.99. 10 volume softcover was $109.50 now $58.99. Mail to DiskCount Data see page 7 for address.

HARDWARE

Model 100 64K RAM modules only $375 each. 8K RAM modules $34.95 each. 24K RAM modules for Tandy 200 $139 each. PG Design Electronics, Inc. 66040 Gratiot, Richmond, Michigan 04862 (313)727-2744.

Circle **549** on Reader Service Card

Circle 101 on Reader Service card.

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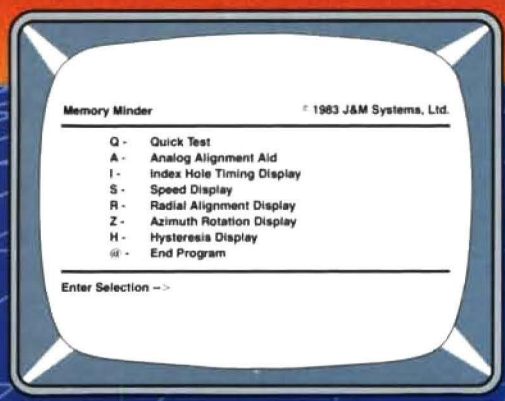
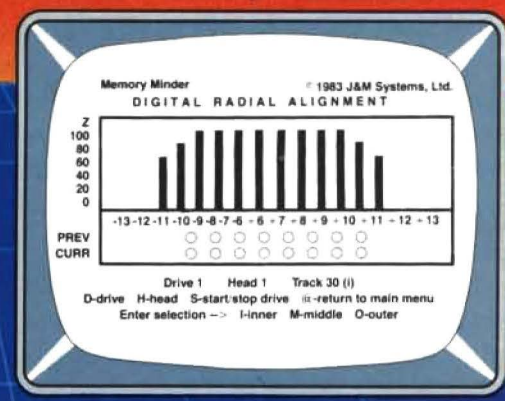
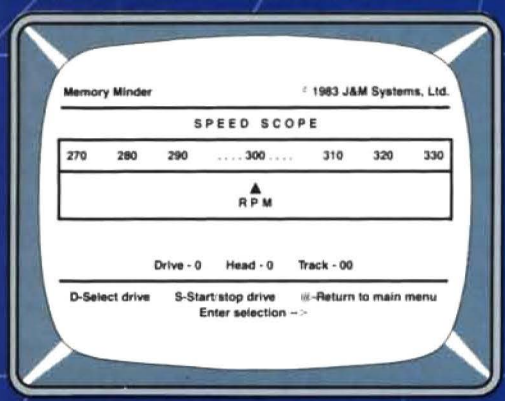
. . . A UNIQUE APPROACH TO DISK RELIABILITY!



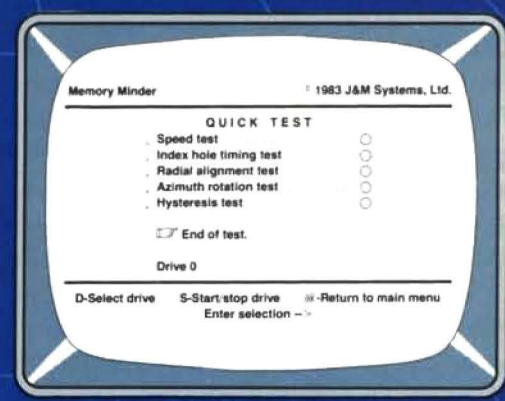
Select any one of seven tests to perform preventive maintenance or to isolate problems. Simple, single-letter commands make MM easy to use! Use MM to align the head, adjust the index hole detector, or adjust the speed.



Use the MM Radial Alignment Test to check the head alignment of your drives. No need for an oscilloscope or other expensive test equipment!



Check the motor speed of your drives. Or, you can even use the Speed Test to adjust the drive speed. No need for any test equipment!



Use the Quick Test to quickly and automatically test five of the most important performance parameters of your drive. Monitor your drives for long term drift. Isolate problems quickly and automatically!

PROTECT YOUR DATA.

Now you can make sure your data is being recorded properly by the use of the revolutionary ***Memory Minder.***

The Memory Minder from J & M Systems, tests your disk's performance and calibration without any additional equipment! It measures your disk's performance and displays it on your screen.

This is the most comprehensive disk diagnostic program available for your TRS-80 microcomputer. You can even adjust drive alignment while watching the display!

Spot problems ***before*** they endanger your data! If you own a disk drive, you ***need*** the ***Memory Minder!***

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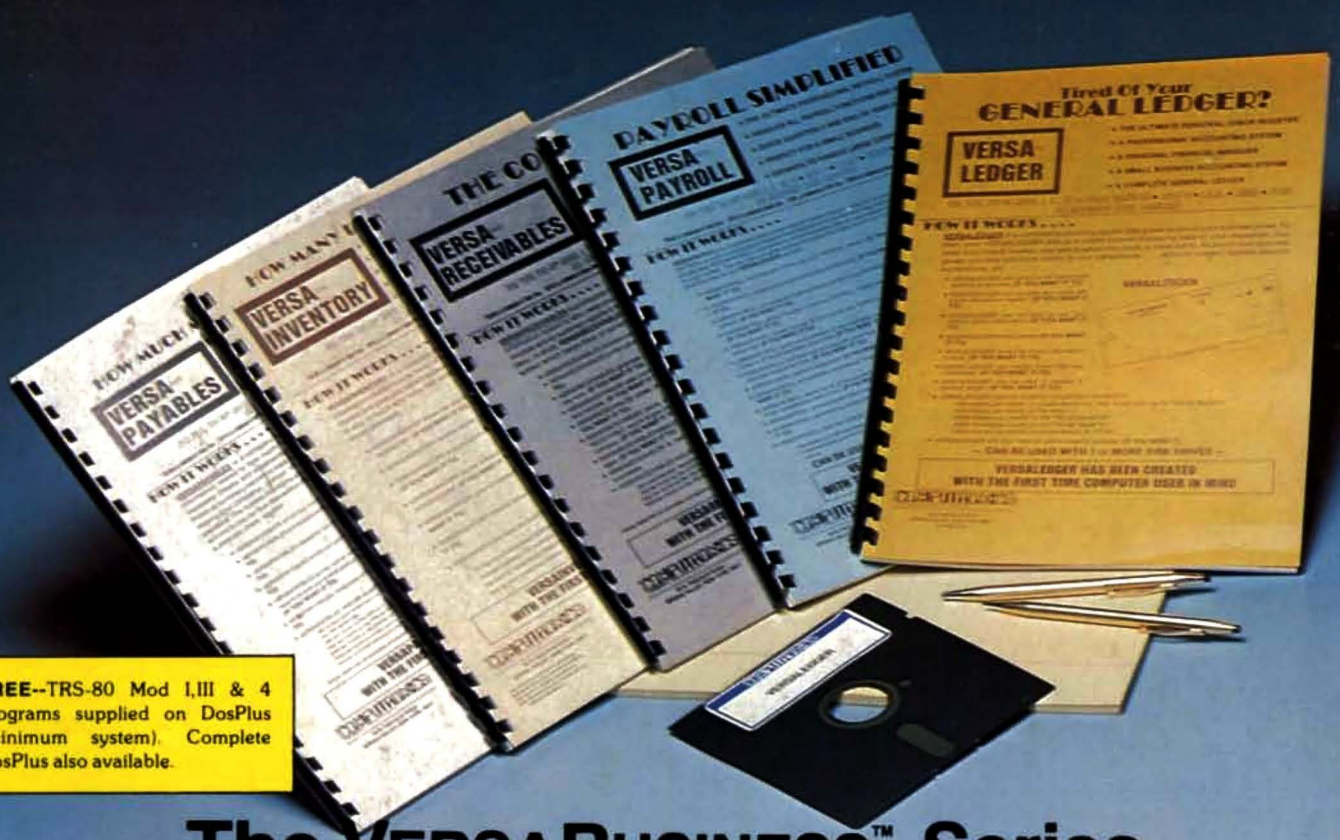

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VERSAPAYROLL™ is a powerful and sophisticated, but easy to use payroll system that keeps track of all government-required payroll information. Complete employee records are maintained, and all necessary payroll calculations are performed automatically, with totals displayed on screen for operator approval. A payroll can be run totally automatically, or the operator can intervene to prevent a check from being printed, or to alter information on it. If desired, totals may be posted to the VERSALEDGER II™ system.

VERSAINVENTORY™ $99.95

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VERSALEDGER II™ is a complete accounting system that grows as your business grows. VERSALEDGER II™ can be used as a simple personal checkbook register, expanded to a small business bookkeeping system or developed into a large corporate general ledger system **without any additional software.**

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- prints tractor-feed checks,
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