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80micro

T.M.

A CWC/I PUBLICATION

the magazine for TRS-80 users*

What's the Difference?

How TRS-80 Basics Compare and Contrast

Young Programmers Show Their Work

Business Graphs On the Model I/III

Also:
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Project 80
BBS Express
The Next Step
Basic Takes
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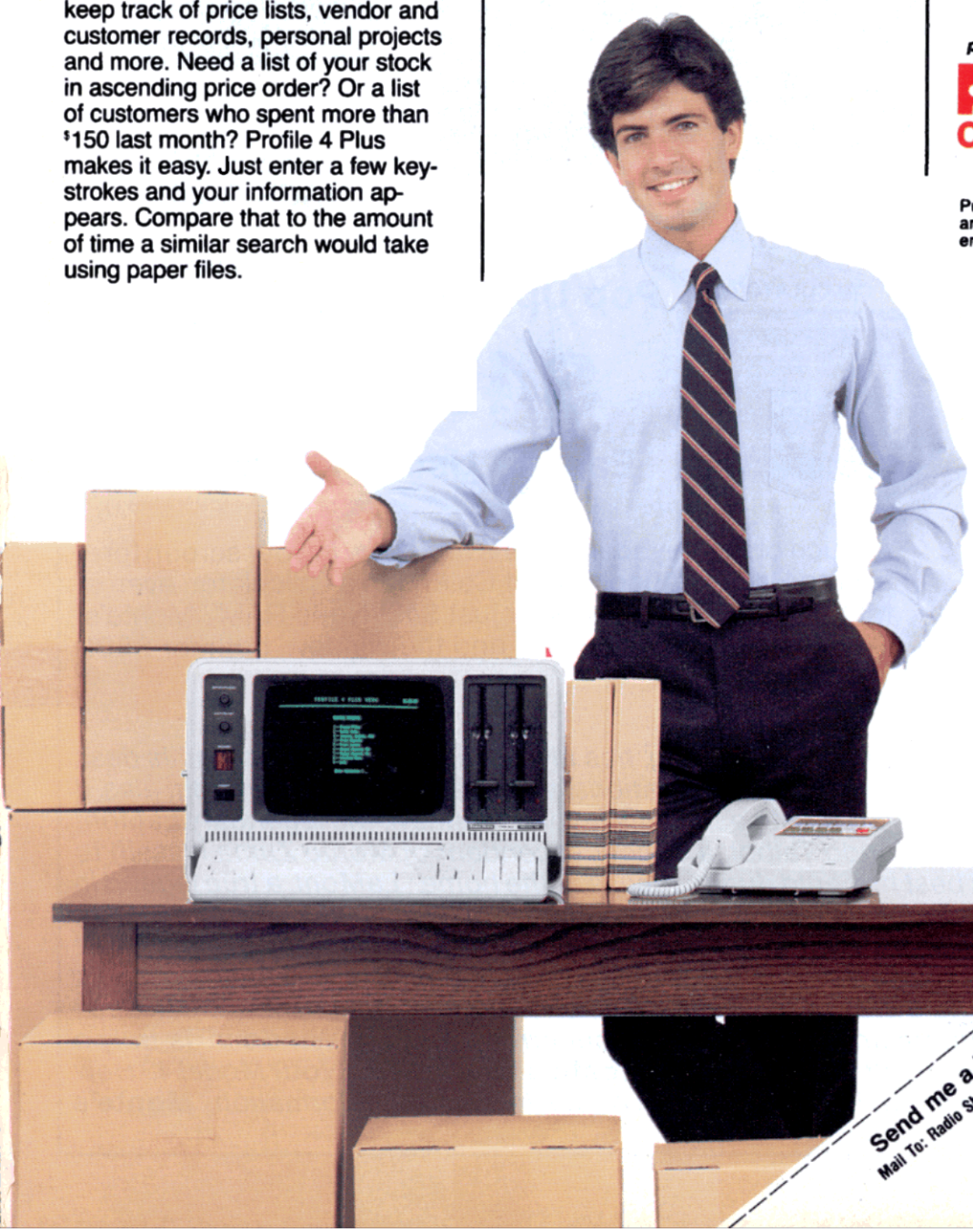

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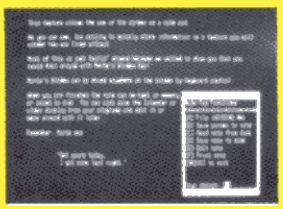

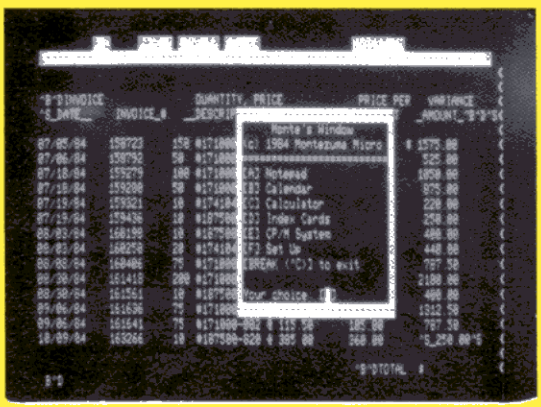

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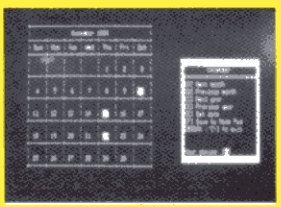

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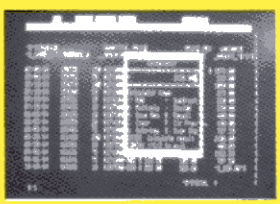
CALCULATOR



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64K Memory drive	YES	NO
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Communication program included	YES	NO
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2000	713.2	7.8	98.9

Note: Not for use with The Home Accountant.*

"...in those programs that use hundreds of strings arrays, the time saved is outstanding." 80 MICRO, Jan. '83

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

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

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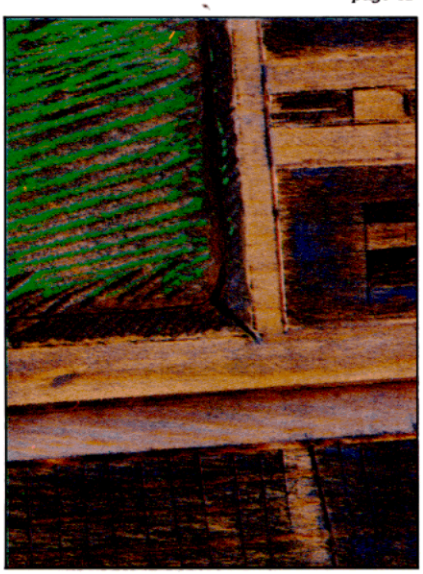

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LOAD 80

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 key 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 $21.97 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 1-800-645-9559 between 9 a.m. and 5 p.m. Or, you can write to *80 Micro*, Subscription Department, P.O. Box 981, Farmingdale, NY 11737.

Directory

Graph

Article: Picture This (p. 56)
System: Model III, 48K RAM
Language: Assembly

Graphics program that lets you create pictures, and combine up to nine screens for a composite illustration.
Cassette filespec: GRAPHS (source code), GRAPH (object code)
Disk filespec: GRAPH/SRC (source code), GRAPH/CMD (object code).
Source code requires Radio Shack Editor/Assembler.

Noeaters

Article: The Pecking Order (p. 59)
System: Models I and III, 16K RAM cassette, 32K RAM disk
Language: Basic

Gobble up the numbers on the screen to win the game.
Cassette filespec: B
Disk filespec: NOEATERS/BAS

Grafmaster

Article: By the Numbers (p. 68)
System: Models I and III, 16K RAM cassette, 32K RAM disk
Language: Basic

Plots and displays data in line or bar charts.
Cassette filespec: C
Disk filespec: GRAFMSTR/BAS

Demo

Article: The Next Step (p. 112)
System: Models I and III, 32K RAM
Language: Assembly

Use DOS exits to add commands to Basic.
Cassette filespec: DEMOS, DEMOC
Disk filespec: DEMO/SRC (source code), DEMO/CMD (object code).
Source code requires Apparat editor/assembler.

BBS

Article: BBS Express (p. 104)
System: Model III, 48K RAM, two disk drives
Language: Disk Basic

Sort and search programs for your BBS.
Cassette filespec: D
Disk filespec: BBS9/BAS

Mail List

Article: Special to Load 80
System: Model 4, 64K RAM
Language: Assembly/Basic

This mailing list program handles up to 900 labels per disk, arranges labels by name or zip code, and inverts first and last names. No related article in *80 Micro*: Program and documentation on Load 80 only.
Cassette filespec: ARTICLE-1 (ASCII text file), ARTICLE-2 (ASCII text file), F, G, H, I, J, K, SORT (object code), NAME (object code)
Disk filespec: ARTICLE1/ASC (ASCII text file), ARTICLE2/ASC (ASCII text file), MENU/BAS, CREATE/BAS, EDIT/DEL, SORT/BAS, MASTER/BAS, PRINT/BAS, SORT/CMD (object code), NAME/CMD (object code)

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Selling Out At Comdex

A successful company cannot simply have a good product. It must also present a forceful and distinctive image to the industry, consumers, and media. If November's Comdex show in Las Vegas was any indication, many, if not most, software vendors fail miserably at this. They haven't learned even the most rudimentary of marketing and presentation skills. The result is that a lot of companies are going to fall into a black hole this year, taking with them some decent software.

Let me cite a couple of examples. Case #1 is that of the manufacturer of a reasonably well-known word processor that I'll call SuperCursor. In the booth were a couple of IBM PCs. The company president sat slouched on a stool. I walked over to the PC at his right and found to my surprise that it was not running SuperCursor, but a series of screens that merely explained what the product was.

Hmmm, I thought. This isn't terribly exciting.

After a few minutes, the president noticed me (I was the only one in the booth), and asked if I had any questions.

"Will it run on the Tandy 1000?" I asked.

"That's their new portable, right?" he responded.

Here was a man who clearly knew what was going on in the market.

I moved on. SuperCursor could be the greatest word processor ever written, but I'll never know.

Case #2 involves the vendor of a data base manager (or was it a data communications program?). The company had a fairly impressive booth in one of the main halls, with lots of computers running their product and an army of people giving demonstrations. I asked the same question:

"Will it run on the Tandy 1000?"

"I really couldn't tell you that."

"Do you plan to test it on the 1000?"

"I don't know."

"Is there anyone here who does know?"

"Well, we're just salespeople. Someone at our hospitality suite might be able to tell you...."

End conversation. Why should I waste my time going to a hospitality suite to get one simple question answered?

These are not isolated situations. Comdex had a seemingly endless supply of indolent, insolent, and ignorant exhibitors. Most companies are not well enough established to afford such behavior. Good luck to them—they're going to need it.

It's no coincidence that the most successful software manufacturers generally show a touch of class. Take Infocom. By their own admission, few announcements could be more boring than that of a new data base manager. Yet Cornerstone, their first business package, received much favorable attention. The primary reason was not so much the product itself, but because people feel good about Infocom. This is an outfit run by a helpful, intelligent, knowledgeable, genuinely likable staff.

Other companies that show some style are Lotus, Ashton-Tate, MicroPro, and Microsoft. But for the most part, walking the floor of Comdex is like cruising car dealers on Miracle Mile; the names are different, but just about everything else is the same. I left with the feeling that if every company randomly swapped its products and personnel with everyone else, hardly anyone would notice.

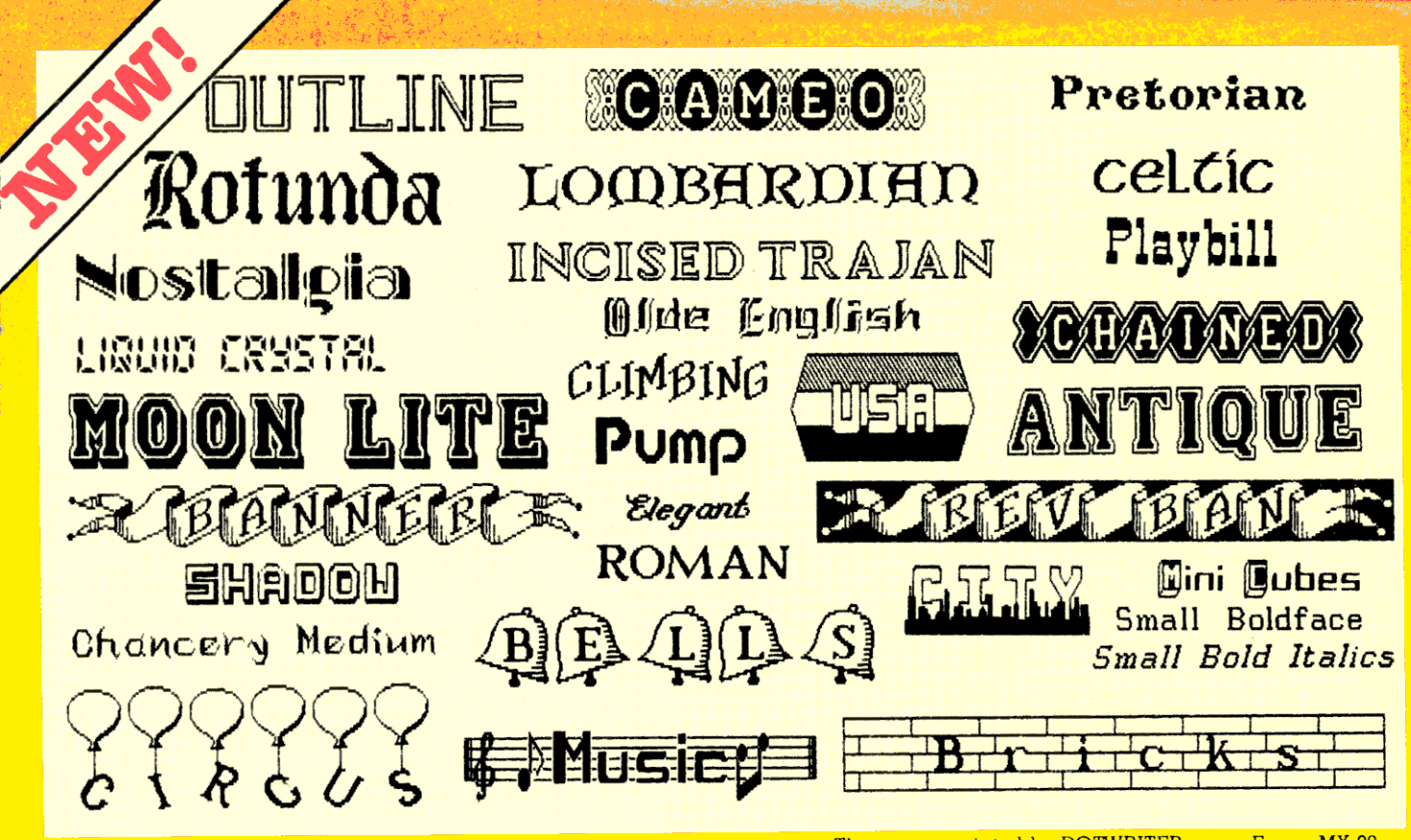
Something Old, Something New

TRS-80 people are hard to please. They expect each new computer to be the ultimate in new technology. So some folks will be disappointed that the Model 200 is not a significant breakthrough in portable computing. They wanted an MS-DOS compatible with 1 megabyte of memory, a 24-line by 80-column color LCD, and the top 30 software packages bundled in ROM. What they got is an upgraded 100.

The Model 200 is to the 100 what the Model III was to the Model I. It's more nicely packaged and has a few interesting modifications, but it's still basically the same computer.

Personally, I don't care about MS-DOS compatibility. I was happy enough to see that Tandy listened to customer complaints and took care of some of the 100's nagging problems. The cursor keys are now in a more convenient cluster, the pause/break key has been moved to the upper left corner for easier reach, and the expansion bus is at the rear of the computer instead of underneath. And, of course, there's the 16-line by 40-column flip-up screen, which gives you more room to work with without resorting to an impossible-to-read 80-column display.

We'll be giving the 200 a thorough review in a future issue. Until then, I recommend you stroll on down to your local Radio Shack and have a look. ■



These were printed by DOTWRITER on an Epson MX-80.

See What You Can Do With DOTWRITER 4.0!

Now available for the Model 4, too!

DOTWRITER lets you create spectacular, eye-catching letterheads, catalogs, invitations, or even books. It is just what you need to turn your dot-matrix printer into a versatile typesetting machine. And it's **available for the Model 4 (yes, in native mode)** as well as for the Models I and III.

What is DOTWRITER?

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DOTWRITER includes the printing program, complete documentation, and fourteen useful sets of typefaces (60 to 90 characters in each set). We will also give you the 105-page Letterset Reference Catalog **free** with your order.

To use DOTWRITER, just write your text with any popular TRS-80 Word Processor, add the necessary formatting commands, and DOTWRITER will do the rest.

25 more disks are available separately. Each has 3–12 complete typefaces (60–95 characters in each set). These disks cost less than $25 each, and may be purchased at any time.

80 readers' choice micro 1983

If you want to create your own logos, modify our typefaces, or even design entirely new typefaces, then you will also want to order the "Letterset Design System" (LDS). We offer LDS at half-price when you order it along with DOTWRITER. LDS operates in Model III mode on the Model 4.

Versions are available for Epson MX-80 with Graftrax, MX-100 with Graftrax-Plus, RX-80, FX-80, C. ITOH 8510/1550, Microline 84/92/93; Radio Shack's DMP series 200–2100, CGP-220 & Gemini 10X, 15X. Please specify printer and computer!

Our print samples were done on an Epson. Sizes vary on other printers. Some of the samples shown here are taken from the additional Letterset disks.

Two disk drives and at least 48K of memory are required. LDS is not available in native Model 4 mode.

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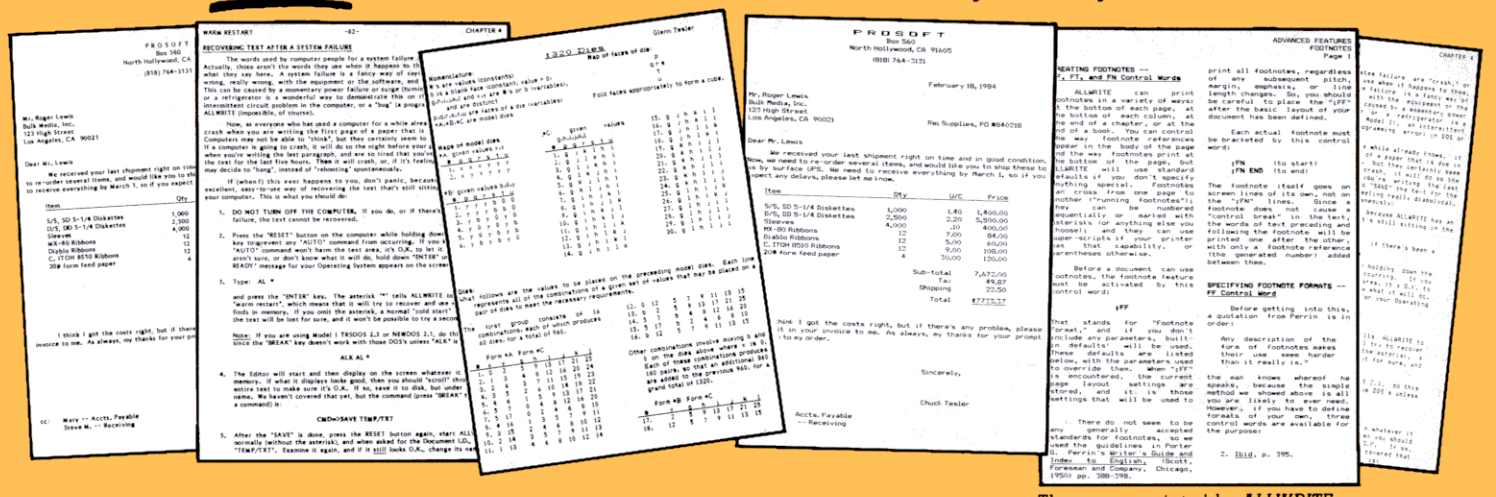

These were printed by ALLWRITE; shown 20% actual size.

We are proud to offer you the one Word Processor that will satisfy all your writing needs: ALLWRITE. It sets new standards for text editing and printing, and will give new life to your TRS-80. Let us tell you why...

In an attempt to push the public into expensive 16-bit computers, many manufacturers have been saying that the TRS-80 is obsolete. The truth is that the software, not the hardware, makes the difference. And the best word processor of all is now available *only* on the humble TRS-80, not on those expensive 16-bit machines!

ALLWRITE is based on the proven methods that made NEWSCRIPT the most popular independently produced TRS-80 word processor, but it also has the speed and new features our customers have asked us for. ALLWRITE will save you time and let you produce the highest-quality, most professional-looking letters, term papers, and reports available on a micro-computer.

Allwrite Can Save You Time!

Reads a 25,000 character file (10 printed pages) from disk in SIX SECONDS...does a global search-and-replace in FOUR SECONDS...outruns even the fastest popular micro-printer.

ALLWRITE'S Screen Handling Makes Word Processing Easier Than Ever

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 ...without annoying blinking or screen flicker. 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 will skip bad sectors, **read the rest of the file,**

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.

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.

NEWSCRIPT's documentation was acclaimed in every review, and ALLWRITE's 350-page book is even better. 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 20 years, and understand the importance of good documentation.

To make installation easy, we include Tiny DOSPLUS for the Models I and III, and special, pre-tailored versions of **both** TRSDOS 6.2 **and** DOSPLUS IV for the Model 4, all at no extra charge. The Model I and III versions work equally well with all major DOS's.

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. There is no time limit to our support: if you are our customer and you need help, just call or write. We give free updates for 90 days, and charge little or nothing for minor updates thereafter.

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.)*

"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

"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.

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

HUNDREDS OF USEFUL CAPABILITIES

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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Fun and Games

Where have all the good times gone? While most of *80 Micro*'s articles are helpful, my main interest is in computer games. You no longer publish two of my favorite columns, Gamer's Cafe and Fun House, and now it seems that most of your programs are in Assembly language rather than in Basic. Whatever happened to Richard Ramella?

Dave M. McCray
Glen Ellyn, IL

Hang on to your joystick—you'll see a couple of good Basic games soon. Also, check out Basic Takes to see what Richard is doing these days.

—Eds.

Basic Manager

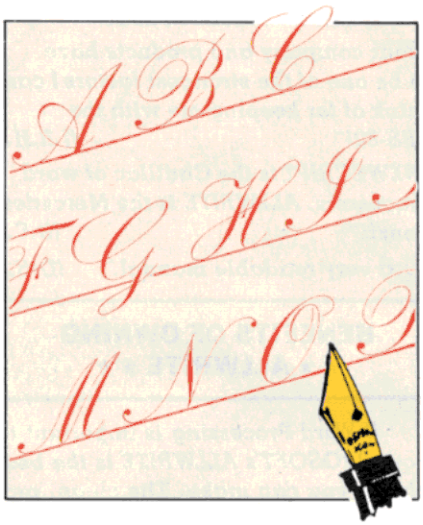
Wynne Keller's review of Basrum (November 1984, p. 190) is fair and accurate. Yet, Keller's difficulty in using the DOS debug utility to transfer Basrum from our distribution disk is misleading. This doesn't reflect a problem with Basrum or the transfer program, but rather is the result of an apparent misunderstanding of the proper Debug command. The documentation for our transfer program explains the correct debug command for TRSDOS users, cautioning other users to refer to their DOS manual for the correct command.

Richard Wiley
Wiley Inc.
Honolulu, HI

Floppy Repair

Vincent E. Meyer's "Drive Ways" (September 1984, p. 42) is informative and well-written. While it may cut down revenues for service centers, it eliminates a lot of frustration for computer users. I restored two erratic drives in under 20 minutes, saving myself close to $80.

H.J. Porssa
Cincinnati, OH



Allwrite's OK

I share Terry Kepner's enthusiasm for Prosoft's Allwrite word processor (Reviews, November 1984, p. 35). It's immensely faster (and neater) than the old yellow legal pad, and almost as fast as dictating, but with the advantage of easy, unlimited editing.

As powerful as Allwrite is, the hardware limitations of the TRS-80's, particularly the 64-character by 16-line screen on the Model III and the RAM on both the Models III and 4, significantly limit the efficiency of word processing. Superior hardware is available with, for example, the IBM PC and its compatibles, for less than what I've spent on my Model III.

Allwrite is great, but the TRS-80 Models III and 4 are doomed.

Patrick B. Anderson
Issaquah, WA

I'm delighted with Allwrite, or at least the portion of it I've been able to decipher. Unfortunately, the manual, which is wordy and desultory, keeps me from making full use of Allwrite's capabilities.

Although Prosoft policy promises ongoing, unlimited support, they ignore my letters that request further clarification. This attitude certainly isn't compatible with stated policy, and is especially unfortunate when you consider the high quality of the product at hand.

Reinaldo D. Verson
Miami, FL

Terry Kepner's review of Allwrite echoes my feelings exactly for Prosoft's latest program. It's probably the best word processor ever written for TRS-80 computers.

The manual, too, is "world-class"; it covers every facet of the program, complete with examples of each operation. Yet, Allwrite is so easy to use that you can produce standard business letters after reading only a few pages of the manual.

A.A. Wicks
Agoura, CA

Font'n'Blue

When Supreme reigns ET on 80,
And an El Clarendon leads droppity
Dropcap, how in the name of heaven
Or hell do you fit the backslash in
Absence of font-Greek-&-Math?

This is a case of font'n'blue
For typesetter as well as editor
When the supplied-line-cxs are left un-
Pasted and the typesetter's effort is
Plum wasted. The whole damn thing is
Clear-un-done, clear-un-done!!

Prem Gongaju
Peterborough, NH

Prem is one of 80's illustrious typesetters. It seems we asked him to insert a backslash character on an off day, when the muse was with him; ET and Clarendon are type fonts used in 80 Micro.

—Eds.

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

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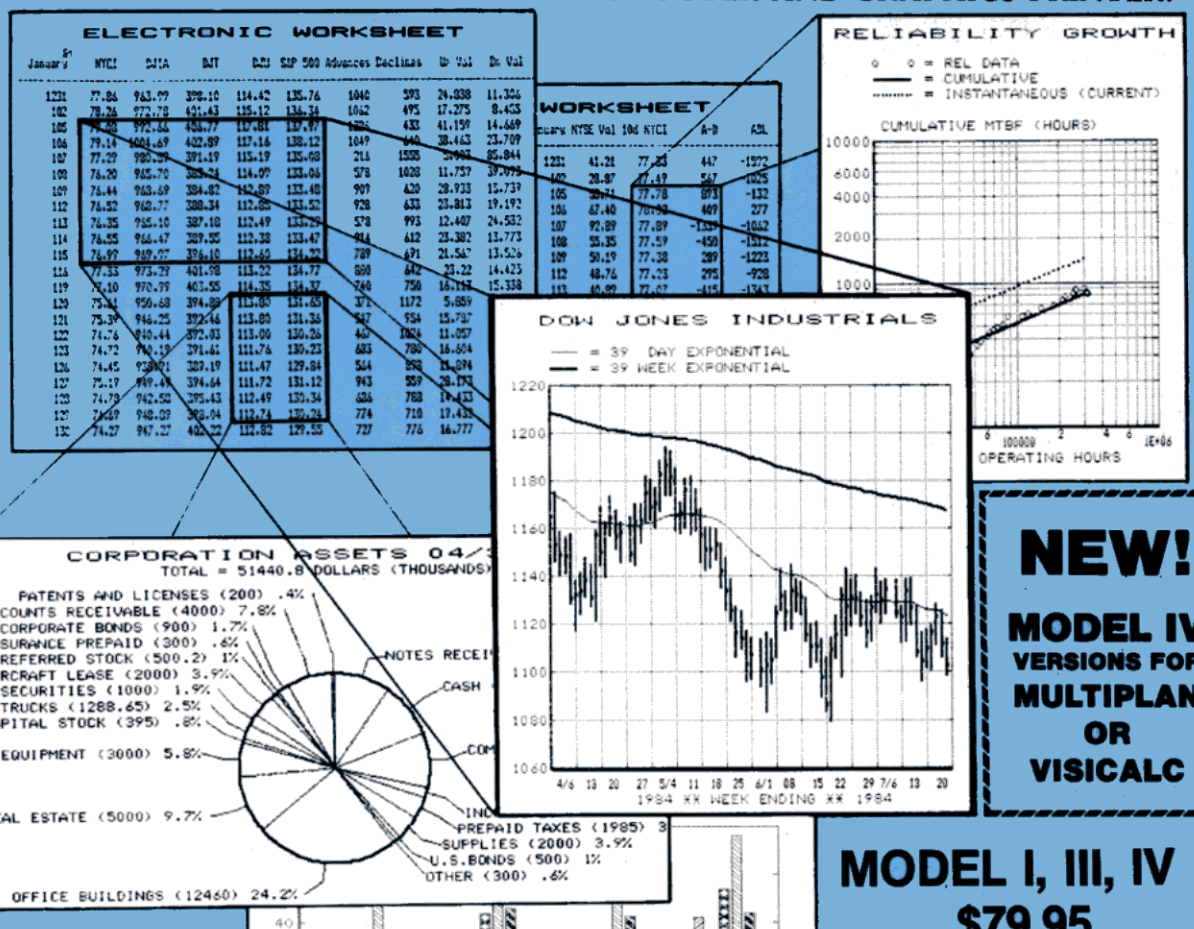

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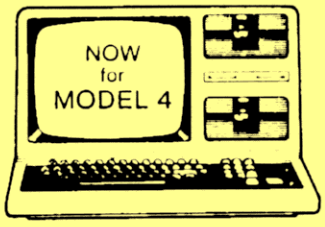

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Q: I've recently had trouble backing up disks on my dual-drive Model III. I follow the prompts as I always have, answering no to the reformat prompt. After the reading and verifying procedure starts, the computer gets stuck. A few moments later, input/output error and lost data messages appear on the screen.

I've done everything possible to avoid outside interference, and I've had the drive heads realigned. None of this helped. I've tried backing up the same disks on other computers and there wasn't any problem. Do you have any suggestions? *(Jon Handel, Los Angeles, CA)*

A: The problem could be your DOS. The back-up utility or the DOS itself could be damaged and the machine-code instructions flawed. An easy and quick test is to use the DOS on another computer and see if the problem disappears. If it does, the problem is not the DOS or the back-up utility.

The next possibility is that your destination disks may be at fault. I'd suggest answering yes to the reformat prompt. It's possible that one of the disk sector header bytes is slightly damaged, causing the DOS to reject the destination disk. By the way, when was the last time you had the drive heads cleaned?

Q: After buying two double-sided disk drives capable of running 40 or 80 tracks, I found out that TRSDOS 1.3 doesn't support two-sided disk reads or 80-track formats. Do you know of a patch to the DOS to correct this? If I have to buy a new DOS, which is best for this purpose? I don't need any other fancy features,

nor do I want to spend a lot of money.

On another subject, is there a program to move the calls on my machine-language software to high memory on my Model III? *(Chris Candreva, Rye, NY)*

A: Patching TRSDOS for double-sided 80-track drives isn't easy, and I don't know of any companies selling such patches, but I've been told that several people have done it. Can anyone help?

NEWDOS80 (Apparat Inc., 4401 S. Tamarac Parkway, Denver, CO 80237), DOSPLUS (Micro Software Systems, 4301-18 Oak Circle, Boca Raton, FL 33431), LDOS (Logical Systems Inc., 8970 N. 55th St., P.O. Box 23956, Milwaukee, WI 53223), and MULTI-DOS (Cosmopolitan Electronics Corp., P.O. Box 234, Plymouth, MI 48170) all support 35-, 40-, and 80-track, single- and double-density, and single- and double-sided drive operation. If your controller can handle them, NEWDOS80, DOSPLUS, and LDOS also support 8-inch drives.

LDOS is currently the least expensive operating system at $69. MULTI-DOS ($99) is the easiest to use as it conforms the most to standard TRS-DOS 1.3 syntax.

You won't find a program to move addresses. The problem is that many jumps are to absolute addresses, such as subroutines and messages to the operator. Some programs also contain jumps to ROM and low-memory areas. The only way I know of to move addresses is to disassemble the target program, manually change the addresses, and reassemble the program to the new location. Any other suggestions?

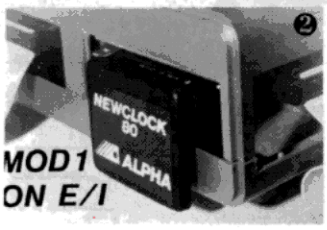
Q: I'd like to use Larry Hamilton's book inventory program in the November 1982 *80 Micro* ("Homebrew Librarian," p. 436), but it's for a Model I cassette system and I own a Model III with two disk drives. What would I need to change to store my data on disk? *(David E. Myers, Childress, TX)*

A: First, replace line 670 with a prompt for the data's file name, and add an Open command for the input statement immediately afterward. Change the INPUT#–1 statement in line 690 to INPUT#1. Then, add CLOSE#1 to the beginning of line 750. Now put a file name prompt in line 900, immediately followed by an Open command for the output statement. Change the PRINT#–1 statement in line 940 to PRINT#1. Add CLOSE#1 to line 970 and change "File copied to tape" to read "File copied to disk".

That should do it, but a straight conversion like this tends to waste space on your disk. For a better conversion, change the INPUT statement to LINEINPUT, and remove the commas as data field separators, using CHR$(13) and semicolons instead. This compresses the data as much as possible on the disk and also lets you use commas inside the field items. Good luck.

Q: I've never seen an article about using 4164 chips in place of the 4116s common in the Model I. The 4164 appears to have the same pin layout with a few exceptions (see the

Newclock-80 $69.95



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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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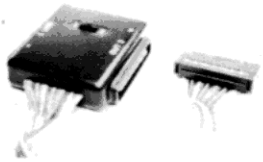

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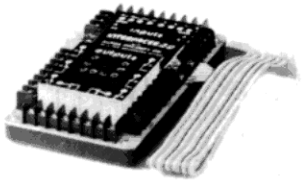
Interfacer-80 $159.00



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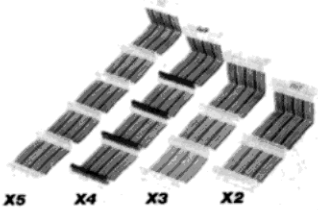
Special Cables



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Disk drive cable (34 pin): • 2-drive...**C162:**$32 • 4-drive...**C163:**$45
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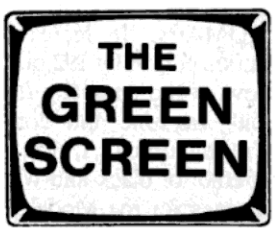

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4116	4164
1	?
2 & 14 shorted on both	
WR	R/W
4 RAS	4 RAS
8 + 5v	?
9 + 12v	9 A7
10 to 12 A5, 4, ?3 on both	
13 CE/A6	13 A6
15 CAS on both	
16 Gnd	?

Table. Pin layouts of 4116 and 4164 chips.

Table). It seems that some judicious trace cutting would be a good start. Would this change (and one or two others) be effective in increasing memory capability? *(C.G. McProud, Lehigh Acres, FL)*

A: Yes, it's possible to convert 4116 sockets to 4164s, but I don't have the technical knowledge to tell you what to do. Does anyone know how to do this modification?

Q: I'm trying to track down the address of a company called Progressive Computer Products. Apparently, they made floppy drive controller boards for the Model III. I'd appreciate any clue you might offer about the company's whereabouts. *(Brian W. Voth, Urbana, IL)*

A: Sorry, Progressive Computer Products seems to have gone out of business, but I found another company, Progressive Electronics, that sells a Model III floppy disk controller board that handles both 5 ¼-inch and 8-inch drives. The controller retails for $149. Their address is 504 E. Main St., Lancaster, OH 43130, and the phone number is 614-687-1019.

Q: I own a cassette-based Level II Model I. I want to upgrade its graphics capability. I'm particularly interested in Micro Control Systems' CHROMAtrs. It increases graphics resolution to 256 by 192 pixels in color. I know of the company only through an old magazine and don't know if they're still around. If not, what about other color or black-and-white graphics expansions for the Model I? *(Craig L. Cole, Circleville, NY)*

A: Unfortunately, Micro Control Systems is no longer in business, and I don't know of any other companies that make color boards for the Model I. Does anyone else know of any color or black-and-white graphics expansion boards?

Q: I have some questions regarding Langley-St. Clair's replacement monitors. I have a Model III with Radio Shack's hi-resolution graphics board. Can the replacement monitors handle 640- by 240-pixel resolution? Also, what is the dot pitch of these monitors? What is fast, medium, and slow decay and how does it affect the way the monitor performs? *(W.R., Waukegan, IL)*

A: The replacement monitors are almost identical to your computer's original monitor. If the original can handle the higher-density graphics, then so can the Langley-St. Clair monitors. I have no idea what you mean by dot pitch (and neither did the Langley-St. Clair technician I asked about it), since the dots are supposed to be perfectly round and flat against the glass screen.

The fast, medium, and slow ratings given to CRTs are relative terms because the phosphor doesn't instantly turn on and off. Instead, when the electron beam hits it, the phosphor flares quite brightly, then diminishes in brightness along a logarithmic scale (fast at first, slower toward the end). The fast phosphor monitors (type P4 is black and white, type P31 is green) have a glow time of .0024 seconds. The P31 is slightly slower than the P4 tube, varying from .0024–.01 glow times, depending on the exact chemical composition of the tube, but it still spends more time off than on.

The medium-amber tubes, P134s, have a glow time of .003 seconds or more. While this is longer than the P4 tubes, it isn't as long as some P31s.

The slow green monitors (P39s and P42s) have a glow time of .33 seconds, lasting until the next scan strobe arrives.

For most people, the P31 green screens or P134 amber screens seem to be the best choices. The fast phosphor green screen doesn't seem to be as harsh on your eyes as normal black-and-white monitors, and some people prefer the green to the amber.

Q: I think you missed the reason for D.M.W.'s problems with the USR command (September 1984, p. 16). Several of my readers have written with similar experiences (error message and exits to DOS), so many, in fact, that I've sometimes considered printing up a form letter reply.

Under any Model I/III DOS, Basic uses the top 256 bytes of available memory as a loading buffer. Even if you enter a memory size on the Basic command line (for example, – M:xxxxx) or at the memory size prompt, it's already too late to protect machine-language routines stored at the top of memory. They've been overwritten and are gone.

The solution is to set high memory before invoking Basic (with the TRSDOS 1.3's Clear command, for example), load the routines after entering Basic, or write the routines so that they're self-relocating and self-protecting.

To add confusion (and it took a while for Jim Kyle of the Software Factory to find the reason for this bug and a solution for it), TRSDOS 1.3's Do command ignores the current high memory value completely. If you load and protect a machine-language routine and then enter Basic with a Do Command, a seemingly easy way to perform several necessary steps, the high-memory routines will still be garbled. *(Hardin Brothers, Upland, CA)*

A: Thank you for sharing your discoveries. I didn't realize Basic used those bytes during loading.

Q: I've heard that somewhere in this world there exists a speed-up chip that gives the Epson MX-80 a printing speed of more than 80 characters per second. Know anything about it? *(Bernadette M. Kennelly, Pittsburgh, PA)*

A: That's a new one for me. Can anyone help out?

Q: I have an LNW-80 computer and a Diablo 1620 serial printer that uses ETX/ACK protocol. I want to run the printer at 1,200 baud through the RS-232 interface. I've been unable to get a serial driver that will handle the ETX/ACK protocol. I've contacted LNW and Xerox to no avail. If someone who has a driver is willing to share, I'd be very grateful. I'm also willing to pay for a program

or to pay someone to write one. *(Robert J. Aubrey, Massena, IA)*

A: Suggestions, anyone?

Q: I bought an RX-80 printer and it's great, but it doesn't have block graphics. I've tried unsuccessfully to work with the RX's bit graphics. I'm hoping that one of your readers, better versed in Basic than I, may have worked up an RX screen dump for graphics as well as text. *(James Criscimagna, Leesburg, FL)*

A: Does anyone have a graphics screen-dump program they wouldn't mind sharing with Jim?

Q: I'm considering buying a Model 4 for word processing, but I've found a major flaw in SuperScripsit. I'm writing a dissertation and must know where page breaks fall so I can position footnotes. I formatted a document for double line spacing and then changed an entire paragraph to single spacing. As I moved the cursor through the text, the line-spacing indicator changed from 2 to 1 and back to 2, but the line counter continued to be incremented by twos, and the top-of-page feature showed me the same "next page" as it had when the entire page was double-spaced.

Do you know of a patch to correct the problem? If not, do you know of an alternative word processor that shows page breaks correctly in the Editor mode? *(Duff Kennedy, Santa Barbara, CA)*

A: I don't know of any patches to SuperScripsit that do what you want. Does anyone else? Nor do I know of another Model 4 word processor that gives you page-break information. However, Allwrite (ProSoft, Box 560, N. Hollywood, CA 91603) lets you type footnotes immediately after the word, phrase, or sentence they reference, then automatically makes room for them when printing the page.

Q: M.J. Mockler asked about an overflow error encountered while attempting to POKE a machine-language routine into core locations 32752-32767 using a For...Next loop. M. J. was able to correct the problem by looping from 32751-32767 and computing the POKE address as the loop variable plus 1, but didn't understand why that worked. I think your response overlooked the problem's most likely cause.

In a For...Next loop, the loop variable increments when Basic encounters the Next statement and compares the result to the upper limit. If it exceeds the limit, the loop terminates; otherwise it repeats. If you define the loop variable as an integer in a DEFINT statement and subsequently use it in a loop with an upper limit of 32767, the Next statement tries to increment the integer 32767 the last time through the loop, producing an overflow. The fact that a POKE is executed within the loop is irrelevant.

Based on this explanation, it's likely that changing the loop limits would remedy the problem. Another way is to use a single-precision variable to control the loop. The same For... Next loop would work fine if the loop variable weren't defined as an integer. Perhaps this was the case in the reader's other program, which ran without error. *(Robert W. Miller, Stow, MA)*

A: You're right, that is the explanation. Don't know why it didn't occur to me.

Q: I have a Model 4 and use cassette Scripsit 3.1 for word processing. Do you know why the program crashes about one time out of 20 or 30 when I save copy to tape? I don't think it's my machine, because a friend's Model III does the same thing using a different copy of the same program. *(James Merlini, Montgomery AL)*

A: Since it's an intermittent problem, I doubt that the program or the computer is at fault. It could be that power line fluctuations (refrigerator, air conditioning, and so on) send voltage spikes through the equipment and foul things up. The only practical solution is to use a scratch tape for periodic file saves while writing so you won't lose too much of the file in the event of a crash.

Q: I'm trying to connect my Model 4P to an IBM mainframe host. I use a protocol converter to make the micro's asynchronous communications protocol compatible with the mainframe's bisynchronous communication. However, the protocol converter requires that the micro emulate one of the following terminals: DEC VT-100, IBM 3101, Televideo 910, Adds Viewpoint, or Lear-Siegler ADM-3A/5. I can't find a Model 4P communications program that provides any of these terminal emulations. Do you know of one? *(Dick Moore, Wilmington, DE)*

A: I know of only one: Logical Systems' LS-HOST/TERM, which uses TRSDOS 6.X.X as its operating system and operates as an ADDS-25 terminal emulator. It costs $199.

Q: I have a 48K Model I with a single drive operating under TRSDOS 2.3. I also have a data disk full of machine-language programs. To run the programs, I have to copy them to a disk that has the DOS on it, or copy the DOS to the data disk. I can't copy with one disk drive; the Backup utility will reformat the disk with the DOS on it. I've seen single-drive copy programs in *80 Micro*, but they require a DOS to open the files to be copied. ARRGH!

Also, do you know of a way to modify Radio Shack's cheap color mouse to work on my Model I? *(Joseph W. Howard, Cleveland, OH)*

A: The two possible solutions to your dilemma are to get a single-drive copy utility or get a DOS that will let you make single-drive copies. The best copy utility is Super Utility Plus (Powersoft, 11500 Stemmons Freeway, Suite 125, Dallas, TX, 75229). It also lets you copy a file, or group of files from one disk to another without losing a byte or requiring a DOS on either disk.

As for the non-Tandy DOSes, NEWDOS80, DOSPLUS, LDOS, and MULTIDOS, all of them support single-drive file copying. See my answer to Chris Candreva's letter above for manufacturers' names and addresses. ■

Terry Kepner is a freelance writer and programmer, and an associate editor of 80 Micro. *He's been writing about microcomputers since 1979.*

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Then with the press of a button, the program generator takes over and does all that complex coding for you in a matter of minutes. The result is a complete program, capable of running by itself. That means your customized programs may be used independently of The Producer. (A feature not possible with Data Base creations.) You may duplicate your Producer generated programs and even sell them for others to use, without paying royalties.

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Later, if you have need for more specific information, you can turn to the fully indexed Producer Reference Manual. The 200 pages of documentation cover virtually any question you may have so you will never be left guessing what to do next. The Producer package also includes a quick reference card to streamline your program operation and, should you ever need technical assistance, you may call a Producer Software technician for free counsel and trouble shooting.

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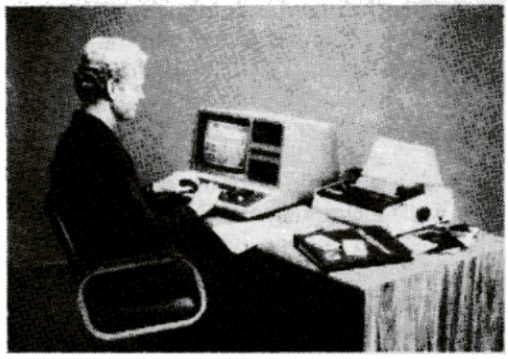

Producer Software, Box 1245, Arlington, Texas 76004

And Baby Makes Three: The Tandy 200

edited by Bradford N. Dixon

Introducing new computers is getting to be a habit with the people at Tandy. The debut of the Tandy 200 last month marks Tandy's third computer unveiling since September 1984.

The 200, priced at $999, is Tandy's long-awaited enhanced version of the Model 100 briefcase computer (see Photo 1). Its firmware features MS-Plan, a full-function, 63-column by 99-row version of Microsoft's Multiplan spreadsheet, and an improved text processor that provides better page formatting. The screen is a 40-column by 16-row liquid crystal display. Standard RAM is 24K, and expansion ports support two additional 24K memory banks.

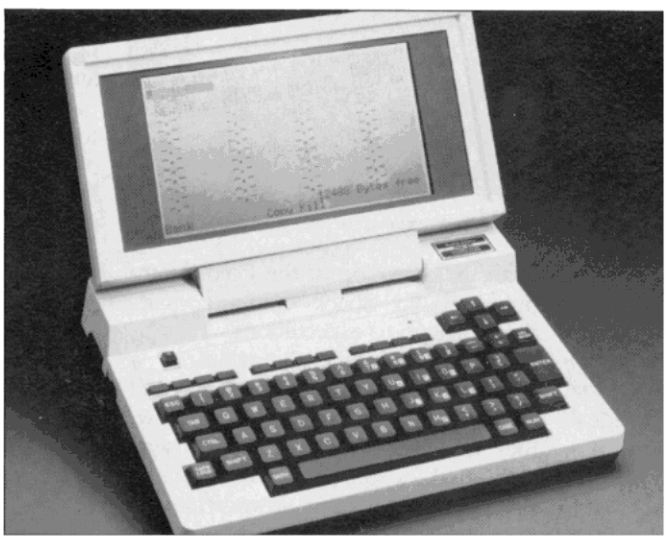

Photo 1. The Tandy 200.

Other enhancements include optional NiCad battery operation, an improved cursor key cluster at the keyboard's top right-hand corner, and a calculator function. The text program now has a list function that performs string searches in .DO files.

The 200 has the same ROM-based software and menu screen as the Model 100, along with a bar code reader port and an internal 300-baud modem. The expansion bus, awkwardly positioned on the bottom of the Model 100, is on the back of the 200, next to the parallel printer port. Users of Radio Shack's disk/video interface or other portable disk drives will appreciate the change.

The new computer is wider and perhaps a half inch thicker than the 100 to provide room for the new hardware.

That's the good news. The not-so-good news is that the 200 isn't 100 percent compatible with its predecessor. Radio Shack's Director of Market Planning, Ed Juge, told *80 Micro* that Tandy aimed for 100 percent compatibility but didn't quite achieve it. The 200 runs Model 100 programs only if they're straight Basic, without any PEEKs, POKEs, or USR statements. Machine-language Model 100 programs probably won't work either, because the new machine's addresses are different from the 100's.

When *80 Micro* asked Juge if Tandy expected to discontinue the Model 100, he said the company had no immediate plans to do so, so long as the older portable continues to sell and be profitable.

The Tandy 200 may not be the super portable featuring a disk drive, MS-DOS, and 256K of RAM that some Tandy watchers hoped for, but it does follow Tandy's winning formula of low price, performance, and ease of use. And that may be all it needs to find acceptance in the marketplace.

Tandyland

Industry analysts' reaction to Tandy's fall 1984 introduction of its 1200 HD computer was lukewarm. Ken Churilla of San Jose-based Creative Strategies thinks marketing the IBM PC/XT-compatible will be a "real challenge" because of Tandy's traditional association with low-end, small-business users.

Lloyd Cohen of International Data Corp. in Framingham, MA, thinks Tandy may have hitched its wagon to a falling star. Cohen predicts PC/XT sales will drop because of IBM's introduction of the PC/AT. He argues that the 1200 won't attract prospective corporate buyers because they'll get service discounts for adding PC/ATs to their PC fleets and won't care that the 1200 HD is $1,000 cheaper.

When the same experts were asked if the 1200 would affect sales of Tandy's Model 2000, most followed Tandy's logic by noting the performance differences between the two machines. As Barbara Isgur, a securities analyst with Paine Webber Mitchel Hutchins Inc., put it, the 1200 won't cannibalize sales of the Tandy 2000 because "people will appreciate the faster speed and better display" of the 2000.

Rumors about mass storage for Radio Shack's Model 100 shifted focus from floppy disks to wafers last fall, after Entrepo president Bob MacDonald said his company was working on a wafer storage system for Tandy.

When *80 Micro* asked Radio Shack's Model 100 line manager Stewart Weinstock about a wafer drive from Entrepo, Weinstock said he had no knowledge of such a project. Weinstock said wafer systems offered some solid advantages such as low power consumption, light weight, and small

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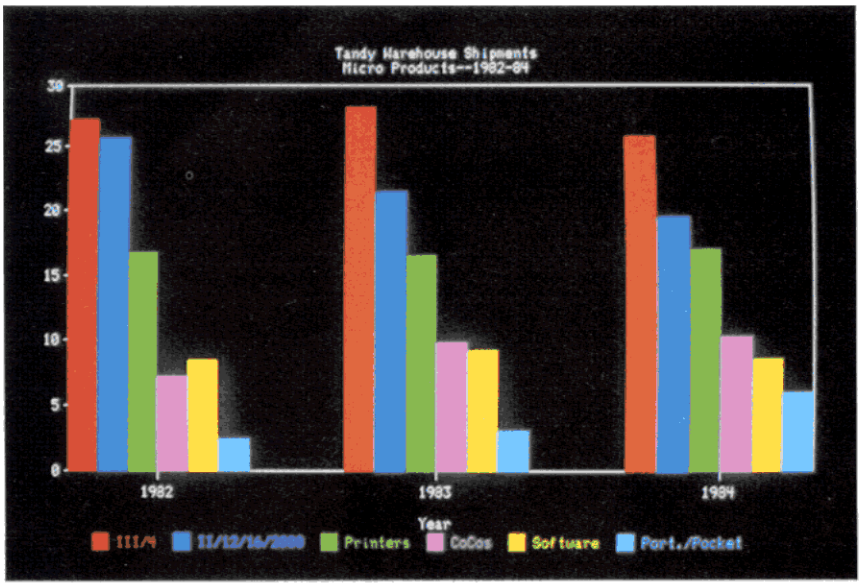

Photo 2. Tandy's fiscal 1984 warehouse shipments.

size, but that in the past, they've exhibited a read/write accuracy problem.

Weinstock did mention, however, that he was looking for another Model 100 mass storage device similar to the present disk/video interface. The ideal unit would be a bit more portable, use both ac and battery power, and support video capability. Weinstock went on to say that although the technology for the product was under research, no such product could be expected until late in the first quarter of 1985.

You see plenty of Model 100s on Eastern Airlines' New York shuttle, so why not on the space shuttle? The space shuttle Challenger's October 1984 mission included experiments measuring the earth's atmosphere using Radio Shack's briefcase computer.

Canadian astronaut Marc Garneau used the 100 with a sunphotometer to measure solar radiation and the effects of volcanic haze on earth's atmosphere. Garneau linked the sunphotometer to the Model 100 via a cable connected to the computer's RS-232C port. Periodically, he downloaded data from the sunphotometer to cassette tape for storage.

NASA tested the Model 100 for electromagnetic and toxic gas emmisions before approving it as the second portable computer qualified for space shuttle missions; the GRiD Compass was the first portable to make a shuttle trip.

Tandy's 1984 annual report had some disappointing news for stockholders: With the exception of the Color Computer, Radio Shack computer sales didn't live up to expectations.

Using warehouse shipments as a measure, Tandy said that not only did computer product sales fail to grow, they declined. Computer-related sales accounted for 33.6 percent of all Tandy shipments, 1 percent lower than in fiscal 1983. Tandy blames a variety of factors for the drop, including increased competition, price reductions, delays in product introductions, and semiconductor shortages.

The Models III and 4 accounted for 25.8 percent of Tandy's computer-related shipments, followed by the Model II/12/16/2000 lines with 19.4 percent. Radio Shack's Color Computer line was third with 10.3 percent, while portable and pocket computers chalked up only 6 percent. Printers, software, and miscellaneous products made up the remaining 48.8 percent (see the Fig. and Photo 2).

MicroTrends

What's with home computer users? According to Tricia Parks of Future Computing, 16 percent of all U.S. households will have computers by the end of 1985. The Dallas-based research company has come out with a report profiling home users and detailing what models they own, what they like and dislike about their systems, and what they use them for.

The report, called "Consumers and Computers 84," costs $12,000, but you can guess at its findings in this Pulse Train quiz. Answer true or false to each statement below:

1. Home computer owners look for ease of use, then for other product features.
2. Home computer owners are more satisfied with productivity applications than with other types of software.
3. The typical home computer owner is dissatisfied with her product.
4. Owners of high-end home computers and owners of low-end home computers read the same magazines.
5. After the novelty wears off, most home computers end up in the closet and are rarely used.

According to the report, the answer to each statement is false.

Future Computing broke down home computer owners into three groups: the home group, the straddlers, and the office/home group. Those in the home group usually own under-$600 systems with 64K or less of RAM like Commodores, Ataris, or Radio Shack Color Computers. The home group is most interested in computer literacy, personal enrichment, child education, and games.

Straddlers typically own an Apple II, a TRS-80, or a PCjr with 64–128K of RAM, and they spend about $1,650 on their initial computer purchase. Home computerists in this group prefer home and business management, word processing, personal enrichment, and child education applications.

Office/home owners are relative high rollers, spending $3,500–$4,000 for IBM PCs, Apple IIIs, Macintoshes, or other high-performance computers which typically have 128K or more RAM. Office/home users are mostly concerned with household and business management, word processing, and communications.

Now you know where you fit in the computer caste system. ■

Model	1984	1983	1982
III/4	25.8	28.1	27.2
II/12/16/2000	19.4	21.4	25.7
Color Computers	10.3	9.8	7.2
Portable/Pocket computers	6.0	3.1	2.5
Printers	17.0	16.5	16.7
Software	8.6	9.2	8.5
Other	12.9	11.9	12.2

Figure. Tandy's computer and computer-related shipments for fiscal 1982–1984.

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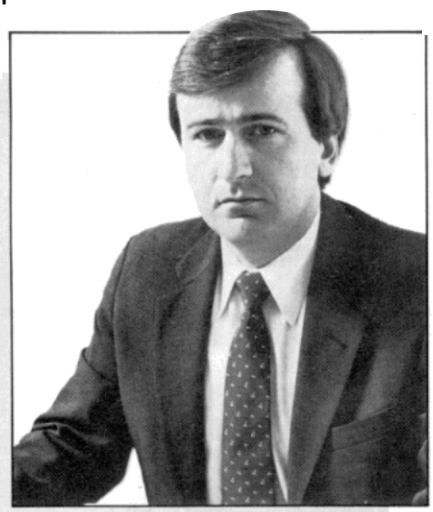

Ovation's president, Thomas Gregory.

October 15, 1984, was supposed to be the day Ovation Technologies of Norwood, MA shipped its highly acclaimed integrated software, also called Ovation, for the IBM PC and Tandy 2000 (see Pulse Train, October 1984, p. 21). Instead, on that day the *Boston Globe* reported that the company had laid off all but two employees and wouldn't release Ovation in the foreseeable future.

The Oct. 29, 1984, *Mass High Tech* traced the history of Ovation's rise and fall, a story of particular interest to Tandy 2000 owners, because the product was billed as the brightest star among software packages for the 2000. It was to be a state-of-the-art integrated program with five modules: a word processor, graphics module, 7-million-cell spreadsheet, terminal program, and data base manager. Ovation was an ambitious undertaking that, during its 20-month life, cost $6.8 million.

In December 1982, four partners founded the company, including Thomas Gregory, who was named President (see the Photo). His goal was to produce a powerful yet easy-to-use integrated business program, aimed at "knowledge workers" who didn't want to deal with 1-2-3's or Symphony's complicated commands. Gregory was able to raise $1.3 million in research and development capital, but his team of investors stipulated that they would own the software, while Ovation Technologies would retain exclusive marketing rights.

In March of 1983, Robert D. Kutnick came to Ovation to head up the software development staff. Programming began in earnest in June; however, design work continued even after coding had begun. The business plan called for the product to enter the market during the first quarter of 1984.

Ovation introduced its business application on Oct. 18, 1983, which was supposed to be the date for beta shipments. The product was nowhere near that stage, however, and Kutnick pulled off a press demonstration of the product with a hardwired demo. Nonetheless, industry experts and the press enthusiastically received the product.

With November came Comdex and Tandy's entry on the scene. Tandy was about to unveil the Model 2000 and Tandy and Ovation benefited from each other's projects. Even at Comdex, Ovation had to hardwire their demo, but at least according to Gregory's side of the story, Kutnick still maintained that a first-quarter delivery date was possible.

Kutnick says he was told to have Ovation ready by the first quarter, but he says by November he was feeling uncomfortable with the deadline. By December, the company had run out of money and was surviving on a $1 million line of credit secured by the four founders. Fortunately, more venture money came through by the end of 1983, giving Ovation a $5.5 million shot in the arm.

But new money didn't solve the company's problems. Ovation had to postpone beta shipments a second time, from January to April 1984, missing its first-quarter release. Product shipment was set for June 28, 1984. With Lotus Corp.'s Symphony scheduled to appear on July 2, the June 28 date loomed important to Ovation. But, by the end of March, the technical staff told Gregory that the project wasn't close enough to completion for beta testing and that Ovation would miss the new beta date.

On May 1, 1984, Gregory fired Kutnick. Gregory decided to scale down the software package by eliminating the communications and data base modules. By early July he realized that even the scaled-down version wouldn't be ready for some time.

The company announced no more completion dates, and in July laid off 50 employees, including some of the software development staff. A software audit, completed in August, showed Gregory that the software was still nine months from completion.

Layoffs continued until early October, when only Gregory and the company's financial controller, John McDonough, remained on board. Development on Ovation ceased; however, when *80 Micro* contacted Gregory in October, he said, "Ovation Technologies still exists and will continue to exist. The company will not file for Chapter 11 relief."

At the time, Gregory wasn't sure if he would try to raise money to continue the project or sell it as-is for another company to finish. He cited bugs as the main reason for the delays, but from stories emanating from the company's Norwood, MA, office, it's clear personality problems also played a major role.

Asked how Ovation compares to Symphony or Framework, Gregory insisted that his product is truly innovative as well as easy to use. Despite everything that's happened, Gregory remains hopeful that Ovation will somehow come to market...someday. ■

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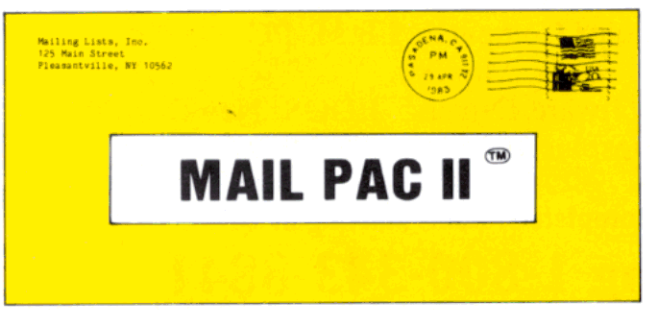

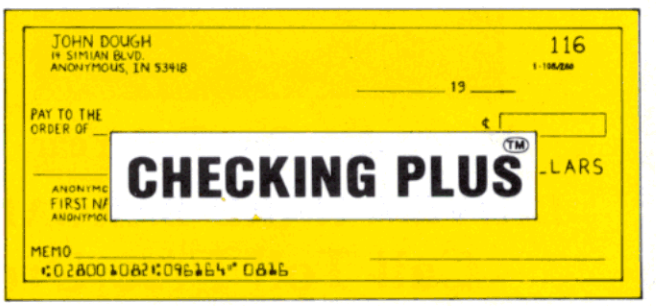

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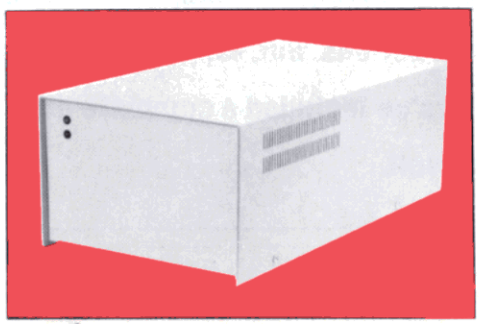

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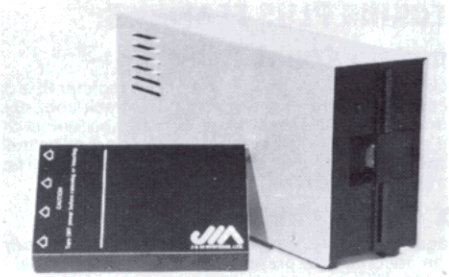

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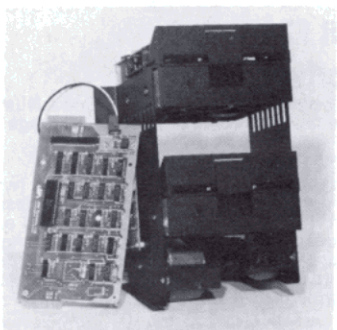

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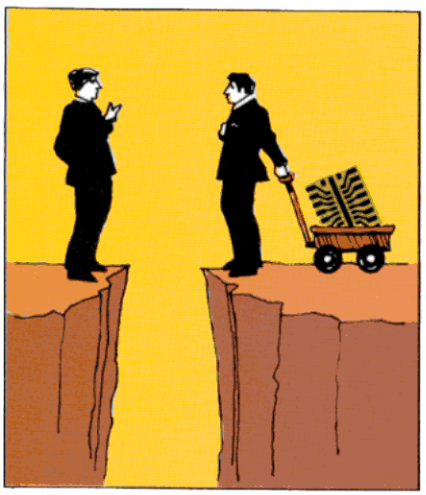
Model 4 Basic users (TRSDOS 6.1.2) can keep Basic from converting CHR$(9)s or horizontal tabs into a string of spaces with a POKE &H40FD,&H18 command.

This is especially useful when you're producing dot graphics on a printer as this is the only character that doesn't reproduce correctly.

Seth Monger
4694 Coos Bay Wagon Road
Roseburg, OR 97470

Printing Problems

When using the DWP-410 SuperScripsit printer driver with my DWP-210 printer in proportional space mode, I encountered this problem: Three characters (the hyphen, uppercase M, and uppercase W) on the proportional print wheel have a different width on the DWP-210. As a result, lines with these characters don't justify properly. Also, the bold print feature works incorrectly with these characters. You can correct the DWP-410 printer driver with the following patches in Model III TRSDOS:



```
PATCH DWP410/CTL (ADD=BAE2,FIND
  =08,CHG=0A)
PATCH DWP410/CTL (ADD=BB02,FIND
  =10,CHG=0E)
PATCH DWP410/CTL (ADD=BBOC,FIND
  =10,CHG=0E)
```

To avoid any confusion over drivers, change the name of the patched driver to DWP210/CTL and the printer type on existing documents to DWP210.

Matt Parker
P.O. Box 296
Grayson, LA 71435

A Change for the Better

Here's a short modification to MPBANK/JCL for Model 4 Multiplan that lets you see your storage disk directory before you enter Multiplan. My routine first sets up the Memdisk and gives you these three options: enter Multiplan without a file, display the directory in drive 1 and then enter MP and the file you want loaded, or exit to DOS. Line 6 sounds several tones that prompt you to enter your choice.

My method takes just a few seconds longer to run than the regular MPBANK, but the added options are worth the wait. You can also apply the program to Scripsit and Lazy Writer.

```
1 system (drive=2,driver= "MEMDISK")
2 D
3 D
4 Y
5 copy mp/bak mp/ovr:2
6 //ALERT 7,6,5,4,3,2,1
7 //. SELECTION MENU
8 //KEYIN 1 ENTER MP, 2 CALL DIR DR 1,
  3 EXIT
9 //1
10 MP
11 //2
12 DIR :1
13 // INPUT ENTER MP AND THEN THE
  FILE YOU WANT
14 //3 EXIT
15 //STOP
```

Lance K. Mertz
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Side Steps

Carl Oppedahl's "The Searcher" (C-Notes, June 1984, p. 157) discusses creating a program to redirect the Model 100's ADDRSS string Find

The following articles were inadvertently left out of *80 Micro*'s 1984 Article Index (December 1984, p. 198):

Author	*Title*	*Issue:Page*
Antunes, George	What's So Good About CP/M?	4:42
Brothers, Hardin	Making Your Selection: Choosing the Right Editor/Assembler	9:58
Lobdell, Gregory E.	A Better Breed of Basic	7:94
Wilson, C. David	Oops—Wrong Disk	4:160

The following reviews were inadvertently left off the 1984 Review Index (December 1984, p. 196):

Product	*Manufacturer*	*Issue:Page*
CP/M 2.2	Montezuma Micro	3:94
dBase II	Ashton-Tate	1:80
LC Compiler	Misosys	2:100
Secret Guide to Computers	Birkhauser Boston Inc.	10:36

In addition, Dan Robinson's "The Stripper" was published in July, not in June as stated in the Article Index, and the review of Nanos Systems' Reference Card for the CP/M System appeared in October, not in August.

80 Micro regrets these errors.—*Eds.*

function. I've found that you can sidestep the whole issue by naming D"(FILE).DO" as "ADRS.DO". This way, your document file becomes ADRS.DO.

Hamish Drummond
P.O. Box 310
Cayman Islands
British West Indies

Aid Forum

I'm running a TRS-80 Vidtex (Radio Shack catalog number 26-1588) as my terminal driver on a Model III, and need a patch that converts the left-arrow key from a BS (ASCII 8) to a DEL/RUBOUT (ASCII 127). I've disassembled the program, but can't find the keyboard look-up table. Also, any ideas where I could get a commented source to Vidtex or any equivalent assembler terminal driver?

Wayne Smith
Department of Accounting/M.I.S.
Cal State Northridge
Northridge, CA 91330

Can anyone help me locate a memory map? Computers exported to Germany contain a ROM different from the ROM referred to in *80 Micro*. Also, I'm interested in any Model 100 software, especially a Basic Compiler.

Hans-Heinrich Bast
Erbacher Str. 1
D-6200 Wiesbaden
West Germany

I belong to CompuServe and use a Model III with a Lynx modem. I bought Videotex Plus so I could download from CIS, but the software package doesn't seem to work. I get as far as "Data carrier restored" and the program quits. I'd appreciate any assistance.

Bob Eichel
515 Ash St.
Vandenberg AFB, CA 93437

I'm trying to find software connected with floor loom handweaving, particularly for looms with eight harnesses. The programs must be suitable for the Model 4P and a DMP-420 printer driver. My main interests are drawdowns, fabric analysis, and pricing calculations for raw materials.

Joel Kahn
Route 1 Box 129C
Mountain View, MO 65548

Error Trap

The photographs of the DMP-110 and DMP-420 printers are incorrectly labeled (Reviews, November 1984, p. 39). The printer in Photo 1 is the DMP-420, while the printer in Photo 3 is the DMP-110.

—Eds.

To correct the error in the Zap listings of J.L. Kissel's "Tape Transfer" (November 1984, p. 125), change the code at sector 00, offset C0 from 53 to 55.

Bob Hardy
71014 Austin Ave.
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DEBUG

The following routine corrects Dynaterm's clear buffer routine that deletes routines placed in high memory ("Smart Talk" by David M. Fischer, May 1984, p. 50):

```
11010 CLRBUF  NOP
11020         PUSH  BC
11030         PUSH  HL
11040         LD    HL,(HIMEM)
11045         LD    BC,EOP
11050         OR    A
11055         SBC   HL,BC
11060         LD    C,L
11065         LD    B,H
11070         LD    HL,EOP
11080         LD    DE,EOP+1
11090         LD    (HL),00H
11100         LDIR
11110         POP   HL
11120         POP   BC
11130         RET
```

Joe Johnson
P.O. Box 654
Middlefield, OH 44062

Four of the ROM routines in "Rooting out ROM Routines" (October 1984, p. 120) contain errors in the exit conditions. Here are the corrections for these ROM routines:

01C9H (Table 3): "All registers altered" should read "A register altered."
021BH (Table 3): In addition the registers listed, the A register is also altered.
0FAFH (Table 3): "A register altered" should read "All registers altered."
RST 18H (Table 5): The A register is destroyed.

Also, note that 28DH checks the break key, not 2BDH (p. 120, 6th paragraph).

Bob Covington
1239 Cheverly Court
St. Louis, MO 63146

Line 280 of Peter G. Savard's "Testing 1-2-3" (October 1984, p. 70) should read:

```
280 IFR=1THENC1=PEEK(PO):
POKEPO,95:FORI2=1TO10:NEXTI2:
POKE PO, C1:GOTO230ELSE200
```

—Eds.

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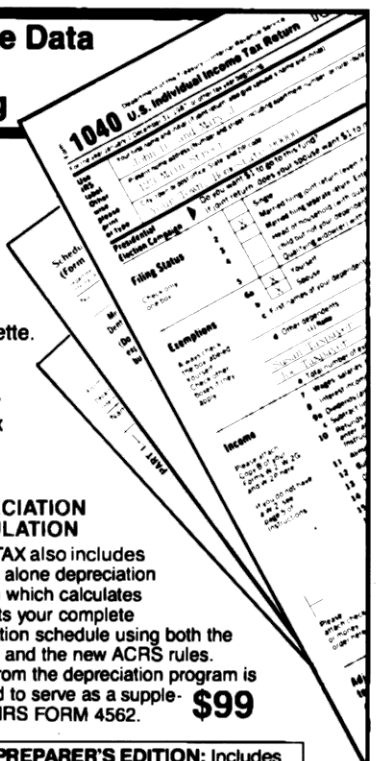

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Open Communications: Let's Talk Transfers Files

by Gary A. Shade

edited by Ryan Davis-Wright

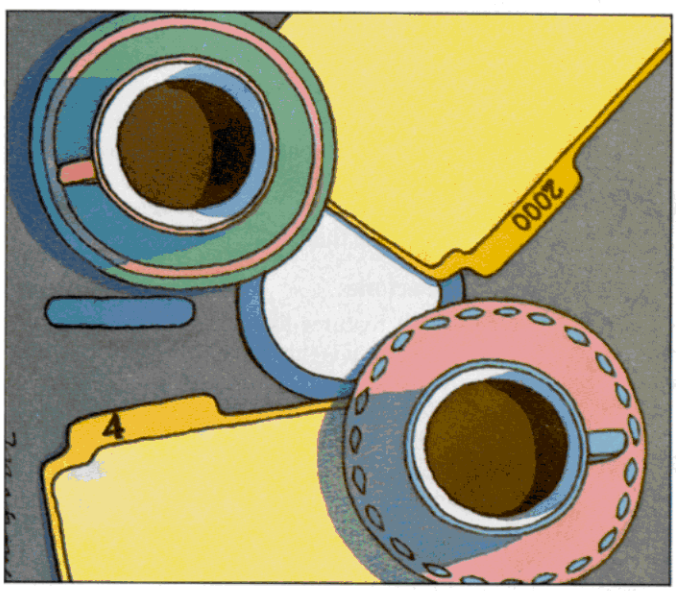

Illustration by Katherine Mahoney

In a world of multiple computer ownership, where compatibility is a big consideration, file transfer utilities are gaining in popularity and importance. Such utilities let you share data and programs between dissimilar computers. The arrival of Tandy's new MS-DOS machines (the 1000 and 1200) makes this type of utility especially important to TRS-80 users. If you own both an MS-DOS machine and one of Tandy's non-MS-DOS computers, you'll probably want to transfer data between them.

Let's Talk supports ASCII-file transfer between any two of the following computers: IBM PC/XT, Tandy 2000, Compaq and other compatibles, and the TRS-80 Models III, 4, II, 12, and 16 (this review was written before the 1200 and the 1000 were available). Let's Talk does a good job at its specific function. Unfortunately, it stops just short of being the panacea you would expect.

Let's Talk contains four master program disks, one for MS-DOS computers, one each for the Models III and 4, and an 8-inch disk for the Models II, 12, and 16.

I used a Compaq and a Model 4 (in both Model III and Model 4 modes) to test Let's Talk.

File Transfers

Installing Let's Talk is easy, since all you have to do is boot it up. You have to load Let's Talk into both computers involved in a file transfer. You can link the computers via modems (either locally or by telephone lines) or by a null cable (crossover). The manual explains in detail how to physically establish the communications link.

After you get the program running, you're prompted for a transfer baud rate. Let's Talk allows 300-, 1,200-, and 2,400-baud operation. Of course, you must set both computers to the same baud rate for communications.

Then Let's Talk asks if you want to be "consulted prior to the transfer of any files to this computer." Pressing the Y key in response triggers the receiving computer to intervene before each file transfer. At that time, you can specify a new file name for the file you're about to receive, and whether or not you want to overwrite any existing file that has the same file name. In this mode, you can't use either terminal unattended.

If you press the N key in answer to the consultation prompt, the computer initiating the file transfer prompts you for the file name you want transmitted and the file name the receiving computer should use.

Let's Talk displays a transfer status line at the top of each computer's display, informing the operator of the program's status and the communication's line status (quiet or link-established). The program offers three basic modes of operation:

- Quiet. Waiting for you to establish a communications link.
- Conversational. The link is established. Whatever you type on one computer automatically appears on both, letting you and the second operator communicate directly.
- Sending or receiving a file.

Either computer can initiate a transfer by electing to send or receive a file. You control the program in all modes of operation with a combination of the control key and another key.

Once you supply the file names, the file transfer begins without further operator intervention. Control-Q stops any transfer in progress and returns both computers to the conversational mode.

Save to ASCII

I used Let's Talk to transfer a 75,000-byte text file from a Compaq to a Model 4 without any problems. I also transferred other files of varying length from the Model 4 to the Compaq, again without a hitch.

You must save files not normally stored in ASCII format in ASCII prior to using Let's Talk. Although the user's manual says that "most files need no special preparation," it later states that Scripsit, Basic, Lotus 1-2-3, and some data base files may not be in ASCII format and must be converted. The exceptions, therefore, seem to be

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the rule. The manual contains ample explanations of the types of files you can transfer and where to find the information necessary to do so.

Since Let's Talk supports only ASCII file transfers, you can't transfer binary files. Other brands of file transfer utilities let you convert binary files to ASCII-hex files, which you can then transmit; after the receiving computer gets the file, the utility converts it back into binary format. However, Let's Talk lacks such a conversion utility.

Let's Talk

★★★☆

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

Basic Language Differences

The Model III normally stores Basic programs in compressed format, removing any spaces between keywords and variables. But the Basic implementation found on the IBM PC/XT, Tandy 2000, and Model 4 expects keywords and variables separated by spaces. Let's Talk provides a utility that "decompresses" Model III Basic programs by inserting the required spaces and puts the program in the proper format.

While your Basic program may now be in a compatible format, it possibly contains keywords incompatible with the different Microsoft Basic interpreters. Fortunately, Let's Talk's manual contains an entire section detailing keywords you may have to change before you can run a Basic program on a receiving machine.

Most of the programs I had on hand contained too many incompatible keywords for the Compaq's Basic interpreter. So I wrote a short, 50-line program in Basic on the Model 4 (in Model III mode), without spaces between the keywords and variables, and I avoided the incompatible Basic keywords. I then saved the program on disk in ASCII format.

After transferring the file from the Model 4 to the Compaq, I ran the Decompress utility, and it inserted the necessary spaces into the program. I could then run the program on the Compaq.

Let's Talk also offers support for programmable modems such as the D.C. Hayes Smartmodem and describes how to use them in the manual.

Remote Directories

One of the features listed in Good Software's manual is that "files can be sent or retrieved from an unattended computer." While this is true, you can't obtain a directory from the remote computer.

Imagine this: You're on the road and remember you need a file that's on your computer at home. Fortunately, you left it running Let's Talk.

You dial up your home computer with your portable, anxious to obtain that forecast and inventory report on disk at home. You're connected and on-line with the home computer, but you can't remember the names of the files you want to download. Let's Talk offers no provision for listing the directory of your home computer from a remote one. You have to know what files reside on the default disk before using Let's Talk.

The way to get around this is to obtain a hardcopy listing of the directory prior to initiating the file transfer.

The directory function (control-D) only works on the computer where you enter the directory command, and then it only displays the directory for the default drive. For example, if the default drive on your Tandy 2000 is drive A, you can't display the directory for drive B. This severely limits the program's utility in multiple drive systems.

Conclusion

My overall impression of Let's Talk is favorable. The program works as advertised and does so flawlessly. The 50-page manual is professionally packaged and contains all the information necessary to install and operate the program. An average or even novice user will only need about 30 minutes to become proficient with Let's Talk.

However, I feel the package doesn't quite merit the price tag it carries. If the program were priced around $80 (a more common price for utilities such as this), I could more easily recommend it.

There are several full-featured terminal programs that perform all Let's Talk functions and more. While they may not be as easy to use, you have a greater degree of flexibility in the types of data transfers allowed. If you have only two of the different types of computers supported by Let's Talk, the alternatives are more functional for about the same price.

The price of the package certainly reflects the stylish packaging and the fact that you get four program disks for the different computers it supports. If your business has multiple computers and you need to share ASCII files, you may want to check out Let's Talk. Just remember that Let's Talk is a file transfer utility and not a communications package. ■

Draftsman's Delight

by David L. Engelhardt

If you're a draftsman or if you just enjoy drafting, xT.CAD may be the program you've been dreaming about. This software package incorporates different modules that together give you a complete computer-assisted drafting (CAD) system. XT.CAD lets you create intricate pictures and diagrams and send them to a plotter for printouts. This CAD program works with any Model III or 4 with the Radio Shack high-resolution graphics board installed, and with Houston Instruments serial interface plotters DMP-29, -40, -41, -42, -51, and -52.

XT.CAD draws plots of up to 24 by 36 inches and features two display overlays, zooming, cursor speed control, single-key draw commands, display rotation, optional grids, and a help screen.

Setting It Up

All the necessary modules come on a data disk that you have to transfer to either a TRSDOS 6.1 or 1.3 disk that contains BASICG. The program provides two useful samples to familiarize yourself with the software and commands.

The documentation explains which modules on the BASICG disk you should purge to free up room for the xT.CAD programs. You also have to move the RS-232 driver to the target disk to control the plotter.

After setting up xT.CAD, you're instructed to test your graphics board with a program named HRGTEST, which comes on your BASICG disk. But you don't have to do this if you know your board's working properly.

HRGTEST takes about 20 minutes to check out all of the board's functions and capabilities. If you experience any errors, consult your Radio Shack dealer to have the problem corrected.

Point and Mark

XT.CAD supports any kind of drafting. The software contains five different-size tracing templates (labeled A–E) that correspond to the plotter paper you're using.

XT.CAD displays the E-sized tracing sheet as a default on start-up, with a scale of 10 pixels per grid unit (the represented screen size is 21 by 30 inches). You can also select 12 or 16 pixels per grid to change the scale, which is helpful in selected drafting applications requiring inch or pound scaling.

The two cursors, called Point (an arrow) and Mark (a square), define areas of the screen where you want to invoke xT.CAD commands. While you can position them anywhere on the screen, Point is the only one you control with the arrow keys. You move Mark by positioning Point to the desired location and hitting the @ key to move Mark to Point's position.

You can increase the speed at which Point moves by 1 to 10 pixels per keystroke. Moving one pixel at a time lets you accurately and precisely control resolution. For example, if one pixel movement represents 1 inch, then the speed set at 6 would represent 6-inch increments per keystroke.

You can draw circles of any size, four different types of lines, and even arcs by hitting the appropriate keys. You use xT.CAD's scaling system to divide the screen into 1-inch grids marked at every 10 pixels, or into fractional grids. The fractional grids further divide the screen so you can create more detailed drawings.

One useful xT.CAD feature is the magnification/zoom capability. You can expand any drawing up to 10 times its size. Since the normal scaling is 1X with 10 pixels per inch, a 3X zoom represents 30 pixels per inch.

You can create a drawing in whole or in part by using the zoom feature to decrease or increase the display. When you choose a desired zoom, xT.CAD clears and redraws the screen.

You may need to sketch without messing up a design on the display. If you decide you don't like the last item, you can erase it. This feature only pertains to the last item put on the screen. If you want to clean up the display by removing all sketch marks, hit the clear/space bar keys to clear the screen and redraw the original design.

XT.CAD lets you paint areas on the screen to enhance a display; you can fill in any area enclosed by solid lines. You can't reproduce painting on the plotter, but you can color in areas to see what a final drawing might look like.

Editing and Printing

You use the editing features to change an existing drawing, move items, and add to, erase, and correct displays. To pull an item from memory, you use the cursors to point to the item or section you want to edit. Once you locate it, you can zoom the display to enlarge it and make the necessary changes.

You define blocks using the Mark

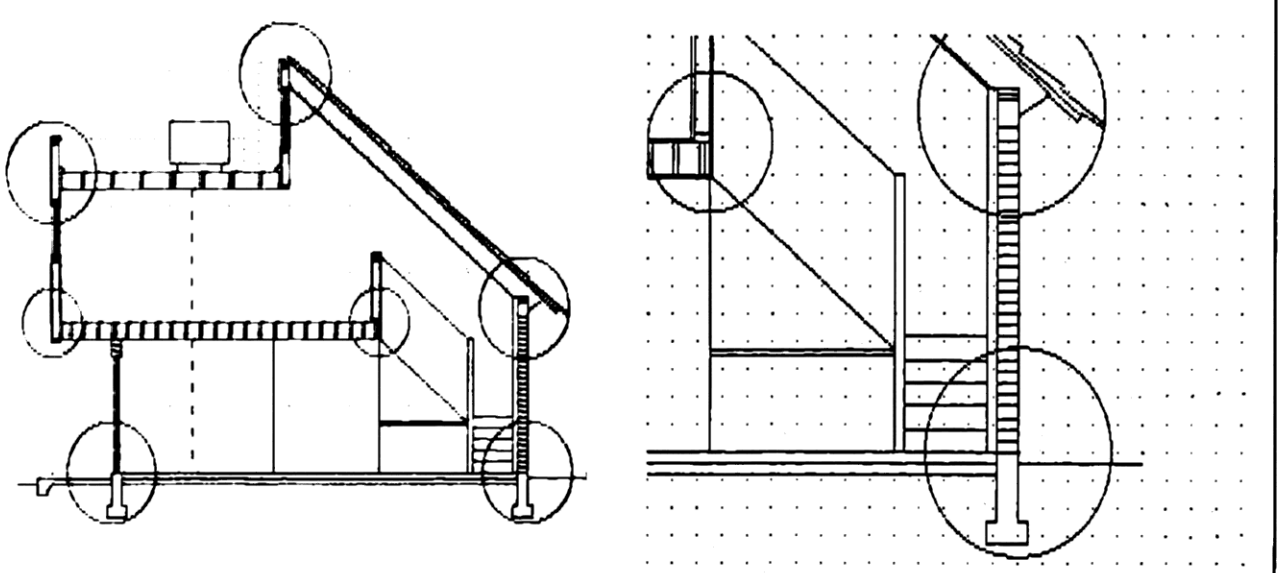

Figure 1. Magnification of drawing. Left is two times of original (2×), right is five times of original (5×). These are screen dumps onto a dot-matrix printer. A plotter would yield true circles and arcs.

and Point cursors to outline a rectangular area of the drawing. This allows you to expand, move, copy, zoom, and delete all or part of any display. You can copy an object to a different section of the screen, rotate it up to 360 degrees, or zoom in on a particular section.

You can change the drawing's position on the screen by shifting or panning the display window. The current window coordinates appear in the upper right-hand corner of the screen, and you can't shift a drawing beyond the edges of the computer's E-sheet.

Two overlay displays are available and you can call either or both at any time. This is useful if you want to create a display by superimposing all or part of another one you've created. For example, you can split up the overlays so that one contains drawings and the other text. You can also plot two overlays together, with each one plotted in a different color.

Display manipulations let you show both overlays separately, together, or swapped. You can draw only one overlay at a time and this is designated the "top" working overlay. You can't access the second overlay until you've entered at least one item into the memory of overlay 1.

XT.CAD also saves and loads displays to disk. Use prompts to select the target disk drive; once selected, xT.CAD automatically displays the directory for you.

If you've displayed both overlays on the screen, xT.CAD saves or loads only the top one. By swapping the two overlays, you can save or load the second one. A safety feature asks if you want to load a display with one currently in memory. Both cursors have to be in the upper left-hand corner (the home position) to load the displays into memory.

XT.CAD also lets you label text and insert it horizontally or vertically. This feature is useful for graphs and labeling parts. You enter all text at the bottom of the screen and xT.CAD marks the display with lines representing the direction and position of the text on the printout. It suppresses labels to prevent clutter. In some instances, they would be too hard to read when you use the zoom feature.

To print a display on the plotter, you must define the work area by a window marked with the two cursors.

I was impressed with xT.CAD's drawing capabilities and features. It makes the high-resolution graphics board truly useful.

You set up the window around the designated area in the same way you set blocks (positioning Mark at the lower left of the item and Point at the upper right).

You can reduce or enlarge a design as you're plotting it. You enter enlargement/reduction values as a percentage; typing in 200 enlarges the final copy to twice screen size while entering 50 reduces the display by one-half.

The default value is 100 percent of the original screen size. You may select any percentage value from 1-9999, but be careful not to make the value more than the size of the plotter paper or the plotter may hang up. The last value required before plotting is the paper size selection from A-E.

A help screen reminds you of xT.CAD commands. The screen contains a brief description of each command along with the key or keys that invokes it.

A Weak Manual

The manual is the weakest part of the system. It's short and broken up into different sections, each with its own numbering system. When you buy xT.CAD, the section that tells you how to create a disk and run the program is at the very back of the manual. This obviously should be located first. You can, however, easily rearrange the sections.

Since the manual is so brief, few examples are provided on how to use the commands. I found it difficult to understand the commands or how to use them. Examples would have helped immensely. Be prepared to spend some time by trial and error to become familiar with xT.CAD's capabilities.

Despite the manual's drawbacks, I was impressed with xT.CAD's drawing capabilities and features. It's the first commercial application I've seen that makes the high-resolution graphics board truly useful. This CAD program can benefit any draftsman or engineering firm that needs such an application. ■

xT.CAD

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by Wynne Keller

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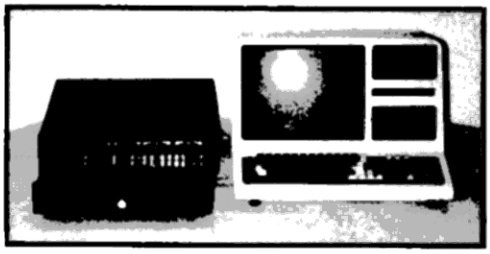

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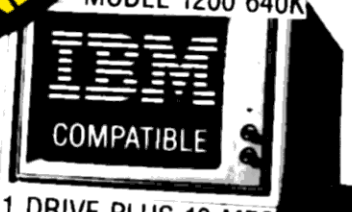

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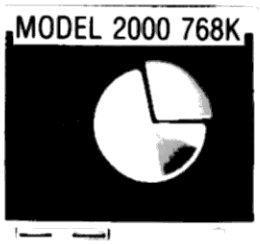

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notebook. The manual contains a brief overview of the system followed by a detailed description of each of the main menu options. It includes machine-specific instructions to back up and format Checkbook disks when you first start to use the program.

Checkbook comes with a subsystem of DOSPLUS called TDOS; the TDOS manual is included in the documentation for those unfamiliar with DOSPLUS.

Initializing the program is simple on the Model III/4: You simply back up the Checkbook disks and begin work. On-screen help is available by typing in an asterisk at any command prompt throughout the program. This brings you back to the main menu, where you select the Help option for the program section that's giving you trouble. The disk includes sample data so you can learn by using the system.

Using Checkbook Plus

When you're ready to set up your own checkbook, assign your checking account a three-letter code that will uniquely identify it. This code remains current until you select a new one. You can store more than one checkbook register per disk and you can move from one register to another without exiting the add mode.

When entering transactions, you work one month at a time. To change months, you make a menu choice and specify a new month number.

It's a good idea to select the starting number for your checks, since Checkbook Plus automatically increments the check number as you draw a new check. But you can override this convenient feature should you need to enter checks out of sequence.

You can check your balance from the main menu and you can manually change the amount, if necessary.

Before you start to draw checks, you have to enter the account names and numbers in the program; you're allowed up to 30 characters for the account name, and up to three digits for the account number. You can enter both expense and credit accounts, and you can group them logically according to your needs. You can also edit and delete any mistakes.

I was disappointed in the way Checkbook Plus handled the mechanics of data entry in the different sections of the program. After entering a new account, you press a key to verify that it's correct. Then you have to press another key to continue (taking you back to the account menu) and yet another key to add an additional account. The middle step here seems completely unnecessary. Pressing the key to verify entry should automatically take you to the menu. Better still, you could eliminate the third step as well, designating an escape key to exit the program.

If you have fixed monthly expenses, you can set up Checkbook for automatic payment. It will print your checks on set dates.

If you use a printer to write checks (using Checkbook Plus's Rapidforms, catalog number 2847), you should next enter the payee name and address. Checkbook Plus will print them so that you can use the checks with window envelopes.

If you have fixed monthly expenses, you can set up Checkbook for automatic payment. It will print a check to the payee you specify on a set date.

After these preliminaries, you enter your transactions. For each check, type in the date, payee, category, short comment, amount, and long comment. After you enter the date once, it remains the default until you change it. If you type any new digit in the date field, Checkbook erases the entire date. For example, in order to change the date from 06/06/84 to 06/07/84, you have to retype the whole date. Checkbook Plus's programmer should at least have left the year as a default when you change the day.

You enter the account number to which you want to assign expenses in the Category field. It allows a short comment of up to 15 characters, and up to 270 characters in the long field. However, the long comments wrap around on printouts and spoil the appearance of the report.

After each transaction, you may approve, cancel, edit, or add another. I found the edit function convenient because you don't have to retype the entire transactions when correcting errors. As Checkbook displays each line, pressing the enter key retains the old data; alternatively, you can type in new data.

I noticed a serious bug in this section of my review copy. The check amount wouldn't display correctly. If you pressed the enter key to accept the amount of a check, the program booted back to Basic. The manufacturer has since corrected this bug and new copies don't have the same problem. Owners of the bugged software can upgrade free.

Checkbook's More option is for a check or deposit you want divided among more than one account. For instance, say you write a check to the grocery store for $68.75, of which $19.89 is household expense and the rest food expense. For such a transaction, you should keep a calculator handy (which seems a little ridiculous to me since you're working with a computer). To enter the above transaction, you have to manually subtract the $19.89 from $69.75, then enter the two accounts as separate transactions. Later, when you print out the transaction, Checkbook Plus totals it, but it isn't totaled on-screen as you work. It would be easy to make a mistake so that the total doesn't add up to the actual amount of the check.

Canceling checks is easy and best of all, you can correct any mistakes.

Continued on p. 125

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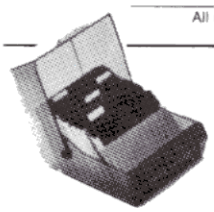

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THE GW DIFFERENCE

by Jim Heid

Basic differences explained—what Model I/III/4 and Color Computer programmers need to know to write GW-Basic code.

The Model 1000's DOS and hardware may be alien territory to most veteran TRS-80 users, but its Basic programming environment is familiar turf. Microsoft's GW-Basic is essentially an expanded version of TRS-80 Basic rather than a brand-new language. That means you can easily convert most of your Model I/III/4 and Color Computer programs to run on the Model 1000.

In this article, I'll take a brief look at GW-Basic's main features, spotlighting functions that may be new to the Model I/III/4 or CoCo programmer. I'll also give you some guidelines for converting traditional TRS-80 Basic programs to the Model 1000's GW-Basic format. (For an introduction to GW-Basic on the Model 2000, see "A Better Breed of Basic," July 1984, p. 94.)

GW-Basic is compatible with IBM's Advanced Basic, even though GW-Basic resides entirely in RAM on the Models 1000 and 1200. The IBM PC's Basic is partly ROM-based, like Radio Shack's Model I/III Basic.

When you enter GW-Basic, the first thing you notice is its full-screen editor. No more agonizing over TRS-80 Basic's single-line editor with its Hack-and-Insert, Extend, and Search-and-Kill commands. To edit, you simply type in new text over the old. For major changes, use the insert and delete keys. You can even change line numbers by typing in the new number over the old one and pressing the enter key. Duplicating program lines is a snap.

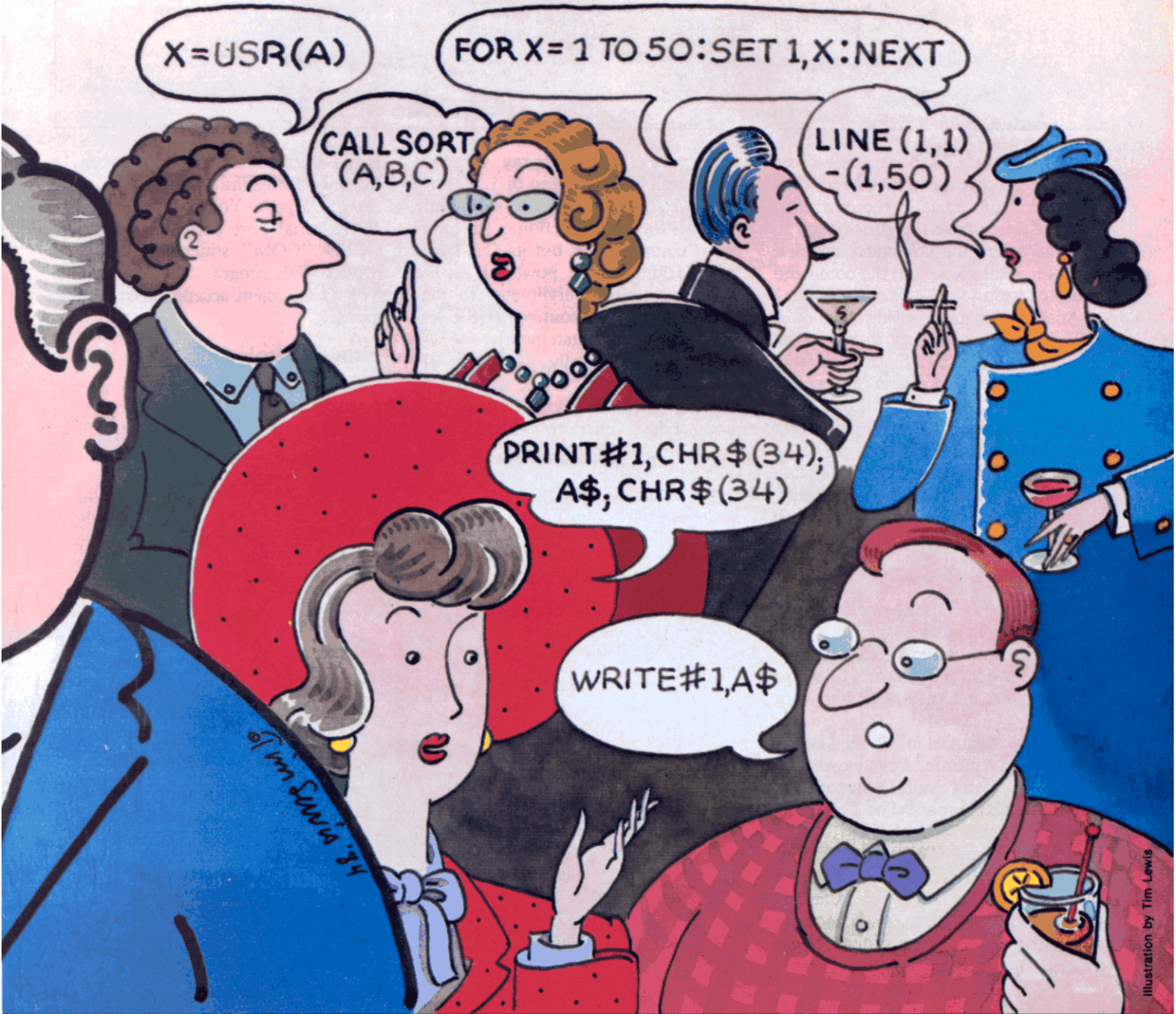


Illustration by Tim Lewis

ABS	DATA	GET	LPRINT	POKE	STICK
AND	DATE$	GOSUB	LSET	POS	STOP
ASC	DEF	GOTO	MERGE	PRESET	STR$
ATN	DEFDBL	HEX$	MID$	PRINT	STRIG
AUTO	DEFINT	IF	MKD$	PRINT#	STRING$
BEEP	DEFSNG	IMP	MKI$	PSET	SWAP
BLOAD	DEFSTR	INKEY$	MKS$	RANDOMIZE	SYSTEM
BSAVE	DEF FN	INP	MOD	READ	TAB
CALL	DEF USR	INPUT	MOTOR	REM	TAN
CDBL	DELETE	INPUT#	NAME	RENUM	THEN
CHAIN	DIM	INPUT$	NEW	RESET	TIME$
CHR$	DRAW	INSTR	HEX$	RESTORE	TO
CINT	EDIT	INT	NOT	RETURN	TROFF
CIRCLE	ELSE	KEY	OCT$	RIGHT$	TRON
CLEAR	END	KILL	OFF	RND	USING
CLOSE	EOF	LEFT$	ON	RSET	USR
CLS	ERASE	LEN	OPEN	RUN	VAL
COLOR	ERL	LET	OPTION	SAVE	VARPTR
COM	ERR	LINE	OR	SBN	VARPTR$
COMMON	ERROR	LIST	OUT	SCREEN	WAIT
CONT	EXP	LLIST	PAINT	SGN	WEND
COS	FIELD	LOAD	PALETTE	SIN	WHILE
CSRLIN	FILES	LOC	PALETTE USING	SOUND	WIDTH
CSNG	FIX	LOCATE	PEEK	SPACE$	WRITE
CVD	FN	LOF	PEN	SPC	WRITE#
CVI	FOR	LOG	PLAY	SQR	XOR
CVS	FRE	LPOS	POINT	STEP	

Table. GW-Basic's reserved words.

You can use GW-Basic's full-screen editor to execute a command repeatedly. After Basic executes the command the first time, move the cursor back to the line where the command appears, press the return key, and the command executes again.

Another keystroke-saving feature is GW-Basic's function key support. Ten of the Model 1000's 12 function keys are preset to common Basic commands such as Run, List, Save, Load, and CONT (continue). And you can reprogram each function key with up to 15 characters. The screen display's 25th line shows current key assignments. Function key support works within Basic programs, too.

Language Overview

Here's how GW-Basic stacks up as a programming language:

Variable names: As in Model 4 Basic, you can have variable names of up to 40 characters, but they must start with a letter.

Key words: Again as in Model 4 Basic, you must separate key words by spaces. You can't cram them together in an unreadable mass. The Table lists GW-Basic's reserved words.

Data structures: GW-Basic provides integer, single-, and double-precision numeric variables with the same accuracy as TRS-80 Basic. As in Model 4 Basic, the Option Base statement lets you specify whether array subscript numbering begins at zero or 1.

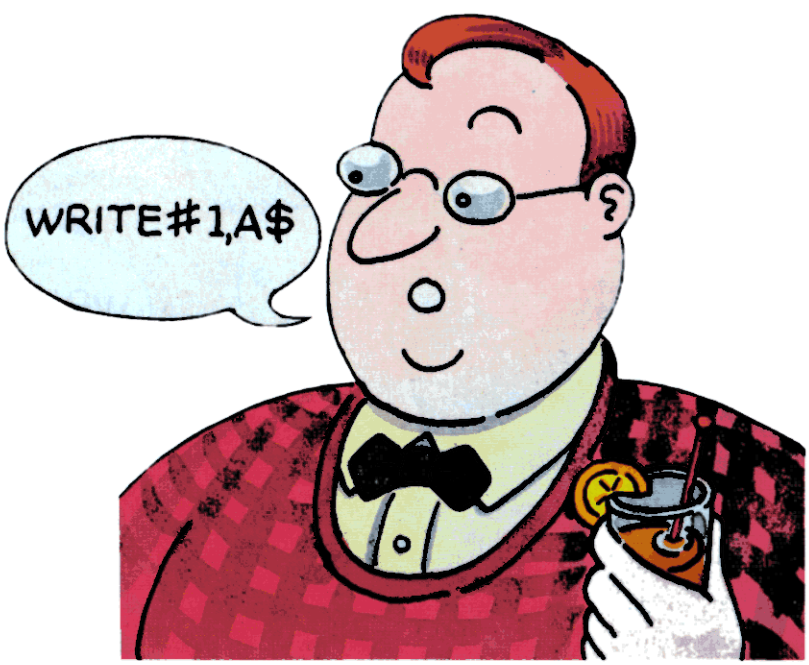
Machine-language support: GW-Basic provides the USR function in the interest of compatibility, but its Call statement is much more powerful, letting you pass multiple arguments to machine-language subroutines (USR lets you pass only one statement).

Debugging aids: Sadly, GW-Basic offers nothing special in the way of debugging aids. Microsoft Basic's infamous Trace function, which simply spews line numbers across the screen, is the only debugging aid provided.

Input/Output: You can adjust the 1000's serial port parameters with an OPEN "COM" statement, much as Model 100 programmers can. The STRIG statement accepts input from a mouse.

Firm Control

GW-Basic offers some exciting control structures. Beside the usual GOTO, On...GOTO, and On...GO-



SUB statements, it has event-trapping capabilities and a While...Wend structure.

Event-trapping statements call a program subroutine when a predefined event occurs. The On Key statement shunts program execution when you press a function or cursor key. ON COM branches program flow when the computer detects data entering the serial communications port. ON STRIG transfers execution when you press a mouse button, and On Error redirects the program when an error occurs. On Error is the only event-trapping TRS-80 Basic provides, except for Model 100 Basic, which can detect serial communications events with its ON COM structure.

GW-Basic's event-trapping features make programs more responsive. For instance, you can use On Key to branch to a help routine when you press a specific function key. ON COM lets you write communications programs that go into action as soon as they detect incoming data at the serial port. ON STRIG allows input from a mouse, opening the door to games and other applications, even to that MacPaint clone you always knew you could write.

While...Wend executes a portion of a program repeatedly as long as the expression following the While statement is true:

```
10  WHILE COUNT <5
20  PRINT "Count now equals:";COUNT
30  COUNT = COUNT + 1
40  WEND
```

This program displays the contents of the Count variable until its value reaches 5, at which time the While... Wend loop ends and execution continues with the first statement after Wend.

Saluting the Colors

With 16 colors and up to 640- by 200-pixel resolution, the Model 1000 is a fine graphics machine. GW-Basic offers a rainbow of graphics statements; in fact, Color Computer programmers will probably feel more at home with them than Model I/III/4 programmers.

For starters, there's a Color statement that lets you set the foreground (text) and background colors. The statement COLOR 6,1,0, for example, produces yellow characters on a blue background, with a black border around the screen. The Color statement also works in graphics mode, where its first argument specifies the background color and its second denotes the current palette. A palette comprises a group of eight colors; the Model 1000 can display up to 16 colors, but only eight at a time.

Like the CoCo's Extended Color Basic, GW-Basic includes statements to draw lines, boxes, and circles. The Line statement draws a line between two specified points, and also draws hollow or filled boxes. The Circle statement draws circles and ovals.

The Draw statement lets you draw shapes. The statement DRAW "L40 E20 F20" draws a triangle— "L40" means move left 40 points; "E20" means move diagonally up and right 20 points, and "F20" means move diagonally up and left.

What makes Draw really powerful, however, is that you can put its arguments into a string variable, then execute the variable. Using the example above, first assign the commands that draw a triangle to a string variable:

```
10 TRIANGLE$ = "L40 E20 F20"
```

Then, anywhere in your program, draw a triangle with:

```
50 DRAW "XTRIANGLE$"
```

The X that precedes the variable name tells the Draw statement to execute the contents of the string variable that follows. Finally, Draw has many optional parameters for specifying color, scale, movement without drawing, and more.

The Get and Put statements normally used with direct file access also have graphics applications in GW-Basic, as they do in Extended Color Basic. By specifying two sets of horizontal and vertical coordinates, you can store a square or rectangular area of the screen in an array using the Get statement. You can then display that area anywhere by using the Put statement followed by the coordinates of a point on the screen.

The Put statement has several modes that make it especially valuable for animation. Its And mode draws an image only if an image already exists at those points. The Or mode superimposes an image onto an existing one, while the XOR (Exclusive-or) mode inverts the points on the screen where one exists in the array. XOR also lets you move an object without erasing the background.

The Paint statement fills an enclosed area with color, given the starting coordinates (and given enough memory; the more complex the area to fill, the more memory required). PSET and Preset turn on and off, respectively, specific points on the display.

Display Formatting

Gone, thank goodness, is Print@. Instead, GW-Basic's Locate statement positions the cursor according to row and column coordinates. For example, the statement LOCATE 12,1 positions the cursor at row 12, column 1. Programming complex displays with Locate is much easier than with Print@, because you don't have to keep referring to the video display worksheet to find out where position 384, for example, really is.

Sounding Off

GW-Basic supports the 1000's sound-generating capabilities with Beep, Sound, and Play statements.

Beep does just what you'd expect: causes a fixed-pitch beep. The Sound statement produces a specified tone for a specified time; you can use it for sound effects or to play music.

The Play statement is for serious music programming. Rather than using arbitrary numbers to specify pitch (like the Sound statement), Play lets you specify musical notes over seven octaves, including sharps (denoted by a # sign) and flats (represented by a minus sign). You can specify whole, half, quarter, eighth, and sixteenth notes, as well as their dotted counterparts, and you can regulate tempo.

The Play statement has two interesting features. First, you can store notes in a string variable, then execute the variable, as in the example above using the Draw command.

Second, you can specify foreground or background music. In foreground mode, GW-Basic doesn't execute any other statements until the Play routine has ended. In background mode, Basic stores the music (up to 32 notes or rests) in a buffer, then resumes program execution while the notes play.

Background mode can be especially valuable in game programming: The game doesn't have to stop every time a musical sequence plays.

Disk File-Handling

Not much is new in the disk file department. GW-Basic supports both sequential- and direct- (random-) access file input/output, with variable record length files permitted under the latter mode. You have up to 15 disk file buffers available, and you access them with the same statements (PRINT#, INPUT#, LINE INPUT#, Get, and Put) used in TRS-80 Basic.

You do get two amenities not found in I/III/CoCo Basics. The Write# statement writes data to sequential files properly delimited with commas and quotes, eliminating the hassle of remembering all those CHR$(34) and "," sequences. Also, the Print# Using function lets you format the data you're writing to sequential files.

Conversion Considerations

"Okay," you say, "GW-Basic is the best thing since keyboard debounce. What about my Basic space shuttle simulator? Will it run on the new computer?"

That depends on a number of factors. The Model 1000 can't read Model I/III/4 or CoCo disks, so you'll have to transmit your existing programs using the machine's serial ports.

You can't transfer Basic programs that contain any machine-language subroutines: Z80 and 8088 machine language are as different from each other as the Model 4 is from the Model 1000. You'll have to convert all Z80 machine code to 8088 code to get programs to run on the 1000. Similarly, existing programs will balk if they contain any PEEKs or POKEs to memory locations specific to a particular machine.

Also, you have to change any programs that use graphics. You'll want to take advantage of the Model 1000's improved resolution and color and GW-Basic's battery of graphics statements. Replace complicated, slow For...Next loops that draw lines and circles with Line and Circle statements. Instead of TRS-80 graphics characters, use GW-Basic's Draw statement to draw shapes. Use the Get and Put graphics statements for fast animation and the Paint statement to fill areas with color.

Eliminate Print@ statements—use Locate instead. You may want to replace key-scanning Inkey$ routines with GW-Basic's On Key control structure. While...Wend can replace For...Next loops and routines that increment or decrement a variable over and over.

Disk file access routines require no modification. However, remember that the Model 1000 disk drive specifier is a letter, not a number, and it goes before the file name (A:file name, not file name:1).

Summary

What's lacking in GW-Basic? Its debugging aids could be better. The only run-time debugging feature is the awful Trace function. Features that would let you monitor the contents of variables and trace program execution without destroying screen displays would help.

That weakness aside, GW-Basic represents one of the better versions of Basic. Its full-screen editor makes typing in and modifying programs easy instead of torturous, its event-trapping features allow for responsive programs, and its graphics statements let you take full advantage of the Model 1000's fine graphics capabilities.

Last but not least, because it's Microsoft Basic, you don't have to learn a whole new language. You'll just have to learn GW-Basic's "gee-whiz" features. And you'll enjoy that. ■

Jim Heid is a freelance writer and the author of a book on Basic programming forthcoming from Ashton-Tate. Contact him c/o 80 Micro, *80 Pine St., Peterborough, NH 03458.*

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Illustration by Phil Geraci

Young Programmer's Awards 1984-85

80 Micro's Young Programmer's Contest is now three years old. During this time, we've seen hundreds of entries from across the country and around the world. To all who entered, we salute you!

The Judging

It's not easy to judge a contest with so many outstanding entries. *80*'s technical staff had to consider many factors in evaluating these programs. The main criteria were:

Originality. Was the program concept new? Did it present a unique twist to a familiar application?

Documentation. We wanted docs that would easily lead the user through the program, telling him what he needed to know to run the program and anticipating any questions he might have.

Programming elegance. We examined the programming techniques used: Did the program incorporate advanced commands? Were shortcuts used to bypass conventional program flow? How good was the overall programming logic? Were there helpful comments in the listings?

Error-trapping. Could a user easily subvert or crash the program? How well was user input defined? Were there any logic mistakes made in programming?

Usefulness. Would we use the program or technique in our own programs? Did we have fun with the games?

And the Winners Are...

Our Grand Prize winner is 18-year-old Michael Leibow, with his full-screen Model III graphics editor. Graph, written in machine language with Basic modules, can draw and manipulate screens in a variety of ways. You can mix screens with any of three different backgrounds, extract portions of a design for use elsewhere on the screen or in other pictures, rotate graphics up to 360 degrees, print the design in any of three sizes, and define pixel size to either elongate or flatten the printed image. The program can save to and load from disk or tape and supports both Epson and Radio Shack printers. *80* will publish Mike's program next month.

Fantastic Realms, written by Michael Lewicki and James Karls, won first prize in the 15–18-year-old category. A Model III interactive fantasy game similar to Dungeons and Dragons, Fantastic Realms offers five levels of difficulty and lots of chambers filled with monsters and treasures. It also had the most complete documentation of any of our entries, with game booklets included for each scenario.

Fourteen-year-old Jeff Reifman was the first-place 12–14-year-old winner for Graphix, a program that lets you design and edit pictures on-screen, save them to buffer or disk, and send them to a printer. You can combine individual screens and print out a composite drawing.

The youngest of our young programmers, 9-year-old Jeffrey Zare, won first place in the 11-and-under category with Number Eaters. The object of this Model III game is to gobble up any numbers lower than yourself, while avoiding higher numbers that appear randomly. Watch out though, or you'll get trapped by the killer Z's!

Herman Calabria's Adventure Generator was good enough to take second place in the 15–18-year-old category. This program lets you develop your own adventure games, complete with scenarios, characters, and game items.

Second prize in the 12–15-year-old category goes to Steven Whysong's Operator, a Model III bulletin board program that allows callers to send and receive public and private messages. Operator also contains an on-line Pilot interpreter for callers who want to program, save, and run Pilot programs.

Eleven-year-old Stephen Lardieri garnered second prize in the 11-and-under category for Drawarama, a machine-language graphics program with an option to add captions and print out your drawings. This Model III program came complete with help screens.

Transport, a Model III adventure graphics game that simulated the transport of goods by sea, won third place in the 15–18-year-old category for Christopher Healey.

Ken Buckley's simulation of a Turing machine on a Model III took third place in the 12–15-year-old category.

The first Model 4 program to win in our contest was Eric Mullenbruch's Conversion. This third-place finisher in the 11-and-under category is a menu-driven program for converting measurements (length, volume, weight, temperature, and liquid measure) from English to metric units and back again.

Honorable mentions go to the following: Lee Periolat, 11, for his 3-D Maze; Jeff Reifman, 14, for Gladiator, a machine-language adventure; Mariam Tariq, 14, for her Forms Management program; and Stacy Lamb, 17, for Concentration, based on the old TV show.

Congratulations to all our winners and our thanks to everyone who entered. ■

Monster Mashing

by Michael Lewicki and James Karls
15–18-Year-Old Category

Fantastic Realms is an interactive fantasy in the Dungeons and Dragons vein. You mastermind your war party's progress through a series of up to 70 chambers and hallways stocked with a daunting variety of monsters. There's treasure to be gained, of course, if you can survive your run-ins with the bad guys.

The game is complex and play can easily go on for days. You can choose from five scenarios of increasing difficulty. Screen graphics illustrate the dungeons; you move characters through them using the numeric keypad. Predefined commands advance the action.

What Goes on Here?

Take some time to read this documentation and become familiar with the game before you start to play. Otherwise, your party is liable to be wiped out during its first encounter with Kobolds or Orcs.

You create and control up to six characters that appear on the screen as the numbers 1–6 (see the Photo). A character's main goal is to gain experience points by killing monsters. When he has enough points, he can move up a skill level and increase his chances for survival by drinking a healing potion. On the down side, each time a character fights he risks losing hit points, which measure the injuries he can sustain before dying. Table 1 lists the experience and hit points for the first 10 levels. To reach each level beyond the 10th, you need an additional 250,000 points. A character's number of hit points increases by 10 at each successive level.

Monsters are everywhere, often in groups; fixed monsters stay in one room and guard treasure while wandering monsters can turn up anywhere. The game routines control the monsters, represented on the screen by letters of the alphabet (see the Photo).

Depending on your party's skill level, you can choose from five dungeons, or game scenarios. Table 2 lists the dungeons and recommended experience levels. Each dungeon has its own background story and assortment of monsters and treasures.

In the Lost Crown, for instance, you battle Orcs and Kobolds who are searching for an ancient crown believed to have been stolen by Wraiths. In Goblin's Magic Realm, your job is to kill off the few surviving members of the evil Goblin race. Chambers of Fortune pits your party against the Stone Giants, cunning creatures who terrorize neighboring towns. Subterranean Empire sets you loose in the kingdom of the wizard Valzar, whose army is bent on conquest even though Valzar is rumored to have died. Hallway of Death, chock-full of angry monsters, holds the treasure of the old magician Paritus.

The Programs

Fantastic Realms is actually a series of 20 programs that interact with each other. The game comes on two disks (see the box on this page for instructions on how to get the disks). The Fantastic Realms disk contains machine-language routines and the central Basic program; the Dungeons disk holds data for the five dungeons. In spite of its size and Basic components, the game runs like an all-machine-language program.

Six Characters in Search Of Treasure

You can run the game using one or two disk drives. If you have one drive, boot up the Fantastic Realms disk. You may be prompted to insert the Dungeons disk; if so, swap disks and press the enter key. If you have two drives, insert the Fantastic Realms disk in drive zero and the Dungeons disk in drive 1. On reset, you should see the game logo.

The game will ask if you want to create new characters. If you're playing for the first time, you must answer yes. Fantastic Realms saves characters to disk and you can recall them the next time you play.

You can create up to six characters. Their names may contain only the letters A–Z, without spaces; Fantastic Realms displays up to 20 letters on the screen, but saves only eight letters to disk.

The game randomly assigns your characters' strength and dexterity ratings from 3 (low) to 18 (high). These measure effectiveness against monsters.

Like any group bent on travel, your party goes shopping before heading for the dungeon. Each character has a supply of gold pieces to spend on protective

Because of Fantastic Realms' length and MULTIDOS-specific ROM calls, no program listing is provided. However, readers interested in obtaining a copy of the game should send two Model III MULTIDOS-formatted disks and a stamped, self-addressed return mailer to Mike Lewicki and James Karls, 5291 Old 22 Road, Gillett, WI 54124.

armor, weapons and arrows, and special items. Table 3 lists the types of armor available—don't leave home without it. The lower the armor class, the greater the protection it offers and the more it costs. It's wise to buy the best armor you can afford.

Table 4 lists weapons; a character can carry up to nine weapons. Cheaper weapons break more easily and tend to slip out of your hands in the heat of battle. Bows and arrows are for those times when you're not close enough to use another weapon; you can fire them from anywhere in a room. As with the other weapons, you get what you pay for: Deadlier bows cost more (see Table 5).

You haggle over price with a barterer. During the transaction, you can consult a list of available items by pressing the enter key without typing in an item number. If you want to buy a different type of equipment, press the zero key or type in NONE and you'll be able to choose another category.

If you want to add magic force to a weapon, add asterisks to its name. Magic force is rated from +1 to +3. AWL PIKE** means you want a +2 magic awl pike. Some magic weapons are unavailable at any price; you have to find them in the dungeon. They're indicated by an asterisk next to the weapon's name. The magic force can backfire, however, if your enchanted weapon becomes cursed.

Characters can also buy special items. A healing potion cures wounds; it costs 250 gold pieces times the experience level of the character buying it. Holy water is for throwing at undead monsters. A vial costs five gold pieces.

Dungeonward Ho!

Once your party is armed and ready for trouble, you choose a dungeon (see Table 2). Usually you enter through room 1, although in some dungeons you're transported to the middle of the dungeon. You can leave the dungeon to create new characters or buy more equipment only through room 1. When the game loads the dungeon, it asks if your party is reentering the dungeon. If you're continuing a game, answer yes.

On the screen, your party is a clump of numbers, one for each character (see the Photo). When Fantastic Realms displays a character's name and attributes in the upper left-hand corner of the screen, it's his turn to do something. You can move by pressing the appropriate key, give a command, or do nothing. If characters are in different rooms, each gets 10 turns; otherwise, the game rotates after every turn.

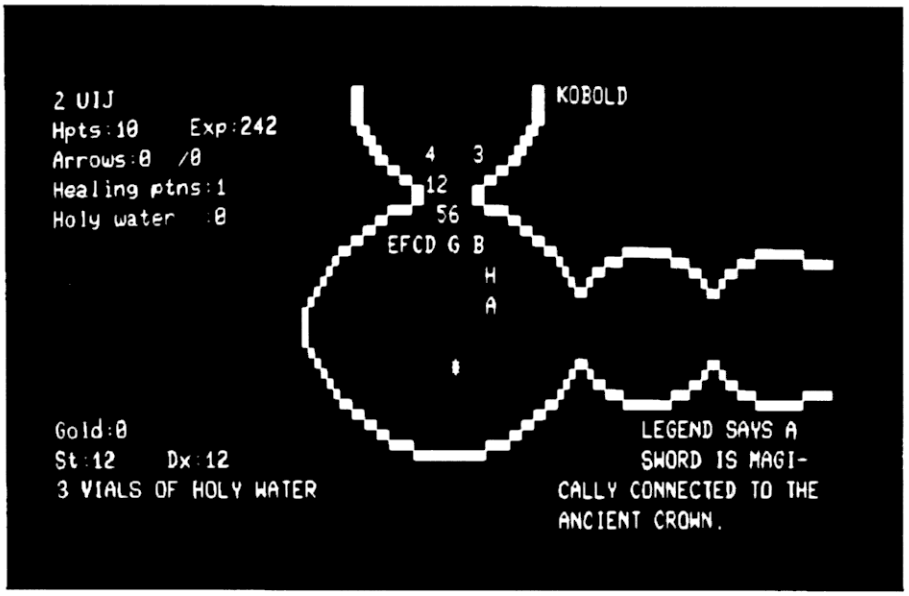

Photo. Screen display of a Fantastic Realms dungeon.

Level	Experience Points	Hit Points
1	0–1,999	10
2	2,000–3,999	20
3	4,000–7,999	30
4	8,000–15,999	40
5	16,000–31,999	50
6	32,000–63,999	60
7	64,000–127,999	70
8	128,000–249,999	80
9	250,000–499,999	90
10	500,000–749,999	100

Table 1. Experience levels.

Dungeon	Recommended Experience Level
Lost Crown	1
Goblin's Magic Realm	1–3
Chambers of Fortune	3
Subterranean Empire	5
Hallway of Death	8

Table 2. The five dungeons and recommended experience levels.

Type	Avg. Cost	Class
Banded	90	4
Chain	75	5
Leather	10	8
Plate	400	3
Ring	30	7
Scale	45	6

Table 3. Armor.

Weapon	Avg. Cost
Composite Bow	100
Long Bow	60
Short Bow	15
Normal Arrow	1 (four arrows)
Magic Arrow	25

Table 5. Bows and Arrows.

Type	Avg. Cost	Max. Damage
Awl Pike	3	12
Bardiche	7	12
Bastard Sword	25	16
Battle Axe	5	8
Bill-Guisarme	6	10
Broad Sword	10	8
Fauchard-Fork	8	10
Glaive-Guisarme	10	12
Long Sword	15	12
Morning Star	5	8
Retaliator	80	25
Shocker	5,000	10
Short Sword	8	8
Spear	1	8
Trident	4	12
Two-Handed Sword	30	18
Voulge	2	8

Table 4. Weapons.

Command	Description	Command	Description
F	Fight	R	Rearrange weapons
N	Fire a normal arrow	P	Pick up dropped weapon
M	Fire a magic arrow	E	Exchange equipment
T	Throw a holy water vial	L	Look for secret passageways
G	Get the treasure	H	Drink a healing potion
W	List weapons	S	Save game

Table 6. Commands.

Name	Hit Points	Max. Damage	Armor Class	Move-ment	Attack Distance	Un-dead	Exp.
Ghoul	16	12	6	1	1	Yes	360
Gnoll	16	8	5	1	1	No	225
Hell Hound	40	10	4	2	3	Yes	600
Hobgoblin	9	8	5	2	1	No	175
Kobold	8	6	6	1	1	No	100
Lizardman	17	14	5	2	1	No	475
Ogre	33	10	5	1	2	No	480
Orc	8	6	6	1	1	No	100
Skeleton	8	6	7	1	1	Yes	100
Wraith	32	6	3	3	2	Yes	320

Table 7. Monsters of the Lost Crown.

Name	Hit Points	Max. Damage	Armor Class	Move-ment	Attack Distance	Un-dead	Exp.
Bugbear	25	8	5	2	1	No	300
Gargoyle	36	16	5	3	1	No	880
Gelatinous Cube	32	8	8	2	1	No	340
Giant Tick	16	4	3	1	1	No	135
Gnoll	16	8	5	2	1	No	230
Goblin	7	6	6	1	1	No	100
Hobgoblin	9	8	5	2	1	No	175
Kobold	4	4	7	1	1	No	50
Lemure	24	3	7	1	1	Yes	100
Manes	8	8	7	1	1	Yes	145
Ochre Jelly	48	12	6	4	1	No	780
Stirge	9	3	8	3	1	No	65
Toad	16	5	7	2	1	No	130

Table 8. Monsters of Goblin's Magic Realm.

Name	Hit Points	Max. Damage	Armor Class	Move-ment	Attack Distance	Un-dead	Exp.
Anhkheg	32	18	2	2	2	No	1,000
Ant	16	6	3	3	1	No	200
Badger	10	7	4	1	1	No	160
Centaur	32	12	4	3	2	No	610
Centipede	8	4	9	1	1	No	50
Ghast	32	16	4	2	1	Yes	820
Ghoul	16	12	6	1	1	Yes	360
Hell Hound	40	10	4	2	3	Yes	600
Leech	16	4	9	1	1	No	90
Mummy	41	12	3	1	2	Yes	710
Orc	8	8	5	1	1	No	160
Peryton	32	16	7	3	2	No	820
Shadow	20	4	7	3	1	Yes	130
Skeleton	8	6	7	1	1	Yes	100
Stirge	8	3	7	3	1	No	70
Stone Giant	75	18	0	2	3	No	1,840
Tick	24	4	3	1	1	No	170
Wasp	32	12	4	4	1	No	600
Wererat	25	8	6	2	1	No	295
White Dragon	48	24	3	5	5	No	1,990
Wight	24	4	5	3	1	Yes	165
Wolf	18	5	7	3	1	No	150
Zombie	16	8	8	1	1	Yes	205

Table 9. Monsters of Chambers of Fortune.

You use the numeric keypad to move a character; 8 represents north, 6 east, 4 west, and 2 south. To move all characters at once, press the shift key along with the appropriate number key (you can do so only if no monsters are in the room and no player in the room has moved).

Table 6 lists the commands that control characters' actions. Type in the letter only; don't press the enter key.

Characters can kill a monster in four ways: You can fight (F), fire a normal arrow (N), fire a magic arrow (M), or throw holy water (T). The game prompts you for the letter of the monster you're attacking. To fight, you have to choose a weapon and be close enough to attack; normal weapons can hit from two spaces away, magic weapons from four spaces, and wand weapons from eight spaces.

Tables 7–11 are field guides to the monsters that inhabit each of the five dungeons. Damage points tell you how much harm they can do; hit points and armor class indicate how hard they are to kill; attack distance tells you how close you must be to fight. The experience points you get for a kill vary with the monster's type. If a monster is undead, you can use holy water against it.

If a member of your party or a monster gets hit during a fight, an asterisk flashes over his position on the screen and his hit points are reduced.

You can see a list of your weapons without losing a turn (press the W key). Press the enter key to resume action. You can also rearrange your weapons' order (press R) or exchange weapons with another character (press E). If a character is near death, you might want to give his weapons to someone else; otherwise, when he goes, they go.

Other commands let you pick up a dropped weapon (press the P key), get a treasure (press G), look for secret passageways (press L), or drink a healing potion (press H).

Always save the game by typing in S when you're ready to stop. Don't ever press the reset button or turn off the computer during disk access. And don't ever turn your back on a Hell Hound. ■

Michael Lewicki (age 18) and James Karls (age 17) are seniors at Gillett (Wisconsin) High School. They taught themselves programming on a home computer and spent two years completing Fantastic Realms. Michael plans to study physics in college; James will be majoring in architecture.

What the heck?!?

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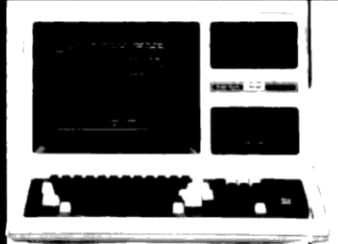
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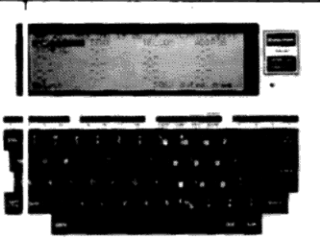
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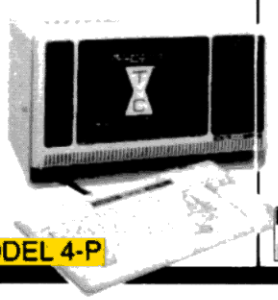
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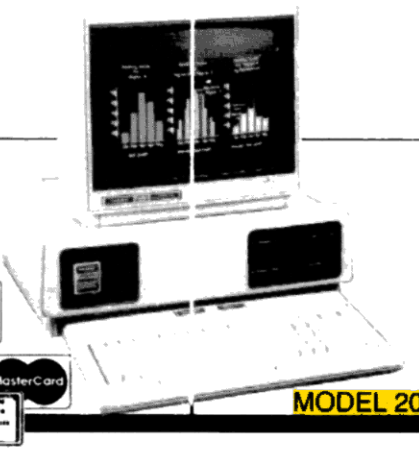
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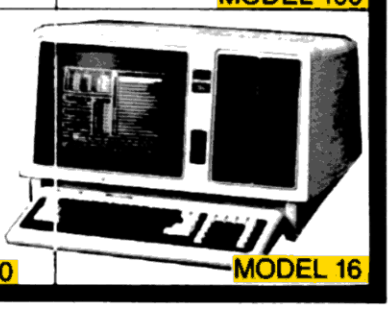
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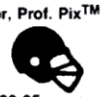

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Name	Hit Points	Max. Damage	Armor Class	Move-ment	Attack Distance	Un-dead	Exp.
Bombardier Beetle	18	12	4	2	3	No	460
Boring Beetle	40	20	3	1	2	No	1,275
Brownie	4	3	3	2	1	No	85
Bugbear	25	8	5	2	2	No	325
Dryad	16	4	9	2	1	No	95
Dwarf	8	4	8	1	2	No	80
Elf	9	10	5	2	1	No	230
Fire Beetle	10	8	4	2	1	No	195
Fire Giant	93	30	3	2	4	No	3,850
Frost Giant	84	24	4	2	4	No	2,740
Gargoyle	36	16	5	3	3	No	930
Ghast	32	16	4	3	3	Yes	880
Ghost	80	40	0	2	4	Yes	5,000
Ghoul	16	12	6	2	2	Yes	385
Gnoll	16	8	5	2	1	No	230
Gnome	8	6	5	1	1	No	120
Goblin	7	6	6	1	1	No	100
Groaning Spirit	56	14	0	3	3	Yes	1,150
Halfling	6	6	7	2	1	No	95
Hill Giant	66	16	4	2	4	No	1,450
Hobgoblin	9	8	5	2	1	No	175
Kobold	4	4	7	1	1	No	50
Lich	88	40	0	3	5	Yes	5,400
Lizard Man	17	12	4	2	2	No	420
Medusa	48	16	5	2	3	No	1,115
Mummy	51	12	3	3	3	Yes	880
Ogre	33	10	5	2	2	No	490
Ogre Mage	64	18	2	2	3	No	1,600
Orc	8	8	6	2	1	No	160
Pixie	4	4	5	2	1	No	70
Rhinocerous Beetle	96	34	2	3	3	No	4,560
Satyr	40	8	5	3	1	No	435
Shadow	25	12	7	3	2	Yes	500
Skeleton	8	6	7	2	2	Yes	125
Slyph	24	10	9	6	1	No	430
Spectre	59	16	2	5	3	Yes	1,375
Sprite	8	4	6	3	1	No	90
Stag Beetle	72	36	3	3	2	No	3,980
Stone Giant	75	18	0	2	4	No	1,880
Vampire	67	10	1	2	4	Yes	960
Water Beetle	32	18	3	2	2	No	980
Wight	35	12	5	3	3	Yes	660
Wraith	43	16	4	3	3	Yes	1,050
Zombie	16	8	8	2	2	Yes	230

Table 10. Monsters of the Subterranean Empire.

Table 11. Monsters of the Hallway of Death.

Name	Hit Points	Max. Damage	Armor Class	Move-ment	Attack Distance	Un-dead	Exp.
Basilisk	49	12	4	3	3	No	845
Blue Dragon	80	80	2	4	10	No	13,525
Bulette	72	84	−2	5	6	No	13,530
Chimera	72	34	2	3	4	No	3,790
Clay Golem	50	30	7	3	3	No	2,485
Displacer Beast	48	16	2	3	3	No	1,160
Djinni	59	16	4	4	3	No	1,330

Table 11 continued

Table 11 continued

Earth Elemental	96	32	2	3	3	No	4,230
Ettin	80	34	3	3	3	No	4,000
Fire Giant	93	30	3	3	4	No	3,860
Gelatinous Cube	32	8	8	2	2	No	360
Ghoul	16	12	6	2	2	Yes	385
Goblin	7	6	6	2	1	No	100
Gray Ooze	27	16	8	2	1	No	700
Griffon	56	24	3	5	3	No	2,080
Harpy	24	12	7	3	2	No	480
Hippogriff	27	22	5	6	3	No	1,240
Hobgoblin	9	8	5	2	2	No	195
Homonculous	16	3	6	3	1	No	100
Horned Devil	45	21	−5	3	3	Yes	1,680
9-Headed Hydra	72	72	5	3	3	No	10,470
Intellect Devourer	54	16	4	4	3	No	1,250
Kobold	4	4	7	2	1	No	50
Lamia	72	4	3	4	3	No	445
Lurker Above	80	6	6	3	5	No	700
Manticore	51	6	4	3	10	No	2,680
Marilith	63	18	−5	3	4	Yes	1,800
NeoOtyugh	96	27	0	3	5	No	3,600
Ogre	33	10	5	2	2	No	490
Roc	144	60	4	5	7	No	11,600
Umber Hulk	72	34	2	3	4	No	3,790
Werebear	59	30	2	3	3	No	2,800

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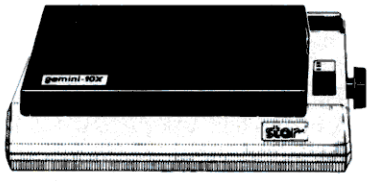

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Picture This

by Jeff Reifman
12–14-Year-Old Category

I decided to soup up what would otherwise be a standard graphics program with some unique features. Graphix offers a number of ways to create designs. You can use graphics blocks (where you turn on and off individual graphics blocks), string blocks together to form a straight line, or draw diagonal lines using either the arrow keys or the Autoline function (described below).

In addition, Graphix provides routines to fill in a shape with a single keystroke, create large-size letters, draw a border around your design, and produce inverse video characters and shapes. Graphix also offers a help screen.

Graphix provides a total of nine buffers so you can save one design while you work on another, or combine screens from different buffers to get a composite printout (see the Figure).

Starting Off

To begin using Graphix, assemble the source code in the Program Listing, turn on your printer, and type in PROG.

Graphix then asks from which of the program's nine buffers you want to load a design. Since you haven't saved any screen to a buffer, type in any number from 1–9 and you're ready to draw.

Graphix Modes

Graphix operates in three modes: Print, Clear, and Neutral. When you boot up Graphix, it's automatically in the neutral mode. You change modes by hitting the key corresponding to the mode you want to invoke (P, C, or N). Once you're in that mode, use the command keys as listed in the Table and described below.

The Print Commands

To create a design, you need to get into the Print mode (I use "print" here to mean print on the screen.) Position the cursor using the arrow keys, then hit the P key. In the Print mode, you draw free-form with the cursor; that is, the cursor leaves a trailing line wherever you move it. Pressing the horizontal and vertical arrow keys simultaneously moves the cursor diagonally. Pressing the left-shift key speeds up cursor movement.

To make drawing lines easier, Graphix's Autoline routine draws a line between any two points you select. This routine adds flexibility to the angle of the lines you can create because diagonal lines you draw with the arrow keys draw at one angle only.

To use Autoline, move the cursor to the line's starting point and hit the A key. Then move the cursor to the destination of the line and press the Z key. Graphix then draws a line between those two points.

To draw more lines from point A, move the cursor to new points and hit the Z key each time.

Special Graphics Commands

Graphix also has commands for special graphics features. Inverse video (I) turns the screen from black-on-white to white-on-black, and vice versa. Press the space bar as you invoke reverse video to inverse a portion of the screen.

Type in M to display large letter forms on screen. Position the cursor where you want the left side of the letter to appear and press the M key. Then type in the letter you want to appear, and Graphix displays it. You must repeat this process for every letter you want to display.

The T command overlays screens from two or more buffers. To make an overlay, load a screen from the buffer, press the T key, and type in the number of another screen buffer. You can combine as many screens as you wish by pressing the T key and a screen buffer number.

The Fill command (F) fills in a figure. Position the cursor inside a figure you've drawn and press the F key. Graphix only fills in enclosed figures. Using Fill with open figures will crash the program.

The Border command (B) draws a border around the screen.

The Clear Mode

You use the Clear mode (C) to erase lines. In the Clear mode, you remove any lines the cursor moves over. You can erase diagonal lines by hitting the horizontal and vertical arrow keys at the same time, and Autoline erases lines between two points. The Border command erases a border in the Clear mode.

The Neutral Mode

The Neutral mode (N) lets you move

The Key Box

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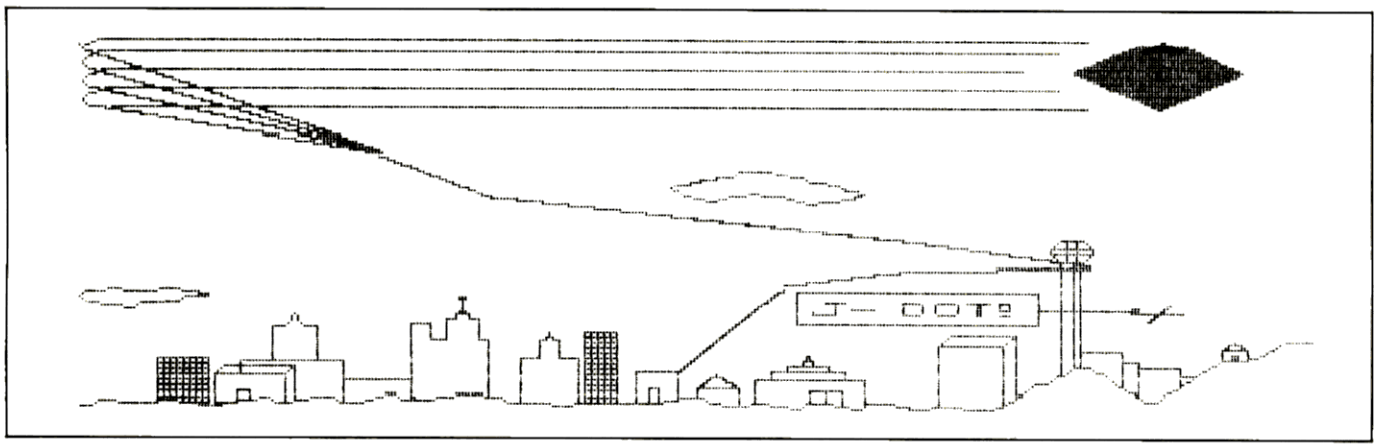

Figure. This small-print picture combines nine of Graphix's screens.

the cursor around the screen without drawing or erasing lines. You can, however, set and reset individual graphics blocks in the Neutral mode by positioning the cursor and hitting the spacebar (to set a graphics block) or the asterisk key (to reset a block) as desired.

Saving and Loading Designs

Graphix does all its work through the buffer. When you first boot up the program, you're asked to select a buffer number; you create a screen in that buffer. But be sure you save the screen back to the buffer or you'll lose it when you invoke one of the ancillary program commands, like printing the screen or overlaying it with another screen. Similarly, when you load a file in from disk, you have to save that file to a buffer to do any further work.

To save a screen to a buffer, hit the S key and type in a buffer number from 1–9 at the prompt. If you want to save that screen to disk, press the O key, then the S key, and Graphix will prompt you for a file name.

To load a screen from a buffer, hit the L key and enter the appropriate buffer number. To load a screen from disk, hit the O key, then the L key, then the file name at the prompt. To keep that screen, save it to a buffer before loading another screen.

You can quit and return to TRSDOS Ready at any time by pressing the Q key; pressing the H key displays a table of program commands and definitions.

Screen Printing

The D command sends screens to the printer. After pressing the D key, select the small- (1) or large- (2) print option. Then you have to specify which buffer you want printed out.

The small-print option prints three screens side by side in compressed format, producing a high-resolution drawing. You have to identify the three screens you want printed in the order you want them to appear at the appropriate prompt.

You can connect sets of three screens in layers to create a picture. For instance, the Figure comprises a total of nine screens in three layers. If you want to print more than three layers, save the additional screens to disk and load them to buffer as needed.

The large-print option sends one screen to the printer at actual size. Enter the screen number you want to print at the prompt. ■

Jeff Reifman is 14 years old. His idea for the graphics representation of letters in the Letters Form routine comes from More TRS-80 Assembly Language Programming, *by Bill Barden Jr. (available at Radio Shack stores). The Fill routine is from "Fill-Ins," by David Lewis (*80 Micro, *October 1984, p. 126).*

Contact Jeff at 2316 Banyon Drive, Los Angeles, CA 90049.

Command	Definition	Command	Definition
A	Autoline start point for line	M	Display letter forms
B	Draw screen border	N	Invoke Neutral mode
C	Invoke Clear mode	O	Load or save file to disk
D	Send screen to printer	P	Invoke Print mode
F	Fill enclosed figure	Q	Exit program
H	Display help menu	T	Overlay Screens
I	Inverse video	Z	Autoline line end point
L	Load screen buffer		

Table. Graphix's commands.

Program Listing. Graphix source code.

```
00100           ORG     7000H
00110 SR2       DEFB    0
00120 SR3       DEFB    0
00130 PRDAT     DEFS    150
00140 DX        DEFB    0
00150 DY        DEFB    0
00160 XS1       DEFB    0
00170 XS2       DEFB    0
00180 YS1       DEFB    0
00190 YS2       DEFB    0
00200 CRDX      DEFB    0
00210 XPLUS     DEFB    0
00220 YPLUS     DEFB    0
00230 BUF2      DEFW    0
00240 DD        DEFB    1
00250           DEFB    2
00260           DEFB    4
00270           DEFB    8
00280           DEFB    16
00290           DEFB    32
00300           DEFB    64
00310 CURR      DEFS    1024
00320 L1        DEFS    300
00330 SCREEN    DEFS    10240
00340 N         DEFB    0
00350 Y         DEFB    0
00360 MD        DEFB    0
00370 A1        DEFB    0
00380 B1        DEFB    0
00390 C1        DEFB    0
00400 PP        DEFB    0
00410 F1        DEFB    0
00420 F2        DEFB    0
00430 START     CALL    FIRSCR
00440           CALL    STATUS
00450           CALL    01C9H
00460           LD      A,18
00470           CALL    3BH
00480           LD      SP,0FFFEH
00490           LD      HL,SCREEN
00500           LD      BC,10240
00510 ST1       LD      A,128
00520           LD      (HL),A
00530           DEC     BC
```

Listing continued on p. 76

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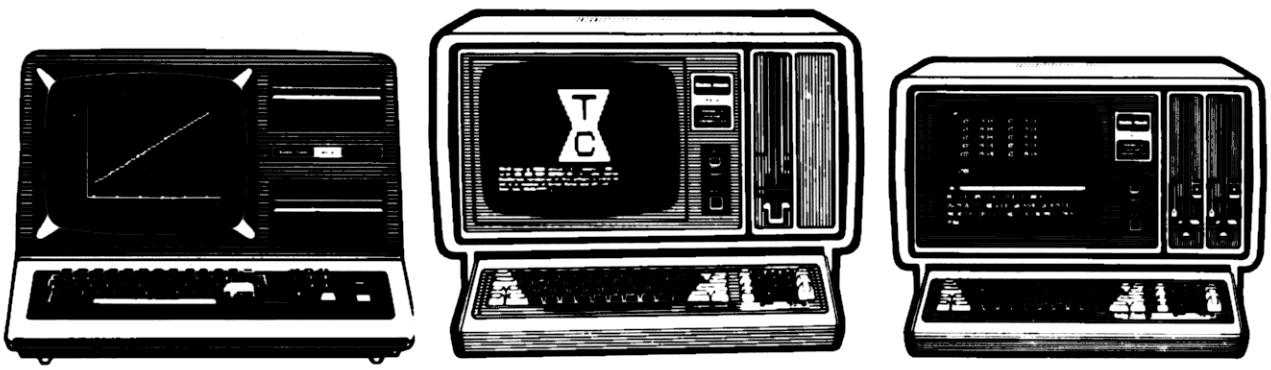

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The Pecking Order

by Jeffrey D. Zare
11-Year-Old and Under Category

Number Eaters uses true number-crunching in a Model I/III game; you scurry around the screen in the guise of a number, gobbling up any numbers lower than yourself while avoiding higher numbers that appear randomly.

You start out as the number 3 and use the arrow keys to move around the screen. You score 10 points for each number you eat that's lower than you, but watch out for higher numbers and other symbols—you lose one life if you touch them.

You also have to beware of asterisks that move constantly from the bottom to the top of the screen. If an asterisk hits any number (including you), that number is immediately surrounded with Z's. If you get trapped by the Z's, you must wait until a number your size or smaller replaces one of the Z's so you can eat your way out of the trap.

For each game, you get three lives, or three chances to reach a score of 200. If you do score 200, you're promoted to the next-highest digit. Each time you increase to a higher number, the screen clears and you start eating a fresh bunch of numbers.

The highest number you can become is a 7. When you reach 200 points after becoming a 7, you get an extra life instead of increasing to the number 8.

If you loose track of where you are during the game, press the clear key and look for the blinking number—that's you.

Game Play

Before you play Number Eaters, get into Basic and type in the Program Listing. Save the game under the file name NOEATERS. To play the game, type in BASIC"NOEATERS at the TRSDOS Ready prompt. Good luck!■

Jeffrey D. Zare, age 9, lives at 220 Barlow Ave., Sarasota, FL 33582.

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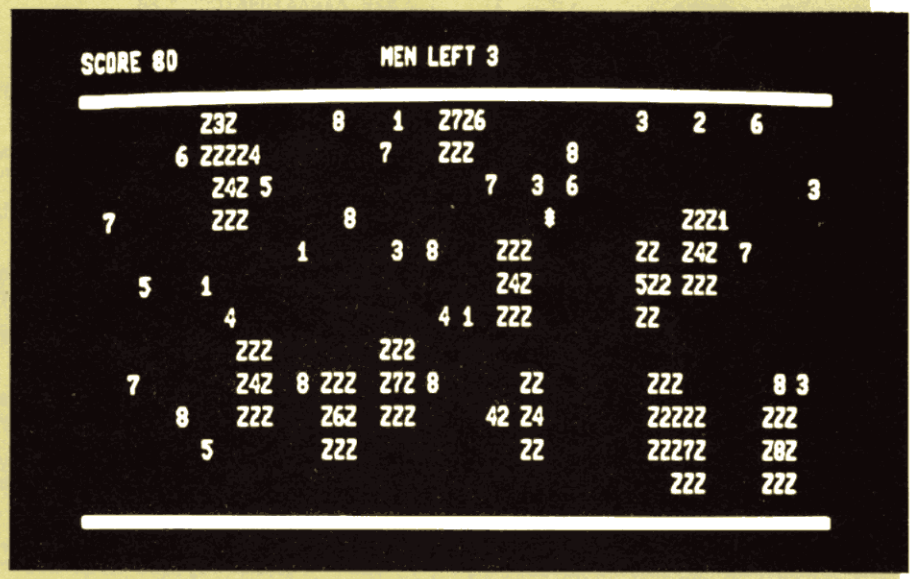

Photo. Playing Number Eaters on the Model III.

Program Listing. Number Eaters.

```
10 ' NOEATERS by Jeffrey D. Zare
20 CLS
30 CLEAR 6000
40 INPUT "DO YOU WANT INSTRUCTIONS ? (Y/N)";R$
50 IF LEFT$(R$,1)="Y" THEN GOSUB 530
60 CLS
70 YS=3:SC=0:ME=3:YP=542:NC=48:PM=15360:NH=8:A4=RND(64):A4=A4+896
80 A=PEEK(14400)
```

Listing continued

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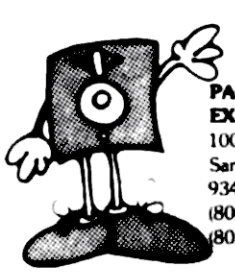

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Listing continued

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90 IF A<>0 THEN PRINT@YP," ";
100 IF A=8 THEN YP=YP-64
110 IF A=16 THEN YP=YP+64
120 IF A=32 THEN YP=YP-1
130 IF A=64 THEN YP=YP+1
140 PRINT@A4," ";:A4=A4-64:IF A4<129 THEN 510
150 IF YP>896 THEN 410
160 IF NH>143 THEN NH=143
170 B=B+1
180 IF B=5 THEN B=0:PP=RND(704):PRINT@PP+128,CHR$(NC+RND(NH));:PP=
0
190 P4=PEEK(15360+A4-64)
200 IF P4<>32 AND   P4<>0 AND P4<>90 AND P4<>140 THEN GOTO 490
210 PRINT@A4,"*";
220 PK=PEEK(15360+YP)
230 PN=PK-48
240 IF PK=32    THEN NN=YS
250 IF PK=0 THEN NN=YS
260 NN=PK-NC
270 IF PK=32   THEN NN=YS
280 IF PK=0 THEN NN=YS
290 IF NN>YS THEN 410
300 IF NN<YS THEN :GOSUB 470
310 IF YS=8 THEN ME=ME+1:YS=7
320 IF NN<0 THEN NN=YS
330 IF A1>190 THEN YS=YS+1:A1=A1-200:CLS:NH=NH+1
340 IF PEEK(14400)=130 THEN NH=NH+1
350 PRINT@YP,CHR$(NC+YS);
360 PRINT@64,STRING$(64,CHR$(140));
370 PRINT@896,STRING$(64,CHR$(140));
380 PRINT@0,"SCORE"SC;
390 PRINT@25,"MEN LEFT"ME;
400 GOTO 80
410 TE=3:YS=3:CLS:ME=ME-1:YP=542:IF ME=0 THEN 420  ELSE 80
420 PRINT@960,"YOUR SCORE WAS"SC;
430 FOR X=1 TO 3000:NEXT
440 CLS:INPUT"DO YOU WANT TO PLAY AGAIN ? (Y/N)";R$
450 IF LEFT$(R$,1)="Y" THEN RUN
460 IF LEFT$(R$,1)="N" THEN END ELSE GOTO 440
470 SC=SC+10
480 A1=A1+10:RETURN
490 PRINT@A4-129,"ZZZ";:PRINT@A4-65,"Z";:PRINT@A4-63,"Z";
500 PRINT@A4-1,"ZZZ";:GOTO 510
510 A4=RND(64)
520 A4=A4+896:GOTO 80
530 CLS
540 PRINT"     In Number Eaters you start out as the Number 3.  Ot
her      numbers ranging from 1 to 9 appear randomly on the screen
. You  get 10 points each time you eat a number smaller than yours
elf. ";
550 PRINT"Each time you get 200 points you increase in value, the
screen  clears and you start again. However, your largest size is
7.    Instead of increasing when you're a 7, you get an extra life
. ";
560 PRINT"  You start out with three lives at the beginning of the
 game."
570 PRINT
580 PRINT"     Letters and symbols also appear on the screen.  Wat
ch out  for these and any number higher than you - you will lose a
 life if they touch you."
590 PRINT:PRINT:INPUT "PRESS ENTER TO CONTINUE ";R$
600 CLS
610 PRINT
620 PRINT"    All through the game there are *s moving from bottom
 to top. If the * gets under anything, that thing will be immediat
ely   surrounded by Zs. ";
630 PRINT" If you get trapped by the Zs you must wait   until a nu
mber smaller than you replaces a Z. Then you can eat  the number a
nd get out of the trap."
640 PRINT
650 PRINT"     If you want to see where you are at any time, press
 the    CLEAR key and look for the flashing number - that's you."
660 PRINT
670 PRINT" Use the arrow keys to move around the screen."
680 PRINT
690 PRINT
700 INPUT"PRESS ENTER WHEN YOU ARE READY TO PLAY ";R$
710 RETURN
```

End

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Photograph by Edward Judice

Hardin Brothers' guide to commercial tools for the serious Assembly-language programmer.

Labor Saver

To be a proficient Assembly-language programmer, you need to start with a good editor/assembler. But don't stop there—you should also consider a variety of other tools to increase your productivity and help reduce the frustrations inherent in programming in a low-level language.

The first two tools seem obvious: a disk system and a printer. It's possible to do without them, but it's also possible to take a mountain hike without shoes. Debugging, the most difficult and time-consuming part of Assembly-language programming, is a constant process of loading an assembler, loading source code, assembling a program, testing it, loading a monitor program, fixing a bug, and then starting all over. Without a disk system to speed up the process of loading programs and codes, you'll spend most of your time waiting impatiently. And without a printout of each major revision of your program, you'll never know where you are in the program or what's supposed to be happening.

Monitor Programs

Having a good monitor program is almost as important as having a disk system and a printer. In Basic, it's a simple matter to scatter Stop commands throughout your program so you can test the values of various variables each time the program stops. A monitor program lets you do the same sort of checking in Assembly language.

At the very least, a monitor should let you step through a program one instruction at a time, execute subroutines in full, examine both the hexadecimal (hex) and ASCII representations of any block of memory, modify any part of memory, and display and change the values held in the Z80's registers.

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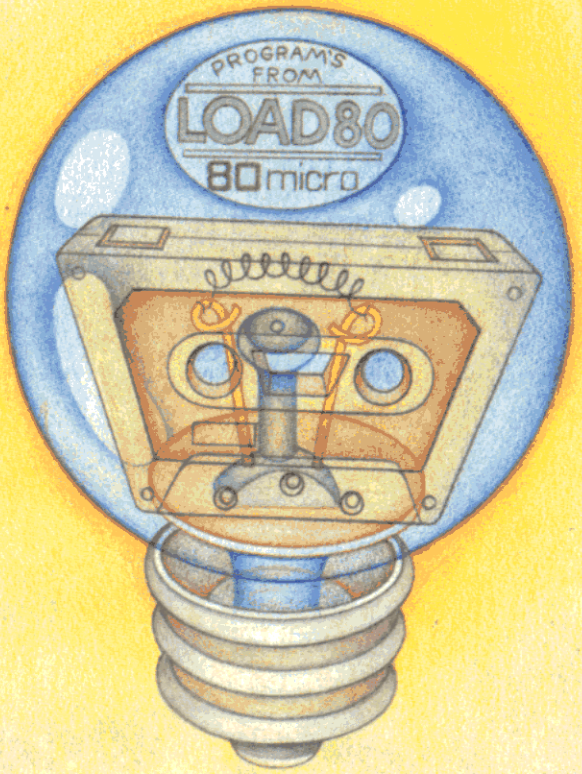

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You can choose from three types of monitors. The most prevalent, and usually the weakest, are the Debug programs included with every DOS. These are often adequate for debugging a small or moderate-size program. They perform the functions mentioned above; some also search through memory for a specified set of bytes, move a block of memory from one location to another, and set a block of memory to a specified value.

The DOS monitors have one great advantage over all the others. They almost invariably load in the DOS overlay area so they don't interfere with your program, wherever it loads in memory. However, that feature can quickly turn to a disadvantage if your program makes calls to DOS routines that load in the same area—the address and programming conflicts will often cause both Debug and the DOS to crash.

In-memory monitors necessarily occupy part of the RAM program area, but by doing so they never conflict with DOS.

The second type of monitor programs are those supplied with some editor/assembler packages. These are generally similar to Debug in their capabilities and commands, though a few can also display parts of your program in symbolic, disassembled form.

The third kind of monitors are sold as separate utilities, and they're generally the most powerful monitors available. I've tried several, though by no means all, of these stand-alone monitor programs, and my favorite for the Model I/III/4 is Tasmon from The Alternate Source (see the Table for manufacturers' addresses).

Tasmon has four features that I find particularly useful. First, it allows up to nine breakpoints. You can set each to stop the program after anywhere from 1-256 loops; for example, you can set breakpoint 5 to stop after 78 executions and breakpoint 2 to stop after 25. Such counted breakpoints are extremely useful for testing program loops. Also, you can set the breakpoints anywhere in RAM or ROM. Most monitors allow breakpoints only in RAM.

Second, besides the regular single-step modes that all monitors have, Tasmon can run a program at several slow speeds, so you can watch the registers or video display change.

Third, it has a complete disassembler built-in. With it, you can display a disassembled listing of any block of memory and scroll forward or backward a page at a time, as well as scroll forward a single instruction at a time. I know of no other monitor that can scroll its disassembler in reverse through memory, and I've found this feature extremely helpful.

Fourth, Tasmon lets you dedicate a 1K block of memory as a shadow video display. Tasmon saves whatever your program would normally display on the screen in that shadow display, so you can examine both the normal monitor display on the screen and, by pressing a single key, the screen display that your program will create. This unique feature makes Tasmon the most useful monitor I've seen for debugging complex display-oriented programs.

I've had only one problem using Tasmon on a Model 4 in Model III mode. It has its own keyboard driver with a debounce routine set for the clock speeds of the Models I and III. If you use the program with the Model 4's faster clock speed, it suffers from terrible keybounce. Be sure to turn off any fast clock modification you have (including the one built into LDOS 5.1.4) before invoking Tasmon.

Books and References

A well-stocked reference library is another necessity for the serious Assembly-language programmer. You need at least one book explaining the Z80 instruction set so you can understand the effects and timing of each instruction. Of the dozens of books available, I've found none better than the documentation included with each of the Radio Shack assemblers. If you own one of them, look no further.

I also like to have a reference card beside me when I work, to check the available commands and their relative speeds. My favorite is the Z80 Reference Card published by Nanos Systems Corp.; it's available in most B. Dalton bookstores.

But having the Z80 instruction set at your fingertips isn't enough. Almost all my programs use ROM and DOS routines. The DOS routines are, of course, documented in the DOS manual (alternative DOSes invariably have better technical documentation than Model I/III TRSDOS). Finding the correct ROM routines can be a problem, however.

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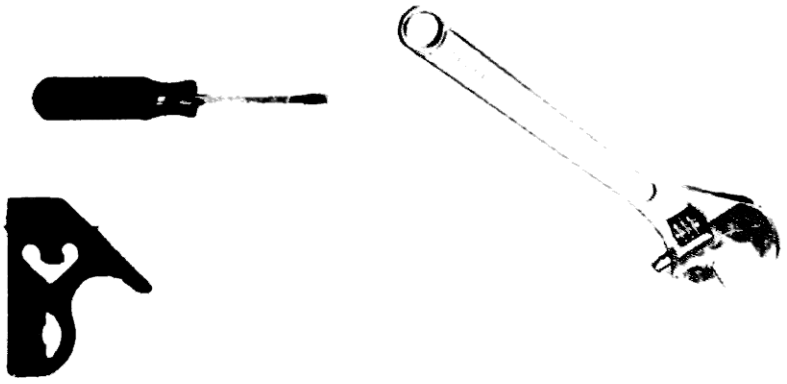

I draw heavily on two books for Model I/III ROM routines. The first is James Farvour's *Microsoft Basic Decoded*, published by IJG. Though this book is a commented disassembly of the Model I's ROM, the Model III's ROM is so similar that most information applies to both machines.

Even more useful is Jack Decker's *TRS-80 ROM Routines Documented* (published by The Alternate Source). This isn't a disassembly at all, but a commentary on several hundred routines in the Model I and Model III ROMs, and it tells you how to use each routine. For many projects, this is the most useful book in my reference library.

Though each applies to a specific topic of Model I/III programming, I find almost all IJG TRS-80 books useful from time to time. I strongly recommend that you buy any of these books that applies to your programming projects, if only for their prewritten routines.

Disassemblers

A disassembler is a software tool that converts a CMD file or section of memory to source code, which you can load back into an editor/assembler, display on screen, or print out. Strictly speaking, you don't need a disassembler to write Assembly-language programs, but most programmers use one.

I have two equally valid reasons for disassembling a program that someone else has written. The first is to learn how professional programmers achieve specific results. Though it's illegal to copy the code from a program you've purchased, it's perfectly legal to learn a technique from the program.

One of the joys of Assembly-language programming is being able to tailor programs to fit your exact needs. Though I have many useful commercial programs, I always find a way to improve each to meet my particular work habits. With a disassembler, you can study a program to find out how it works, and then find patch points to add your own modifications. It's not easy to do, but with a good disassembler and monitor and a lot of patience, you can generally decipher any piece of code.

The best-known Model I/III disassembler is the one that comes with NEWDOS80. It's been included with every version of NEWDOS80 since Apparat released version 2.1 in 1979. This early TRS-80 disassembler is useful, but suffers from one major flaw: It can't distinguish between program instructions and program data. For example, if the original program contained the code:

```
DEFM  '(Y/N)?'
```

the Apparat disassembler might very well disassemble it as:

```
JR    Z,2F59H  (Y/
LD    C,(HL)   N
ADD   HL,HL    )
CCF            ?
```

You can easily tell by looking at the right-hand column that this is a section of program data, but its form is confusing. Even more frustrating is the disassembler's insistence on regarding a 256-byte data area, initialized to all zeros, as four and a half pages of NOP instructions.

Some disassemblers are advertised as being able to recognize program data automatically and disassemble it as such. Some types of program data (such as ASCII messages) are easy to recognize. Others, such as tables or graphics values, aren't. Often, only the context of the program can help you decide which is which.

Because of those considerations, I use DSMBLR III from Misosys. DSMBLR doesn't attempt to separate instructions from data; it lets you do so. When you use DSMBLR, you start with disassemblies to the screen, watching for sections of data in the program code. The more you use a disassembler, the easier it is to spot those sections. After the first disassembly, you create a text file of sections that you want to mark as data. You can mark the data sections as ASCII messages, 1-byte hex values, or 2-byte hex words.

After two or three passes with DSMBLR, you should have a fairly accurate set of screening data in the text file, and a final disassembly to either disk or printer will be as close to the original Assembly-language program (without the comments, of course) as any disassembler can take you. Though DSMBLR III is made for use with Misosys's EDAS assembler, it can also create disk source files that are EDTASM-compatible. The program's data sections are marked with DB, DM, and DW pseudo-ops instead of DEFB, DEFM, and DEFW, but you can easily substitute any format you want using your editor/assembler's search and replace facility.

Putting It All Together

With a quality editor/assembler, disk system, printer, monitor program, disassembler, and a library of reference works—and a lot of practice—you'll be able to take direct control of your computer and make it do whatever you want as quickly and efficiently as possible. ■

Hardin Brothers is an associate editor for 80 Micro. *He also writes The Next Step, a monthly column on Assembly language appearing in this magazine. You can write to him at 280 N. Campus Ave., Upland, CA 91786.*

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By the Numbers

by Arnold E. van Beverhoudt, Jr.

Plot numerical data on either line or bar charts, then display the graphs sequentially with Graph Master's slide show option.

I recently used a CP/M business graphics package that produced high-quality charts and graphs and wished I could get the same kinds of graphs on my Model I as easily as I did with that package. But then I thought, "Why not?" Thus began Graph Master, an easy-to-use, menu-driven Basic program (see the Program Listing) that creates crisp bar and line graphs with a Model I or III (see Figs. 1 and 2).

Mastering Graph Master

It's easy to develop your own graphs with Graph Master: You choose from six straightforward menu options to create a graph, edit the current graph, print a graph, load a graph from disk, present a slide show (to display a series of graphs sequentially), or end the program.

If you opt to create a new graph (menu option 1), a submenu gives you the choice of developing either a bar or line graph. Once you've made this decision, Graph Master takes you to the input routine for the appropriate type of graph (see Table 1 for a list of program subroutines).

Graph Master's Input routine prompts you for information needed to produce each graph. You're asked to supply headings for the graph, the maximum value of the Y-axis (vertical), and the number of points you want plotted along the X-axis (horizontal). I've set the number of points at 12, which lets you plot a graph for a 12-month period. You can remove this limit simply by changing the value of the variable MB in line 30 (see Table 2 for a list of program variables).

Finally, you're prompted for both the X-axis label and the Y-axis values for each point you want plotted. Graph master automatically scales the X- and Y-axis options for bar and line graphs based on the values you enter. When you're finished inputting, press the enter key and the graph is constructed.

Saving, Editing, And Printing Graphs

When Graph Master finishes drawing a graph,

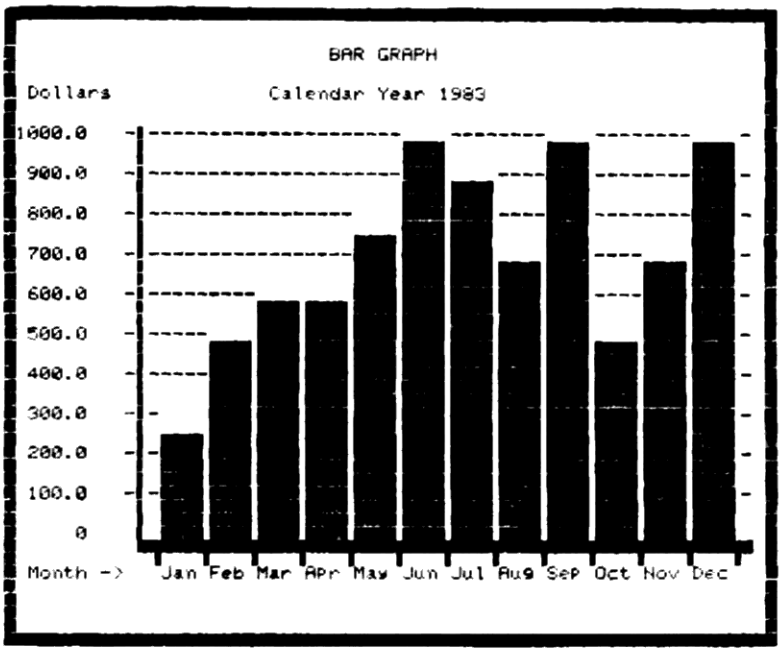

Figure 1. Sample bar graph.

you can save, edit, or print it. Graph Master's Save routine prompts you for a file name, then saves the raw data you input. The program then redraws the graph on-screen and saves the screen image as part of the same file.

After you create a graph, Graph Master sets the variable G$, in line 1140, to either B or L, depending on the type of graph you make. The Edit option (choice 2 on the menu) looks at the value in G$ and branches to the edit section appropriate for either a bar or line graph. You're shown the current value of each variable and given the chance to change any of them. If you want to maintain the current values, simply press the enter key.

When you've finished making changes, Graph Master displays the updated graph. If you want to make further changes, the program calls the edit routine. Once again, you're given the chance to save this revised graph before returning to the main menu.

Selecting the third menu choice, the print option, gives you a printout of the graph currently in memory. This routine first draws the graph to the screen, then invokes a standard screen dump to the printer. The screen dump routine in lines 870–1070 is for the Radio Shack Line Printer VII (DMP-100). If you have another type of printer, replace these lines with a screen dump routine appropriate for your printer.

The fourth option on the main menu lets you load a saved graph from disk. After you input a file name, the routine inputs the raw data for the graph and retrieves the screen image, displaying it on the screen. If you choose not to save the graph to disk, it remains in memory until you either create a new graph, load a graph from disk, or present a slide show.

Slide Shows

Graph Master's slide show option (option 5) presents a unique alternative to traditional graph displays. This interesting feature is simply a loop that loads a series of up to 10 graphs and lets you look at each one before loading the next graph in the sequence. With this program option, you can present a series of graphs without having to enter a file name before displaying each graph. If you want more than ten graphs in a presentation, change the value of the variable MG in line 30.

The last item on the main menu lets you end the program and gives you the chance to save the current graph if you haven't already done so.

Error-Handling

Graph Master is relatively bomb-proof; each time it presents an option, the program checks for valid input. The values that you input are then checked against the maximum values set to MB and MG in line 30. If you try to edit or print when there's no data in memory, Graph Master returns you to the main menu. An error trap in the Load Graph routine also returns you to the main menu if you enter a nonexistent file name. If the printer isn't on-line when you select the print option, the program, once again, transfers you to the main menu. If the worst does happen, you can restart Graph Master without losing any data by issuing a GOTO 70 command. ■

Write to Arnold E. van Beverhoudt Jr. at P.O. Box 56, St. Thomas, Virgin Islands 00801.

The Key Box

LOAD 80

Models I and III
32K RAM
Disk Basic
Printer optional

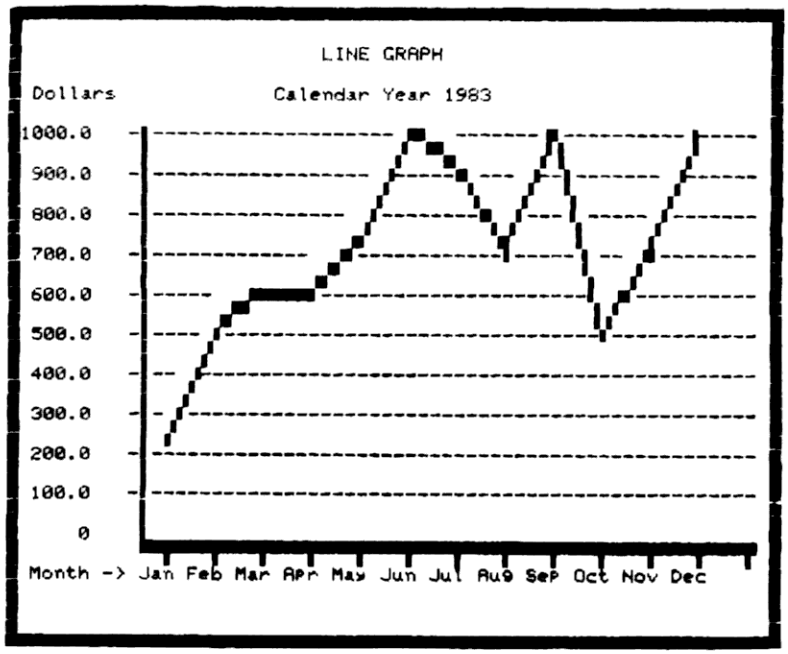

Figure 2. Sample line graph.

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Lines	Function	Lines	Function
20–50	Initialize variables and arrays	1480–1540	End program
60–190	Main menu	1550–1740	Display bar graph
200–540	Create graph	1750–2070	Display line graph
550–810	Edit graph	2080–2240	Save graph
820–1110	Print graph	2250–2260	Center screen headings
1120–1300	Load graph	2270–2290	Disk input error routine
1310–1470	Present slide show		

Table 1. Independent subroutines.

Variable	Definition	Variable	Definition
B	Number of bar/line points	N	Number of bar/line points
CH	CHR$ value for disk save of screen	N1	Scaling variable for bar/line
D	Loop counter	NG	Peek location for screen save
F$	File name for disk input/output		Switch to designate presentation (SS)
F$(mg)	File names for presentation	P	Number of graphs for presentation
G	Loop counter	SW$	Loop counter
G$	Type of graph (B/L)	T	Peek location for screen print
H$	Screen headings to be centered	V	Loop counter
H1$	Main heading for graph	W	Set X coordinate
H2$	Subheading for graph	X	Labels for bar/line X-axis points
HX$	Title for bar/line X-axis	X$(mb)	Scaling variable for bar/line
HY$	Title for bar/line Y-axis	X1	Set Y coordinate
I	Loop counter	Y	Values of bar/line Y-axis points
L	Variable for bar line scaling routine	Y0(mb)	Scaling variable for bar/line
M1	Maximum value of bar/line Y-axis	Y1	Menu selection variable
MB	Maximum number of bar/line points	Z	INKEY$ variable
MG	Maximum number of graphs in presentation	Z$	

Table 2. Variables and arrays used in Graph Master.

Program Listing. Graph Master.

```
10 REM  ************************************
        ********** GRAPH  MASTER **********
        ************ (1984) BY ************
        ** ARNOLD E. VAN BEVERHOUDT, JR. **
        ************************************

20 REM *** INITIALIZE VARIABLES & ARRAYS ***
30 CLEAR 1000:G$="":MB=12:MG=10
40 DIM Y0(MB),X$(MB)
50 DIM F$(MG)
60 REM *** MAIN MENU ***
70 SW$="":CLS:H$="*** GRAPH MASTER ***":GOSUB2260 :PRINT:PRINT
80 H$="MAIN MENU":GOSUB2260 :PRINT:PRINT
90 PRINTTAB(21);"1 - CREATE New Graph"
100 PRINTTAB(21);"2 - EDIT Current Graph"
110 PRINTTAB(21);"3 - PRINT Current Graph"
120 PRINTTAB(21);"4 - LOAD Graph from Disk"
130 PRINTTAB(21);"5 - PRESENT Slide Show"
140 PRINTTAB(21);"6 - END Program"
150 PRINT:PRINT
160 H$="Enter your choice (1 to 6)":GOSUB2260
170 Z$=INKEY$:IFZ$=""THENGOTO170  ELSEZ=VAL(Z$)
180 IFZ<1ORZ>6THENGOTO70
190 ONZGOTO210  ,560  ,830  ,1130 ,1320 ,1490
200 REM *** CREATE NEW GRAPH ***
210 CLS:H$="CREATE NEW GRAPH":GOSUB2260 :PRINT:PRINT
220 H$="GRAPH MENU":GOSUB2260 :PRINT:PRINT
230 H$="1 - BAR Graph":GOSUB2260 :PRINT
240 H$="2 - LINE Graph":GOSUB2260 :PRINT
250 H$="3 - MAIN MENU":GOSUB2260 :PRINT
260 PRINT:PRINT
270 H$="Enter your choice (1 to 3)":GOSUB2260
280 Z$=INKEY$:IFZ$=""THENGOTO280  ELSEZ=VAL(Z$)
290 IFZ<1ORZ>3THENGOTO210
300 IFZ=1THENG$="B"ELSEIFZ=2THENG$="L"
310 ONZGOTO330  ,330  ,70
320 REM *** BAR or LINE GRAPH ***
330 CLS:IFG$="B"THENH$="BAR GRAPH"ELSEH$="LINE GRAPH"
340 GOSUB2260 :PRINT:PRINT
350 B=1
360 INPUT"Enter MAIN HEADING";H1$
```

Listing continued

Listing continued

```
370 INPUT"Enter SUB-HEADING";H2$
380 INPUT"Enter X-AXIS HEADING";HX$
390 INPUT"Enter Y-AXIS HEADING";HY$
400 INPUT"Enter MAXIMUM VALUE of Y-AXIS";M1
410 INPUT"Enter NUMBER of VALUES to be used";N
420 IFN>MBTHENPRINT:PRINT"Maximum number of values allowed is";MB:
GOTO410
430 FORT=1TON:CLS
440 PRINT"Enter X-AXIS TITLE for value #";T;:INPUTX$(T)
450 PRINT"Enter Y-AXIS VALUE for value #";T;:INPUTY0(T)
460 IFY0(T)>M1THENPRINT"Value is too large":GOTO450
470 PRINT:NEXTT
480 PRINT:H$="Press <ENTER> to DISPLAY the graph":GOSUB2260
490 Z$=INKEY$:IFZ$=""THENGOTO490
500 IFG$="B"THENGOSUB1560 ELSEGOSUB1760
510 PRINT@973,"Do you want to SAVE this graph (Y/N) ?";
520 Z$=INKEY$:IFZ$=""THENGOTO520
530 IFZ$="Y"ORZ$="y"THENGOSUB2090 ELSEIFZ$="N"ORZ$="n"THENGOTO210
 ELSEGOTO510
540 GOTO70
550 REM *** EDIT GRAPH ***
560 CLS:H$="EDIT GRAPH":GOSUB2260 :PRINT:PRINT
570 IFG$=""THENH$="There is no graph currently in memory":GOSUB226
0 :FORT=1TO1500:NEXTT:GOTO70
580 GOTO600
590 REM *** BAR or LINE GRAPH ***
600 CLS:H$="EDIT GRAPH":GOSUB2260 :PRINT:PRINT
610 PRINT"MAIN HEADING: ";H1$:INPUTH1$
620 PRINT"SUB-HEADING: ";H2$:INPUTH2$
630 PRINT"X-AXIS HEADING: ";HX$:INPUTHX$
640 PRINT"Y-AXIS HEADING: ";HY$:INPUTHY$
650 PRINT"MAXIMUM VALUE OF Y-AXIS:";M1:INPUTM1
660 FORT=1TON:CLS:PRINT"VALUE #";T:PRINT
670 PRINT"X-AXIS TITLE: ";X$(T):INPUTX$(T)
680 PRINT"Y-AXIS VALUE:";Y0(T):INPUTY0(T)
690 NEXTT
700 CLS:H$="Press <ENTER> to DISPLAY graph":GOSUB2260
710 Z$=INKEY$:IFZ$=""THENGOTO710
720 IFG$="B"THENGOSUB1560 ELSEIFG$="L"THENGOSUB1760
730 PRINT@973,"Do you want to do more EDITING (Y/N) ?";
740 Z$=INKEY$:IFZ$=""THENGOTO740
750 IFZ$="Y"ORZ$="y"THENGOTO560
760 IFZ$="N"ORZ$="n"THENGOTO780
770 GOTO730
780 PRINT@973,"Do you want to SAVE this graph (Y/N) ?";
790 Z$=INKEY$:IFZ$=""THENGOTO790
800 IFZ$="Y"ORZ$="y"THENGOSUB2090 ELSEIFZ$="N"ORZ$="n"THENGOTO70
 ELSEGOTO780
810 GOTO70
820 REM *** PRINT GRAPH ***
830 CLS:H$="PRINT GRAPH":GOSUB2260 :PRINT:PRINT
840 IFG$=""THENH$="There is no graph currently in memory":GOSUB226
0 :FORT=1TO1500:NEXTT:GOTO70
850 H$="Prepare printer then press <ENTER>":GOSUB2260
860 Z$=INKEY$:IFZ$=""THENGOTO860
870 IFPEEK(14312)>127THENPRINT:PRINT:H$="Printer not available":GO
SUB2260 :FORT=1TO1500:NEXTT:GOTO70
880 IFG$="B"THENGOSUB1560 ELSEIFG$="L"THENGOSUB1760
890 FORX=0TO127:SET(X,47):NEXTX:Y=0:FORV=15360TO16383STEP64
900 P1=0:FORI=0TO63:P=PEEK(V+I):IFP<33ORP>126THENP=0
910 P1=P1+P:NEXTI:IFP1=0GOTO950
920 FORI=0TO63
930 P=PEEK(V+I):IFP<32ORP>126THENP=32
940 LPRINTCHR$(P);:NEXTI:LPRINTCHR$(26);
950 LPRINTCHR$(18);
960 FORW=1TO3
970 P1=0:FORX=0TO127
980 P=POINT(X,Y):P1=P1+P:NEXTX:IFP1=0GOTO1040
990 FORX=0TO127
1000 P=POINT(X,Y):IFP=-1THENP=255:GOTO1020
1010 P=128
1020 LPRINTCHR$(P);CHR$(P);CHR$(P);
1030 NEXTX
1040 LPRINTCHR$(10);:Y=Y+1:IFY=48THENGOTO1090
1050 NEXTW
1060 LPRINTCHR$(30);
1070 NEXTV
1080 LPRINTCHR$(30);
1090 PRINT@976,"Do you want another COPY (Y/N) ?";
1100 Z$=INKEY$:IFZ$=""THENGOTO1100
1110 IFZ$="Y"ORZ$="y"THENFORX=0TO127:SET(X,47):NEXTX:GOTO890  ELSE
IFZ$="n"ORZ$="N"THENGOTO70   ELSEGOTO1090
1120 REM *** LOAD GRAPH ***
1130 CLS:H$="LOAD GRAPH":GOSUB2260 :PRINT:PRINT
1140 H$="Insert DATA DISK in drive":GOSUB2260 :PRINT:PRINT:INPUT"E
nter FILENAME";F$:CLS
1150 ONERRORGOTO2280
1160 OPEN"I",1,F$
1170 INPUT#1,G$
1180 IFG$<>"P"THENGOTO1200

1190 REM *** BAR or LINE GRAPH ***
1200 INPUT#1,N,M1,H1$,H2$,HX$,HY$
1210 FORT=1TON:INPUT#1,Y0(T),X$(T):NEXTT
1220 FORP=15360TO16383
1230 INPUT#1,CH
1240 POKEP,CH
1250 NEXTP
1260 CLOSE1
1270 IFSW$="SS"THENPRINT@979,"Press <ENTER> to continue";:GOTO1290
1280 PRINT@977,"Press <ENTER> for MAIN MENU";
1290 Z$=INKEY$:IFZ$=""THENGOTO1290
1300 IFSW$="SS"THENRETURNELSEGOTO70
1310 REM *** SLIDE SHOW ***
```

Listing continued

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Listing continued

```
1320 SW$="SS"
1330 CLS:H$="PRESENT SLIDE SHOW":GOSUB2260 :PRINT:PRINT
1340 PRINT"How many graphs do you want to use (maximum is";MG;")";
:INPUTNG:PRINT
1350 IFNG>MGTHENGOTO1320
1360 FORT=1TONG
1370 PRINT"Enter FILENAME for graph #";T;:INPUTF$(T)
1380 NEXTT
1390 PRINT:H$="Insert DATA DISK in drive then press <ENTER>":GOSUB
2260
1400 Z$=INKEY$:IFZ$=""THENGOTO1400 ELSE1410
1410 FORG=1TONG:CLS
1420 ONERRORGOTO2280
1430 OPEN"I",1,F$(G)
1440 INPUT#1,G$
1450 GOSUB1200
1460 NEXTG
1470 SW$="":GOTO70
1480 REM *** END PROGRAM ***
1490 CLS:H$="END PROGRAM":GOSUB2260 :PRINT:PRINT
1500 H$="Do you want to CANCEL this command (Y/N) ?":GOSUB2260
1510 Z$=INKEY$:IFZ$=""THENGOTO1510 ELSEGOTO1520
1520 IFZ$="y"ORZ$="Y"THENGOTO70
1530 IFZ$="n"ORZ$="N"THENCLS:END
1540 GOTO1490
1550 REM *** BAR GRAPH ***
1560 CLS:FORX=0TO127:SET(X,0):SET(X,47):NEXTX
1570 FORY=0TO47:SET(0,Y):SET(1,Y):SET(126,Y):SET(127,Y):NEXTY
1580 PRINT@65,;:PRINTTAB((63-LEN(H1$))/2);H1$;
1590 PRINT@130,HY$;TAB((63-LEN(H2$))/2);H2$;
1600 PRINT@898,HX$;
1610 L=M1:N1=INT(100/N)
1620 FORI=1TO10:PRINT@129+64*I,;
1630 PRINTUSING"####.#";M1-M1/10*(I-1);
1640 PRINT"   -";CHR$(149);STRING$(50,"-");:NEXTI
1650 PRINT@837,0;TAB(11);CHR$(141);
1660 PRINT@844,STRING$(50,140);
1670 FORI=25TO126STEPN1:SET(I,41):NEXTI
1680 FORI=0TON-1:PRINT@909+I*N1/2,X$(I+1);:NEXTI
1690 FORD=0TON-1
1700 FORY=0TOINT(Y0(D+1)/M1*30+.5)
1710 FORZ=0TON1-2:SET(N1*D+Z+26,40-Y)
1720 NEXTZ:NEXTY:NEXTD
1730 PRINT@979,"Press <ENTER> to continue";
1740 Z$=INKEY$:IFZ$=""THENGOTO1740 ELSERETURN
1750 REM *** LINE GRAPH ***
1760 CLS
1770 FORX=0TO127:SET(X,0):SET(X,47):NEXTX
1780 FORY=0TO47:SET(0,Y):SET(1,Y):SET(126,Y):SET(127,Y):NEXTY
1790 PRINT@65,;
1800 PRINTTAB((63-LEN(H1$))/2);H1$;
1810 PRINT@130,HY$;
1820 PRINTTAB((63-LEN(H2$))/2);H2$;
1830 PRINT@898,HX$;
1840 L=M1:N1=INT(100/N+.5)
1850 FORI=1TO10:PRINT@129+64*I,;
1860 PRINTUSING"####.#";M1-M1/10*(I-1);
1870 PRINT"   -";CHR$(149);STRING$(50,"-");:NEXTI
1880 PRINT@837,0;TAB(11);CHR$(141);
1890 PRINT@844,STRING$(50,140);
1900 FORI=26TO126STEPN1:SET(I,41):NEXTI
1910 FORI=0TON-1:PRINT@907+I*N1/2,X$(I+1);:NEXTI
1920 I=1:Y0=Y0(I)
1930 FORX2=26+N1 TO126 STEPN1
1940 IF I=NTHENGOTO1970 ELSEY0=Y0(I)
1950 I=I+1:X1=X2-N1:Y=Y0
1960 GOSUB1990 :NEXTX2
1970 PRINT@979,"Press <ENTER> to continue";
1980 Z$=INKEY$:IFZ$=""THENGOTO1980 ELSERETURN
1990 Y1=39-INT(Y/M1*30):Y2=39-INT(Y0(I)/M1*30):IFX1<>X2THEN2020
2000 IFY1<Y2 THENS=1 ELSES=-1
2010 FORY=Y1TOY2STEPS:SET(X1,Y):NEXTY:RETURN
2020 M=(Y2-Y1)/(X2-X1)
2030 IFABS(M)>1S=ABS(1/M)ELSES=1
2040 IFX1>X2 THENS=-S
2050 FORX=X1TOX2STEPS
2060 SET(X,M*(X-X1)+Y1)
2070 NEXTX:RETURN
2080 REM *** SAVE GRAPH ***
2090 CLS:H$="SAVE GRAPH":GOSUB2260 :PRINT:PRINT
2100 H$="Insert DATA DISK in drive":GOSUB2260 :PRINT:PRINT:INPUT"E
nter FILENAME";F$
2110 PRINT:H$="Wait a few moments please":GOSUB2260
2120 OPEN"O",1,F$
2130 PRINT#1,G$
2140 IFG$<>"P"THENGOTO2160
2150 REM *** BAR GRAPH ***
2160 PRINT#1,N;",";M1;",";H1$;",";H2$;",";HX$;",";HY$
2170 FORT=1TON:PRINT#1,Y0(T);",";X$(T):NEXTT
2180 IFG$="B"THENGOSUB1560 ELSEIFG$="L"THENGOSUB1760
2190 FORX=0TO127:SET(X,47):NEXTX
2200 FORP=15360TO16383
2210 PRINT#1,PEEK(P);:POKEP,128
2220 NEXTP
2230 CLOSE1
2240 GOTO70
2250 REM *** CENTER HEADINGS ***
2260 PRINTTAB((64-LEN(H$))/2);H$;:RETURN
2270 REM *** DISK INPUT ERROR ROUTINE ***
2280 IFERR/2+1=54THENPRINT:H$="File not found":GOSUB2260 :FORT=1TO
1500:NEXTT:CLOSE1:GOTO70
2290 PRINT:H$="Disk input error":GOSUB2260 :FORT=1TO1500:NEXTT:CLO
SE1:GOTO70
```

End

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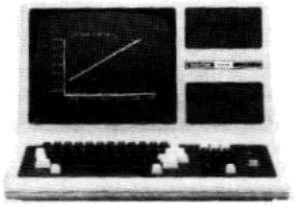

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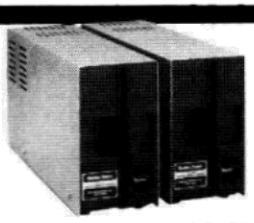

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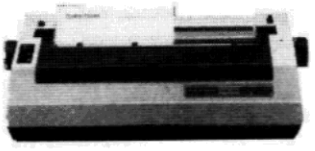

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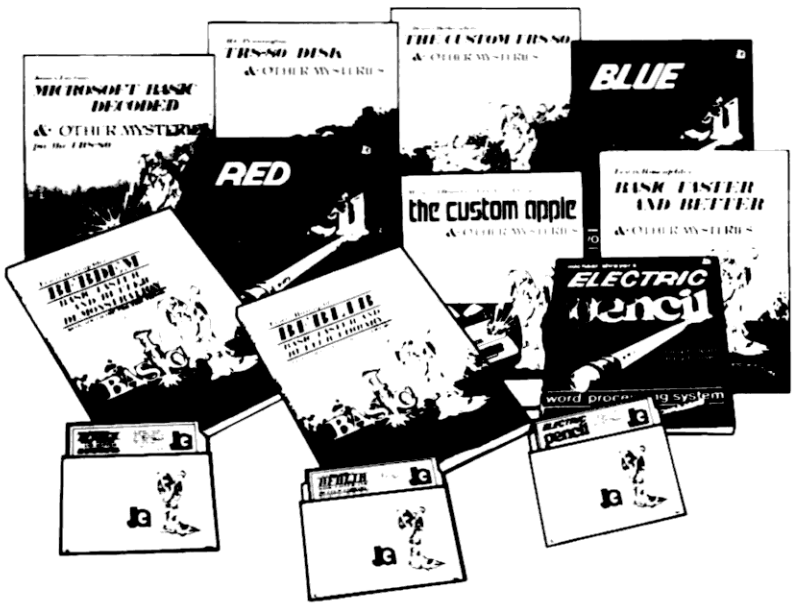

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00540          INC     HL
00550          LD      A,B
00560          OR      C
00570          JP      NZ,ST1
00580 DRWP1    LD      HL,L1
00590          LD      BC,300
00600 ST3      LD      A,128
00610          LD      (HL),A
00620          INC     HL
00630          DEC     BC
00640          LD      A,B
00650          OR      C
00660          JP      NZ,ST3
00670 RST1     CALL    DRAW
00680          CALL    01C9H
00690          LD      HL,QUMES        ;WHICH SIZE?
00700          LD      DE,15360
00710          CALL    WRITE
00720          CALL    GETCHR
00730          CP      '1'
00740          JP      Z,DRWPRT
00750          CP      '2'
00760          JP      Z,LGPRT
00770          JP      RST1
00780 LGPRT    LD      HL,LGMES        ;LARGE PRINT
00790          LD      DE,15360
00800          CALL    WRITE
00810          CALL    GETSNM
00820          LD      B,A
00830          CALL    LOAD2
00840          LD      A,0
00850          LD      (SR2),A
00860 LPR1     LD      (SR3),A
00870          LD      E,A
00880          LD      A,(SR2)
00890          LD      D,A
00900          CALL    TEST
00910          JP      Z,LPR2
00920          LD      A,255
00930          JP      LPR3
00940 LPR2     LD      A,128
00950 LPR3     CALL    3BH
00960          CALL    3BH
00970          CALL    3BH
00980          LD      A,(SR3)
00990          INC     A
01000          CP      128
01010          JP      Z,LPR4
01020          JP      LPR1
01030 LPR4     LD      A,(SR2)
01040          INC     A
01050          CP      48
01060          JP      NZ,LPR45
01070          CALL    LPRINT
01080          JP      RST1
01090 LPR45    LD      (SR2),A
01100          CALL    LPRINT
01110          LD      A,0
01120          JP      LPR1
01130 DRWPRT   LD      IX,PRDAT        ;SMALL PRINT
01140 DP4      LD      HL,MES9
01150          LD      DE,15360
01160          CALL    WRITE
01170          CALL    GETSNM
01180          ADD     A,48
01190          LD      (15426),A
01200          SUB     48
01210          LD      (IX),A
01220          CALL    GETSNM
01230          ADD     A,48
01240          LD      (15427),A
01250          SUB     48
01260          LD      (IX+1),A
01270          CALL    GETSNM
01280          ADD     A,48
01290          LD      (15428),A
01300          SUB     48
01310          LD      (IX+2),A
01320          LD      IX,PRDAT
01330 DP62     LD      A,1
01340 DP7      LD      (SR2),A
01350 DP8      LD      A,1
01360          LD      (SR3),A
01370          LD      A,-5
01380          LD      (F1),A
01390          LD      A,0
01400          LD      (F2),A
01410 DP812    CALL    STSR4
01420 DP811    LD      A,(IX)
01430          LD      B,A
01440          CALL    LOAD2
01450          LD      A,0
01460          LD      (A1),A
01470          LD      (C1),A
01480          LD      A,128
01490          LD      (B1),A
01500          PUSH    IX
01510          CALL    SETUP
01520          POP     IX
01530          CALL    SENDPT
01540          CALL    L1SET
01550          LD      A,(SR3)
01560          INC     A
01570          LD      (SR3),A
01580          CP      4
01590          JP      Z,DP12
01600          INC     IX
01610          JP      DP811
01620 DP12     CALL    LPRINT
01630          LD      IX,PRDAT
01640          LD      A,1
01650          LD      (SR3),A
01660          LD      A,(SR2)
01670          INC     A
01680          LD      (SR2),A
01690          CP      7
01700          JP      Z,DP13
01710          CP      -1
01720          JP      Z,DP14
01730          JP      DP812
01740 DP13     LD      A,(F2)
01750          DEC     A
01760          LD      (F1),A
01770          LD      A,48
01780          LD      (F2),A
01790          LD      A,-2
01800          LD      (SR2),A
01810          JP      DP811
01820 DP14     JP      DRWP1
01830 SENDPT   LD      HL,L1    ;SEND A LINE OF DATA TO PRINTER
01840          LD      B,128
01850 SENDP2   LD      A,(HL)
01860          CALL    3BH
01870          INC     HL
01880          DJNZ    SENDP2
01890          RET
01900 LPRINT   LD      A,13     ;SEND CARRIAGE RETURN TO PRINTER
01910          CALL    3BH
01920          RET
01930 SETUP    LD      A,(A1)   ;TAKES LINE OF SCREEN DATA AND
01940 ;CONVERTS IT INTO BIT IMAGE PRINTER DATA
01950          LD      (PP),A
01960          LD      IX,L1
01970 SET5     LD      IY,DD
01980          LD      A,(F1)
01990          LD      B,A
02000 SET3     LD      D,B
02010          LD      A,(C1)
02020          LD      C,A
02030          LD      A,(PP)
02040          SUB     C
02050          LD      E,A
02060          PUSH    BC
02070          PUSH    DE
02080          PUSH    HL
02090          CALL    TEST
02100          POP     HL
02110          POP     DE
02120          POP     BC
02130          JP      Z,SET1
02140          LD      A,(IY)
02150          ADD     A,(IX)
02160          LD      (IX),A
02170 SET1     INC     IY
02180          INC     B
02190          LD      A,(F2)
02200          LD      C,A
02210          LD      A,B
02220          OR      A
02230          CP      C
02240          JP      Z,SET2
02250          JP      SET3
02260 SET2     LD      A,(B1)
02270          LD      C,A
02280          LD      A,(PP)
02290          INC     A
02300          OR      A
02310          CP      C
02320          JP      Z,SET4
02330          INC     IX
02340          LD      (PP),A
02350          JP      SET5
02360 SET4     RET
02370 STATUS   LD      A,(14312)        ;CHECKS PRINTER STATUS
02380          CP      63
02390          RET     Z
02400          LD      A,B
02410          CP      5
02420          JP      Z,STATUS
02430          LD      HL,PMES
02440          LD      DE,15360
02450          CALL    WRITE
02460          LD      B,5
02470          JP      STATUS
02480 STSR4    LD      A,(F2)
02490          LD      (F1),A
02500          ADD     A,7
02510          LD      (F2),A
02520          RET
02530 LOAD     LD      HL,MES1 ;LOADS A SCREEN TO VIDEO
02540          LD      DE,15360
02550          CALL    WRITE
02560          CALL    GETSNM
02570          CP      'Q'
02580          JP      Z,RST1
02590          LD      B,A
02600 LOAD2    LD      HL,SCREEN-1024
02610          LD      DE,1024
02620 LD1      ADD     HL,DE
02630          DJNZ    LD1
02640          LD      DE,15360
02650          LD      BC,1024
02660 LD2      LD      A,(HL)
02670          LD      (DE),A
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2	ANNU1	Annuity computation program
3	DATE	Time between dates
4	DAYYEAR	Day of year a particular date falls on
5	LEASEINT	Interest rate on lease
6	BREAKEVN	Breakeven analysis
7	DEPRSL	Straightline depreciation
8	DEPRSY	Sum of the digits depreciation
9	DEPRDB	Declining balance depreciation
10	DEPRDDB	Double declining balance depreciation
11	TAXDEP	Cash flow vs. depreciation tables
12	CHECK2	Prints NEBS checks along with daily register
13	CHECKBK1	Checkbook maintenance program
14	MORTGAGE/A	Mortgage amortization table
15	MULTMON	Computes time needed for money to double, triple, etc.
16	SALVAGE	Determines salvage value of an investment
17	RRVARIN	Rate of return on investment with variable inflows
18	RRCONST	Rate of return on investment with constant inflows
19	EFFECT	Effective interest rate of a loan
20	FVAL	Future value of an investment (compound interest)
21	PVAL	Present value of a future amount
22	LOANPAY	Amount of payment on a loan
23	REGWITH	Equal withdrawals from investment to leave 0 over
24	SIMPDISK	Simple discount analysis
25	DATEVAL	Equivalent & nonequivalent dated values for oblig.
26	ANNUDEF	Present value of deferred annuities
27	MARKUP	% Markup analysis for items
28	SINKFUND	Sinking fund amortization program
29	BONDVAL	Value of a bond
30	DEPLETE	Depletion analysis
31	BLACKSH	Black Scholes options analysis
32	STOCVAL1	Expected return on stock via discounts dividends
33	WARVAL	Value of a warrant
34	BONDVAL2	Value of a bond
35	EPSEST	Estimate of future earnings per share for company
36	BETAALPH	Computes alpha and beta variables for stock
37	SHARPE1	Portfolio selection model-i.e. what stocks to hold
38	OPTWRITE	Option writing computations
39	RTVAL	Value of a right
40	EXPVAL	Expected value analysis
41	BAYES	Bayesian decisions
42	VALPRINF	Value of perfect information
43	VALADINF	Value of additional information
44	UTILITY	Derives utility function
45	SIMPLEX	Linear programming solution by simplex method
46	TRANS	Transportation method for linear programming
47	EOQ	Economic order quantity inventory model
48	QUEUE1	Single server queueing (waiting line) model
49	CVP	Cost-volume-profit analysis
50	CONDPROF	Conditional profit tables
51	OPTLOSS	Opportunity loss tables
52	FQUOQ	Fixed quantity economic order quantity model
53	FQEOWSH	As above but with shortages permitted
54	FQEOQPB	As above but with quantity price breaks
55	QUEUECB	Cost-benefit waiting line analysis
56	NCFANAL	Net cash-flow analysis for simple investment
57	PROFIND	Profitability index of a project
58	CAP1	Cap. Asset Pr. Model analysis of project
59	WACC	Weighted average cost of capital
60	COMPBAL	True rate on loan with compensating bal. required
61	DISCBAL	True rate on discounted loan
62	MERGANAL	Merger analysis computations
63	FINRAT	Financial ratios for a firm
64	NPV	Net present value of project
65	PRINDLAS	Laspeyres price index
66	PRINDPA	Paasche price index
67	SEASIND	Constructs seasonal quantity indices for company
68	TIMETR	Time series analysis linear trend
69	TIMEMOV	Time series analysis moving average trend
70	FUPRINF	Future price estimation with inflation
71	MAILPAC	Mailing list system
72	LETWRT	Letter writing system-links with MAILPAC
73	SORT3	Sorts list of names
74	LABEL1	Shipping label maker
75	LABEL2	Name label maker
76	BUSBUD	DOME business bookkeeping system
77	TIMECLCK	Computes weeks total hours from timeclock info.
78	ACCTPAY	In memory accounts payable system-storage permitted
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80	INVENT2	In memory inventory control system
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82	TIMUSAN	Time use analysis
83	ASSIGN	Use of assignment algorithm for optimal job assign.
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90	UPSZONE	Finds UPS zones from zip code
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93	INSFILE	Insurance policy file
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95	DILANAL	Dilution analysis
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02760           LD      HL,MES2
02770           LD      DE,15360
02780           CALL    WRITE
02790           CALL    GETSNM
02800           LD      B,A
02810           LD      HL,SCREEN-1024
02820           LD      DE,1024
02830 SV2       ADD     HL,DE
02840           DJNZ    SV2
02850           PUSH    HL
02860           CALL    TRANS2
02870           POP     HL
02880           LD      DE,15360
02890           LD      BC,1024
02900 SV3       LD      A,(DE)
02910           LD      (HL),A
02920           DEC     BC
02930           INC     HL
02940           INC     DE
02950           LD      A,B
02960           OR      C
02970           RET     Z
02980           JP      SV3
02990 TRANS     LD      HL,CURR ;MOVES VIDEO DATA INTO MEMORY
03000 ;TO MAKE WAY FOR A MESSAGE
03010           LD      DE,15360
03020           LD      BC,1024
03030 TR1       LD      A,(DE)
03040           LD      (HL),A
03050           DEC     BC
03060           INC     HL
03070           INC     DE
03080           LD      A,B
03090           OR      C
03100           RET     Z
03110           JP      TR1
03120 TRANS2    LD      HL,CURR
03130           LD      DE,15360
03140           LD      BC,1024
03150 TR2       LD      A,(HL)
03160           LD      (DE),A
03170           DEC     BC
03180           INC     HL
03190           INC     DE
03200           LD      A,B
03210           OR      C
03220           RET     Z
03230           JP      TR2
03240 WRITE     CALL    01C9H   ;DISPLAY MESSAGE ROUTINE
03250 WRITE1    LD      A,(HL)
03260           CP      0
03270           RET     Z
03280           LD      (DE),A
03290           INC     DE
03300           INC     HL
03310           JP      WRITE1
03320 GETSNM    INC     DE      ;GET A NUMBER
03330 SNM1      LD      A,191
03340           LD      (DE),A
03350           PUSH    DE
03360           CALL    2BH
03370           POP     DE
03380           OR      A
03390           JP      NZ,GOTC1
03400           LD      A,128
03410           LD      (DE),A
03420           JP      SNM1
03430 GOTC1     CP      1
03440           JP      Z,RST1
03450           LD      B,A
03460           SUB     58
03470           JP      P,GETSNM
03480           LD      A,B
03490           SUB     48
03500           JP      M,GETSNM
03510           RET
03520 GETCHR    INC     DE      ;GET ANY KEY
03530 CHR1      LD      A,191
03540           LD      (DE),A
03550           PUSH    DE
03560           CALL    2BH
03570           POP     DE
03580           OR      A
03590           JP      NZ,CHR2
03600           LD      A,128
03610           LD      (DE),A
03620           JP      CHR1
03630 CHR2      CP      1
03640           JP      Z,RST1
03650           RET
03660 LISET     LD      HL,L1   ;RESETS LINE OF PRINTER DATA
03670           LD      BC,300
03680 LIST1     LD      A,128
03690           LD      (HL),A
03700           INC     HL
03710           DEC     BC
03720           LD      A,B
03730           OR      C
03740           RET     Z
03750           JP      LIST1
03760 DRAW      LD      A,0     ;CHECKS FOR COMMANDS
03770           LD      (N),A
03780           LD      (Y),A
03790           LD      (MD),A
03800           CALL    LOAD
03810 DW1       LD      A,(15350)
03820           BIT     0,A
03830           JP      Z,DW12
03840           LD      BC,1
03850           JP      DW13
03860 DW12      LD      BC,4000
03870 DW13      CALL    60H
03880           CALL    2BH
03890           CP      'P'
03900           JP      Z,MODEP
03910           CP      'C'
03920           JP      Z,MODEC
03930           CP      'N'
03940           JP      Z,MODEB
03950           CP      'S'
03960           JP      Z,SCRSAV
03970           CP      'L'
03980           JP      Z,SCRLD
03990           CP      'Q'
04000           JP      Z,QUIT
04010           CP      'H'
04020           JP      Z,HELP
04030           CP      'F'
04040           JP      Z,FILL
04050           CP      'I'
04060           JP      Z,INVER
04070           CP      'O'
04080           JP      Z,OUTPUT
04090           CP      'B'
04100           JP      Z,BORDER
04110           CP      'A'
04120           JP      Z,SETXS
04130           CP      'Z'
04140           JP      Z,DRAWLN
04150           CP      'T'
04160           JP      Z,PACK
04170           CP      'M'
04180           JP      Z,LETTER
04190           CP      'D'
04200           RET     Z
04210           LD      A,(14450)
04220           CP      128
04230           JP      Z,SETNB
04240           CP      8
04250           JP      Z,NEGB
04260           CP      16
04270           JP      Z,POSB
04280           CP      32
04290           JP      Z,NEGN
04300           CP      64
04310           JP      Z,POSN
04320           CP      40
04330           JP      Z,NEGBN
04340           CP      72
04350           JP      Z,PNNB
04360           CP      48
04370           JP      Z,NNPB
04380           CP      80
04390           JP      Z,POSBN
04400           CP      4
04410           JP      Z,RESNB
04420 DW2       LD      A,(N)
04430           CP      -1
04440           JP      NZ,DW3
04450           LD      A,127
04460           LD      (N),A
04470 DW3       LD      A,(N)
04480           CP      128
04490           JP      NZ,DW4
04500           LD      A,0
04510           LD      (N),A
04520 DW4       LD      A,(Y)
04530           CP      -1
04540           JP      NZ,DW5
04550           LD      A,47
04560           LD      (Y),A
04570 DW5       LD      A,(Y)
04580           CP      48
04590           JP      NZ,DW6
04600           LD      A,0
04610           LD      (Y),A
04620 DW6       LD      A,(MD)
04630           CP      0
04640           JP      NZ,DW7
04650           LD      A,(N)
04660           LD      E,A
04670           LD      A,(Y)
04680           LD      D,A
04690           CALL    TEST
04700           JP      Z,DW61
04710           LD      A,(N)
04720           LD      E,A
04730           LD      A,(Y)
04740           LD      D,A
04750           PUSH    DE
04760           CALL    RESET
04770           LD      BC,1000
04780           CALL    60H
04790           POP     DE
04800           CALL    SET
04810           JP      DW1
```

Listing continued on p. 82

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	LIST PRICE	OUR PRICE
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26-5311 Microsoft Multiplan	$ 195.00	$ 166.00
26-5352 dBase II (Data Base)	$ 595.00	$ 420.00
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	LIST PRICE	OUR PRICE
25-3000 Tandy 1200 1 Disk and 10 Meg HD	$ 2999.00	$ 2550.00
25-3010 VM-3 Green Monitor	$ 219.00	$ 185.00
26-3212 CM-2 Color Monitor	$ 549.95	$ 467.50
25-3040 Monochrome Display Adapter	$ 219.00	$ 185.00
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25-3044 Graphics Master	$ 695.00	$ 590.00
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26-1635 Profile 4 Model 4	$ 249.95	$ 212.00
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26-6004 Model 16B 256K 1 Drive Computer	$4999.00	$3175.00
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26-6006 Model 16B 256K 15Meg HD	$5999.00	$4750.00
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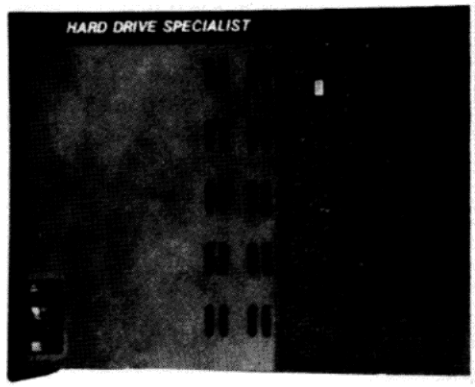

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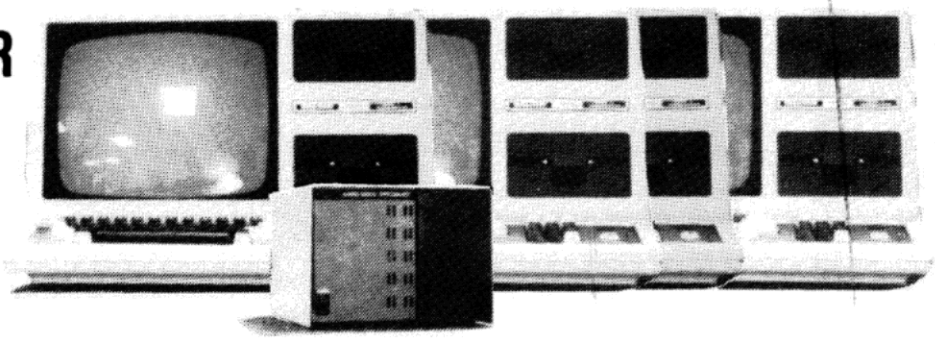

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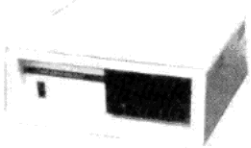

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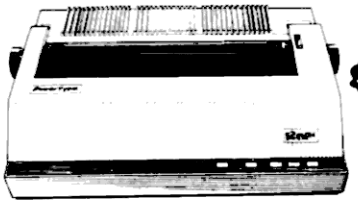

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Listing continued from p. 78

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04820 DW61    LD      A,(N)
04830         LD      E,A
04840         LD      A,(Y)
04850         LD      D,A
04860         CALL    SET
04870         LD      BC,1000
04880         CALL    60H
04890         LD      A,(N)
04900         LD      E,A
04910         LD      A,(Y)
04920         LD      D,A
04930         CALL    RESET
04940         JP      DW1
04950 DW7     CP      1
04960         JP      NZ,DW8
04970         LD      A,(N)
04980         LD      E,A
04990         LD      A,(Y)
05000         LD      D,A
05010         PUSH    DE
05020         CALL    SET
05030         LD      BC,1000
05040         CALL    60H
05050         POP     DE
05060         CALL    RESET
05070         JP      DW1
05080 DW8     CP      2
05090         JP      NZ,DW1
05100         LD      A,(N)
05110         LD      E,A
05120         LD      A,(Y)
05130         LD      D,A
05140         PUSH    DE
05150         CALL    RESET
05160         LD      BC,1000
05170         CALL    60H
05180         POP     DE
05190         CALL    SET
05200         JP      DW1
05210 SCRLD   CALL    LOAD
05220         JP      DW1
05230 SCRSAV. CALL    SAVE
05240         JP      DW1
05250 FILL    LD      A,(N)    ;FILL IN A FIGURE
05260         LD      E,A
05270         LD      A,(Y)
05280         LD      D,A
05290         LD      (BUF2),SP
05300 TRYL    PUSH    DE
05310         LD      A,E
05320         CP      1
05330         JP      C,TRYU
05340         DEC     E
05350         CALL    TEST
05360         JP      NZ,TRYU
05370         POP     HL
05380         JP      TRYL
05390 TRYU    POP     DE
05400         PUSH    DE
05410         LD      A,D
05420         CP      1
05430         DEC     D
05440         CALL    TEST
05450         JP      NZ,STACK
05460         POP     HL
05470         JP      TRYL
05480 STACK   POP     DE
05490         PUSH    DE
05500         PUSH    DE
05510         INC     E
05520         CALL    TEST
05530         JP      NZ,SKIP1
05540         INC     D
05550         CALL    TEST
05560         JP      Z,SKIP1
05570         DEC     E
05580         CALL    TEST
05590         JP      Z,TRYR
05600 SKIP1   POP     DE
05610 TRYR    POP     DE
05620         PUSH    DE
05630         LD      A,E
05640         CP      127
05650         JP      NC,TRYD
05660         INC     E
05670         CALL    TEST
05680         JP      NZ,TRYD
05690         DEC     E
05700         CALL    SET
05710         INC     E
05720         POP     HL
05730         JP      TRYL
05740 TRYD    POP     DE
05750         PUSH    DE
05760         LD      A,D
05770         CP      47
05780         JP      NC,UNSTCK
05790         INC     D
05800         CALL    TEST
05810         JP      NZ,UNSTCK
05820         DEC     D
05830         CALL    SET
05840         INC     D
05850         POP     HL
05860         JP      TRYL
05870 UNSTCK  POP     DE
05880         CALL    SET
05890         XOR     A
05900         LD      HL,(BUF2)
05910         SBC     HL,SP
05920         JP      Z,DW1
05930         POP     DE
05940         JP      TRYL
05950 QUIT    CALL    TRANS    ;QUIT?
05960         LD      HL,MES3
05970         LD      DE,15360
05980         CALL    WRITE
05990         CALL    GETCHR
06000         CP      'Y'
06010         JP      Z,402DH
06020         CALL    TRANS2
06030         JP      DW1
06040 BORDER  LD      A,(N)    ;DRAW OR ERASE A BORDER
06050         LD      B,A
06060         LD      A,(Y)
06070         LD      C,A
06080         PUSH    BC
06090         LD      A,0
06100         LD      (N),A
06110 BOR1    LD      A,(N)
06120         LD      E,A
06130         LD      D,0
06140         CALL    SETBOR
06150         LD      A,(N)
06160         LD      E,A
06170         LD      D,47
06180         CALL    SETBOR
06190         LD      A,(N)
06200         INC     A
06210         CP      128
06220         JP      Z,BOR2
06230         LD      (N),A
06240         JP      BOR1
06250 BOR2    LD      A,0
06260         LD      (Y),A
06270 BOR3    LD      A,(Y)
06280         LD      D,A
06290         LD      E,0
06300         CALL    SETBOR
06310         LD      A,(Y)
06320         LD      D,A
06330         LD      E,127
06340         CALL    SETBOR
06350         LD      A,(Y)
06360         INC     A
06370         CP      48
06380         JP      Z,BOR4
06390         LD      (Y),A
06400         JP      BOR3
06410 BOR4    POP     BC
06420         LD      A,B
06430         LD      (N),A
06440         LD      A,C
06450         LD      (Y),A
06460         JP      DW1
06470 SETBOR  LD      A,(MD)
06480         CP      1
06490         JP      Z,RESET
06500         JP      SET
06510 HELP    CALL    TRANS    ;DISPLAY COMMAND MENU
06520         LD      HL,MES4
06530         LD      DE,15360
06540         CALL    WRITE
06550         CALL    GETCHR
06560         CALL    TRANS2
06570         JP      DW1
06580 LETTER  CALL    TRANS    ;DISPLAY A LETTER FORM
06590         LD      HL,MES6
06600         LD      DE,15360
06610         CALL    WRITE
06620         CALL    GETCHR
06630         LD      D,A
06640         LD      HL,CTAB
06650 LET1    LD      A,D
06660         CP      (HL)
06670         JP      Z,LET2
06680         LD      A,(HL)
06690         CP      0
06700         JP      NZ,LET3
06710         CALL    TRANS2
06720         JP      DW1
06730 LET3    INC     HL
06740         JP      LET1
06750 LET2    PUSH    DE
06760         CALL    TRANS2
06770         LD      A,(Y)
06780         LD      B,0FFH
06790 LOP1    INC     B
06800         SUB     3
06810         JP      P,LOP1
06820         ADD     A,3
06830         SLA     A
06840         LD      C,A
06850         LD      L,B
06860         LD      H,0
06870         LD      B,6
06880 LOP2    ADD     HL,HL
06890         DJNZ    LOP2
06900         LD      D,0
06910         LD      A,(N)
06920         LD      E,A
06930         SRL     E
```

Listing continued

Tidbit # 18

Here's an Assembly-language program that converts Mark Goodwin's disk drive timer program ("Keeping Time," September 1984, p. 72) for the Model I.

```
00100 ;DISK DRIVE TIMER FOR THE MODEL 1. ORIGINAL CODE WRITTEN
00110 ;FOR THE MODEL 3 AND APPEARED IN THE SEPTEMBER 1984 ISSUE
00120 ;OF 80 MICRO, WRITTEN BY MARK GOODWIN.
00130 ;THE FOLLOWING LINES NEED TO BE CHANGED OR ADDED.
00140 CMD      EQU     37ECH           ;FDC STATUS ADDRESS
00150 SEL      EQU     37E1H           ;FDC DRIVE SELECT ADDRESS
00180 RDSPLY   EQU     4467H           ;DISPLAY LINE VECTOR ADDRESS
00310          ORG     7000H           ;RE-ORGED TO 7000H (WAS 5000H)
01080          JP      C,MAIN6         ;Jump if it is.
01231          LD      BC,06H          ;THIS OFFSET MUST BE ADDED WHEN USING
01232          ADD     HL,BC           ;4467H FOR THE DISPLAY ROUTINE.
01241          LD      BC,06H          ;ADD DISPLACEMENT VALUE - SAME AS
01242          ADD     HL,BC           ;ABOVE COMMENT.
01470          JP      NZ,MAIN1        ;Jump if a key was pressed.
01620          LD      (HL),91         ;91 IS THE MODEL 1 UP ARROW
01960          CALL    RDSPLY          ;JP CHANGED TO CALL FOR MOD 1
01961          RET                     ;ADDDED TO MAINTAIN STACK INTEGRITY
02060 SELCT0   LD      A,(CMD)         ;WAS "IN" FOR MOD 3 VERSION
02090          LD      (SEL),A         ;WAS "OUT" FOR MOD 3 VERSION
02170          LD      (SEL),A         ;WAS "OUT" FOR MOD 3 VERSION
02190          LD      (CMD),A         ;WAS "OUT" FOR MOD 3 VERSION
02390          LD      A,(CMD)         ;WAS "IN" FOR MOD 3 VERSION
02460          LD      HL,2900         ;REQUIRED OFFSET FOR MOD 1 1.77 MHZ CLOCK
02480          LD      (SEL),A         ;WAS "OUT" FOR MOD 3
02500          LD      (CMD),A         ;WAS "OUT" FOR MOD 3
02530 GETSP1   LD      A,(CMD)         ;WAS "IN" FOR MOD 3
02560 GETSP2   LD      A,(CMD)         ;WAS "IN" FOR MOD 3
02591          NOP                     ;ADDED TO ADJUST TIMING
02600          LD      A,(CMD)         ;WAS "IN" FOR MOD 3
02631          NOP                     ;ADDED TO ADJUST TIMING
02640          LD      A,(CMD)         ;WAS "IN" FOR MOD 3
03290 MESS0    DEFM    'Model I Disk Timer V1.2 (P. Eriksen 9/84)'
03300 MESS1    DEFM    'MOD 3 (c) 83 M. Goodwin'Copyright '
```

Paul E. Eriksen
Newark, DE

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C ITOH Prowriter 1550/8510 · NEC 8023/8025	1/2x18	$15/3 $54/12 $288/72	$7/1 $6 ea 2 or more	$15/2 $42/6 $ 78/12	
C ITOH Starwriter F10 \ CARBON FILM BLACK	5/16	$24/6 $42/12 $234/72	$5 ea 3-11 $4 ea 12 or more	$18/3 $60/12 $348/72	
DIABLO HYTYPE II / FABRIC BLACK	5/16x17	$21/3 $78/12 $510/72	$8/1 $7 ea 2 or more	$18/2 $51/6 $ 96/12	
OKIDATA·PACEMARK 2350-2410 Black	1/2x100	$30/3 $108/12 $576/72	$20/1 $18 ea 2 or more	$32 Each	
·MICROLINE ML80/82/83/92/93	1/2x16	----------	----------	Spool $38/12	
RADIO SHACK \ MICROLINE ML84	1/2x40	----------	----------	Spool $ 84/12	
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DAISY WII·DWP-410-510 Black (1419)	1/4x145	$24/6 $42/12 $234/72	$5 ea 3-11 $4 ea 12 or more	$18/3 $60/12 $348/72	
Red, Green, Blue, Brown Colors (1419)	1/4x130	$30/6 $54/12 $288/72	$6 ea 3-11 $5 ea 12 or more	$21/3 $72/12 $420/72	
FABRIC (Long-Life) DWP-210 Black (1458)	5/16x17	$21/3 $78/12 $510/72	$8/1 $7 ea 2 or more	$18/2 $51/6 $ 96/12	
DAISY WII·DWP-410/510 Black (1449)	1/4x25	$21/3 $78/12 $510/72	$8/1 $7 ea 2 or more	$18/2 $51/6 $ 96/12	
LPI-II-IV CENTRONICS 730/737/739/779 (1413)	9/16x16	$12/3 $45/12 $252/72	----------	----------	
DMP-200,120,430 (1296) (1483)	1/2x20	$15/3 $54/12 $288/72	$7/1 $6 ea 2 or more	$27/2 $81/6 $162/12	
DMP-500 (1482)	1/2x20	$15/3 $54/12 $288/72	$7/1 $6 ea 2 or more	$24/2 $72/6 $144/12	
DMP-2100 · TOSHIBA P1340,1350,51 (1442)	1/2x20	$15/3 $54/12 $288/72	$7/1 $6 ea 2 or more	$15/2 $42/6 $ 78/12	
DMP-100, LP VII-Commodore 1525, Gorilla Banana (1424)	Inker Loop	----------	----------	$16/2 $48/6 $ 96/12	
LP III-V (1414)	1/2x15	$15/3 $54/12 $288/72	$7/1 $6 ea 2 or more	$15/2 $42/6 $ 78/12	$12/3 $44/12 $252/72
DMP-400/420, LP VI-VIII (1418)	5/16x14	$15/3 $54/12 $288/72	$7/1 $6 ea 2 or more	$15/2 $42/6 $ 78/12	$11/3 $40/12 $228/72
EPSON·LQ 1500	1/2x14	$15/3 $54/12 $288/72	$7/1 $6 ea 2 or more	$22/2 $63/6 $120/12	----------
·MX/FX/RX 70/80 · IBM PC	1/2x20	$15/3 $54/12 $288/72	$7/1 $6 ea 2 or more	$14/2 $36/6 $ 66/12	$12/3 $44/12 $252/72
· MX/FX/RX 100 · IBM PC	1/2x30	$18/3 $66/12 $360/72	$8/1 $7 ea 2 or more	$18/2 $51/6 $ 96/12	$15/3 $54/12 $288/72
COMMODORE 8023-P · CENTRONICS 152-2	1/2x12	$15/3 $54/12 $288/72	$7/1 $6 ea 2 or more		
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```
06940           JP      NC,CON2
06950           INC     C
06960 CON2      ADD     HL,DE
06970           LD      DE,3C00H
06980           ADD     HL,DE
06990           PUSH    HL
07000           POP     IY
07010           POP     DE
07020           LD      A,D
07030 LARGEC    LD      IX,CTAB
07040 LAR20     CP      (IX)
07050           INC     IX
07060           JP      NZ,LAR20
07070           PUSH    IX
07080           POP     HL
07090           LD      BC,CTAB+1
07100           OR      A
07110           SBC     HL,BC
07120           PUSH    HL
07130           POP     IX
07140           ADD     IX,IX
07150           ADD     IX,IX
07160           ADD     IX,IX
07170           LD      BC,DOTTAB
07180           ADD     IX,BC
07190           CALL    MATSR
07200           LD      BC,60
07210           ADD     IY,BC
07220           CALL    MATSR
07230           JP      DW1
07240 MATSR     LD      B,4
07250 MAT10     LD      A,(IX)
07260           SET     7,A
07270           LD      (IY),A
07280           INC     IX
07290           INC     IY
07300           DJNZ    MAT10
07310           RET
07320 PACK      CALL    TRANS   ;PACK SCREENS TOGETHER
07330           CALL    LOAD
07340           LD      HL,CURR
07350           LD      BC,1024
07360           LD      DE,15360
07370 PACK2     LD      A,(DE)
07380           OR      (HL)
07390           LD      (DE),A
07400           DEC     BC
07410           INC     DE
07420           INC     HL
07430           LD      A,B
07440           OR      C
07450           JP      Z,DW1
07460           JP      PACK2
07470 SETXS     LD      A,(N)   ;SAVE FIRST POINT ON LINE
07480           LD      (XS1),A
07490           LD      A,(Y)
07500           LD      (YS1),A
07510           JP      DW1
07520 DRAWLN    LD      A,(N)   ;AUTOLINE
07530           LD      E,A
07540           LD      (XS2),A
07550           LD      A,(Y)
07560           LD      D,A
07570           PUSH    DE
07580           LD      (YS2),A
07590 DRWLN     LD      A,(XS1)
07600           LD      B,A
07610           LD      A,(XS2)
07620           SUB     B
07630           LD      (DX),A
07640           LD      A,(YS1)
07650           LD      B,A
07660           LD      A,(YS2)
07670           SUB     B
07680           LD      (DY),A
07690           LD      A,(DX)
07700           OR      A
07710           JP      P,DRWLN2
07720           JP      Z,DRWLN3
07730           LD      B,1
07740           JP      DRWLN4
07750 DRWLN2    LD      B,-1
07760           JP      DRWLN4
07770 DRWLN3    LD      B,0
07780 DRWLN4    LD      A,B
07790           LD      (XPLUS),A
07800           LD      A,(DY)
07810           OR      A
07820           JP      P,DRL2
07830           JP      Z,DRL3
07840           LD      A,1
07850           JP      DRL4
07860 DRL2      LD      A,-1
07870           JP      DRL4
07880 DRL3      LD      A,0
07890 DRL4      LD      (YPLUS),A
07900           LD      A,(DX)
07910           OR      A
07920           JP      P,DRL5
07930           LD      B,A
07940           LD      A,0
07950           SUB     B
07960           LD      (DX),A
07970 DRL5      LD      A,(DY)
07980           OR      A
07990           JP      P,DRL6
08000           LD      B,A
08010           LD      A,0
08020           SUB     B
08030           LD      (DY),A
08040 DRL6      LD      A,(DX)
08050           LD      (CRDX),A
08060 DRL7      LD      A,(DY)
08070           LD      B,A
08080           LD      A,(CRDX)
08090           SUB     B
08100           JP      P,DRL8
08110           LD      A,(YPLUS)
08120           LD      B,A
08130           LD      A,(Y)
08140           ADD     A,B
08150           LD      (Y),A
08160           LD      A,(CRDX)
08170           LD      B,A
08180           LD      A,(DX)
08190           ADD     A,B
08200           LD      (CRDX),A
08210           JP      DRL9
08220 DRL8      LD      (CRDX),A
08230           LD      A,(XPLUS)
08240           LD      B,A
08250           LD      A,(N)
08260           ADD     A,B
08270           LD      (N),A
08280 DRL9      LD      A,(N)
08290           LD      E,A
08300           LD      A,(Y)
08310           LD      D,A
08320           LD      A,(MD)
08330           CP      1
08340           JP      Z,DRL91
08350           CALL    SET
08360           JP      DRL92
08370 DRL91     CALL    RESET
08380 DRL92     LD      A,(N)
08390           LD      B,A
08400           LD      A,(XS1)
08410           CP      B
08420           JP      NZ,DRL7
08430           LD      A,(Y)
08440           LD      B,A
08450           LD      A,(YS1)
08460           CP      B
08470           JP      Z,DRL10
08480           JP      DRL7
08490 DRL10     POP     DE
08500           LD      A,E
08510           LD      (N),A
08520           LD      A,D
08530           LD      (Y),A
08540           JP      DW1
08550 OUTPUT    CALL    TRANS   ; SAVE OR LOAD DISK FILES
08560           LD      HL,MES10
08570           LD      DE,15360
08580           CALL    WRITE
08590           CALL    GETCHR
08600           CP      'S'
08610           JP      Z,OUTSAV
08620           CP      'L'
08630           JP      Z,OUTLOD
08640           JP      DW1
08650 OUTSAV    CALL    FILENM
08660           LD      HL,BUFFER
08670           LD      DE,DCB
08680           LD      B,128
08690           CALL    4420H
08700           JP      NZ,DSKERR
08710           CALL    TRANS2
08720           LD      A,1
08730           LD      (CRFL),A
08740           LD      HL,15360-128
08750 OUTSV3    LD      DE,128
08760           ADD     HL,DE
08770           LD      A,(CRFL)
08780           CP      9
08790           JP      Z,OUTSV5
08800           LD      DE,DCB
08810           CALL    4439H
08820           LD      A,(CRFL)
08830           INC     A
08840           LD      (CRFL),A
08850           JP      OUTSV3
08860 OUTSV5    LD      DE,DCB
08870           CALL    4428H
08880           JP      NZ,DSKERR
08890           CALL    TRANS2
08900           JP      DW1
08910 OUTLOD    CALL    FILENM
08920           LD      HL,BUFFER
08930           LD      DE,DCB
08940           LD      B,128
08950           CALL    4424H
08960           JP      NZ,DSKERR
08970           LD      A,1
08980           LD      (CRFL),A
08990           LD      HL,15360-128
09000 OUTLD1    LD      DE,128
09010           ADD     HL,DE
09020           LD      DE,DCB
09030           CALL    4436H
09040           JP      NZ,DSKERR
09050           LD      A,(CRFL)
09060           CP      8
09070           JP      Z,DW1
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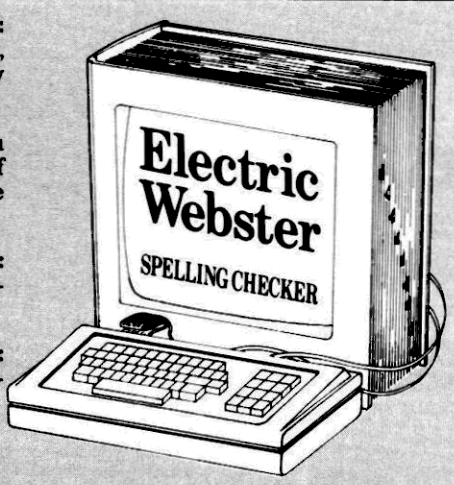
Listing continued

Listing continued

```
09080           INC     A
09090           LD      (CRFL),A
09100           JP      OUTLD1
09110 DSKERR    OR      80H
09120           CALL    4409H
09130           CALL    TRANS2
09140           JP      DW1
09150 FILENM    LD      HL,MES11
09160           LD      DE,15424
09170           CALL    WRITE
09180           LD      B,8
09190           LD      HL,DCB
09200           CALL    40H
09210           RET
09220 INVER     LD      BC,0    ;INVERSE DISPLAY
09230 IN1       PUSH    BC
09240           LD      D,B
09250           LD      E,C
09260           CALL    TEST
09270           JP      NZ,IN2
09280           POP     BC
09290           PUSH    BC
09300           LD      D,B
09310           LD      E,C
09320           CALL    SET
09330           JP      IN4
09340 IN2       POP     BC
09350           PUSH    BC
09360           LD      D,B
09370           LD      E,C
09380           CALL    RESET
09390 IN4       POP     BC
09400           INC     B
09410           LD      A,B
09420           CP      48
09430           JP      NZ,IN1
09440           LD      B,0
09450           INC     C
09460           LD      A,C
09470           CP      128
09480           JP      Z,DW1
09490           PUSH    BC
09500           CALL    2BH
09510           CP      ' '
09520           JP      Z,DW1
09530           POP     BC
09540           JP      IN1
09550 MODEP     LD      A,2
09560           LD      (MD),A
09570           JP      DW2
09580 MODEC     LD      A,1
09590           LD      (MD),A
09600           JP      DW2
09610 MODEB     LD      A,0
09620           LD      (MD),A
09630           JP      DW2
09640 NEGB      LD      A,(Y)
09650           DEC     A
09660           LD      (Y),A
09670           JP      DW2
09680 POSB      LD      A,(Y)
09690           INC     A
09700           LD      (Y),A
09710           JP      DW2
09720 NEGN      LD      A,(N)
09730           DEC     A
09740           LD      (N),A
09750           JP      DW2
09760 POSN      LD      A,(N)
09770           INC     A
09780           LD      (N),A
09790           JP      DW2
09800 NEGBN     LD      A,(Y)
09810           DEC     A
09820           LD      (Y),A
09830           LD      A,(N)
09840           DEC     A
09850           LD      (N),A
09860           JP      DW2
09870 PNNB      LD      A,(N)
09880           INC     A
09890           LD      (N),A
09900           LD      A,(Y)
09910           DEC     A
09920           LD      (Y),A
09930           JP      DW2
09940 NNPB      LD      A,(N)
09950           DEC     A
09960           LD      (N),A
09970           LD      A,(Y)
09980           INC     A
09990           LD      (Y),A
10000           JP      DW2
10010 POSBN     LD      A,(N)
10020           INC     A
10030           LD      (N),A
10040           LD      A,(Y)
10050           INC     A
```

Listing continued

- **DISPLAYS CORRECT SPELLINGS:** If you don't know the correct spelling, EW will look it up for you, and display the dictionary.
- **VERIFIES CORRECTIONS:** If you think you know the correct spelling of a word, EW will check it for you before making the corrections.
- **HYPHENATES AUTOMATICALLY:** (Optional). Inserts discretionary hyphens throughout text.
- **GRAMMAR & STYLE CHECKER:** (Optional). Identifies 22 types of common errors. Makes suggested corrections with the stroke of a key. Runs within EW.
- **50,000 WORD DICTIONARY:** Uses only 2½ bytes per word; add as many words as you wish.
- **FAST CORRECTING:** In as little as 30 seconds, Electric Webster can return you to your Word Processing program, with your text fully corrected and on your screen.
- **INTEGRATES:** into 12 different word processing programs: WordStar, Spellbinder, Palantir, NewScript, Lazy Writer, SuperScripsit, Scripsit, Electric Pencil, CopyArt, Superscript, Zorlof, and LeScript (specify). Begins proofing at the stroke of a key; returns you to word processing automatically.



"The Cadillac"
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80 Microcomputing, 9/82

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"The most helpful program I've found is Electric Webster. After looking at nine proofreading programs, I've settled on Webster . . ." *Creative Computing, 11/83*

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"Electric Webster is the best. Just read any review in any magazine and I don't believe that you will find even one disagreement to that statement." *CINTUG, Cincinnati's Users Group Mag., 4/83*

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✓ See List of Advertisers on Page 128

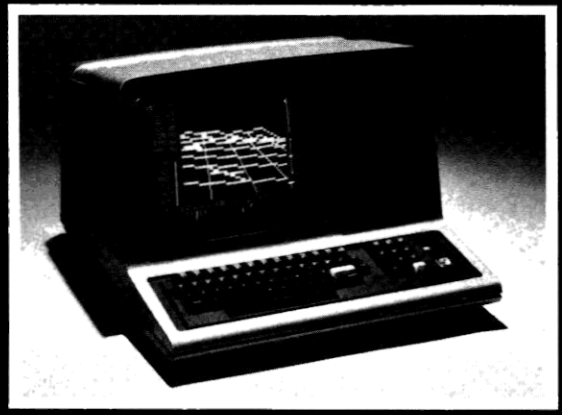
Listing continued

```
10060           LD      (Y),A
10070           JP      DW2
10080 SETNB     LD      A,(N)
10090           LD      E,A
10100           LD      A,(Y)
10110           LD      D,A
10120           CALL    SET
10130           JP      DW2
10140 RESNB     LD      A,(N)
10150           LD      E,A
10160           LD      A,(Y)
10170           LD      D,A
10180           CALL    RESET
10190           JP      DW2
10200 FIRSCR    CALL    01C9H   ;
      DISPLAY INTRO SCREEN
10210           LD      HL,FIR1
10220           LD      DE,15360
10230           CALL    WRITE
10240           CALL    49H
10250           RET
10260 SET       LD      A,0C6H  ;
      SET, RESET, AND TEST SUBS.
10270           JR      TEST10
10280 RESET     LD      A,86H
10290           JR      TEST10
10300 TEST      LD      A,46H
10310 TEST10    LD      (INST+1),A
10320           PUSH    DE
10330 ADDRES    LD      A,D
10340           LD      B,0FFH
10350 LOOP      INC     B
10360           SUB     3
10370           JP      P,LOOP
10380           ADD     A,3
10390           SLA     A
10400           LD      C,A
10410           LD      L,B
10420           LD      H,0
10430           LD      B,6
10440 LOOP1     ADD     HL,HL
10450           DJNZ    LOOP1
10460           LD      D,0
10470           SRL     E
10480           JR      NC,CONT
10490           INC     C
10500 CONT      ADD     HL,DE
10510           LD      DE,3C00H
10520           ADD     HL,DE
10530           SLA     C
10540           SLA     C
10550           SLA     C
10560           LD      A,(INST+1)
10570           ADD     A,C
10580           LD      (INST+1),A
10590 INST      DEFB    0CBH
10600           DEFB    0
10610           SET     7,(HL)
10620           POP     DE
10630           RET
10640 MES1      DEFM    'Which screen would you like loaded?'
10650           DEFB    0
10660 MES2      DEFM    'Which screen would you like saved?'
10670           DEFB    0
10680 MES3      DEFM    'Do you want to quit (Y/N)?'
10690           DEFB    0
10700 MES4      DEFM    '                                Menu
      '
10710           DEFM    '                          Arrows move cursor
      '
10720           DEFM    'D) - Send figures to printer                H) - Help Menu
      '
10730           DEFM    'P) - Print mode      C) - Clear mode        N) - Neutral mode
      '
10740           DEFM    'S) - Save screen-buffer                     L) - Load screen-b
uffer'
10750           DEFM    'I) - Inverse video                          M) - Letter forms
      '
10760           DEFM    'T) - Pack screens                           O) - Output to dis
k     '
10770           DEFM    'A) - Set first point for AUTOLINE           Z) - Draw line to
point'
10780           DEFM    'F) - Fill enclosure                         B) - Draw border
      '
10790           DEFM    '                             Q) - Quit
10800           DEFM    '                          Press ANY key
10810           DEFB    0
10820 FIR1      DEFM    '                          Printer Graphics
10830           DEFM    '                 Program by 14 year old Jeff Reifman
10840           DEFM    'An entry in 1984-1985 80 Micro'
10850           DEFB    39
10860           DEFM    's Young Programmers'
10870           DEFB    39
10880           DEFM    'Contest!'
10890           DEFM    '                          Press ANY key
10900           DEFB    0
10910 MES6      DEFM    'Available characters: ABCDEFGHIJKLMNOPQRSTUVWXYZ?!-(space)
10920           DEFM    'Which character would you like?'
10930           DEFB    0
10940 MES9      DEFM    'Which 3 screens would you like printed (in order)?'
```

Listing continued

T80-FS1 Flight Simulator

Available for Model I or Model III. $25.00 on cassette or $33.50 on disk (with enhancements) All versions require 16K.



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Communications Corp.
713 Edgebrook Drive
Champaign, IL 61820
(217) 359-8482
Telex: 206995

Listing continued

```
10950           DEFB    0
10960 MES10     DEFM    'Would you like to load or save a screen (L/S)?'
10970           DEFB    0
10980 PMES      DEFM    'Printer not ready!'
10990           DEFB    0
11000 MES11     DEFM    'What is the name of this file (8-char.)?'
11010           DEFB    0
11020 QUMES     DEFM    'Will you be using large or small print format?
11030           DEFM    '1=Small print      2=Large print'
11040           DEFB    0
11050 LGMES     DEFM    'Which screen would you like?'
11060           DEFB    0
11070 BUFFER    DEFS    256
11080 DCB       DEFS    8
11090           DEFB    0DH
11100           DEFS    350
11110 CRFL      DEFB    0
11120 CTAB      DEFM    'ABCDEFGHIJKLMNOPQRSTUVWXYZ -?!'
11130 DOTTAB    DEFB    22      ;A
11140           DEFB    3
11150           DEFB    3
11160           DEFB    41
11170           DEFB    23
11180           DEFB    3
11190           DEFB    3
11200           DEFB    43
11210           DEFB    55      ;B
11220           DEFB    51
11230           DEFB    51
11240           DEFB    25
11250           DEFB    53
11260           DEFB    48
11270           DEFB    48
11280           DEFB    26
11290           DEFB    23      ;C
11300           DEFB    3
11310           DEFB    3
11320           DEFB    11
11330           DEFB    53
11340           DEFB    48
11350           DEFB    48
11360           DEFB    56
11370           DEFB    23      ;D
11380           DEFB    3
11390           DEFB    3
11400           DEFB    41
11410           DEFB    53
11420           DEFB    48
11430           DEFB    48
11440           DEFB    26
11450           DEFB    23      ;E
11460           DEFB    3
11470           DEFB    3
11480           DEFB    3
11490           DEFB    55
11500           DEFB    51
11510           DEFB    51
11520           DEFB    48
11530           DEFB    23      ;F
11540           DEFB    3
11550           DEFB    3
11560           DEFB    3
11570           DEFB    23
11580           DEFB    3
11590           DEFB    3
11600           DEFB    1
11610           DEFB    23      ;G
11620           DEFB    3
11630           DEFB    3
11640           DEFB    11
11650           DEFB    53
11660           DEFB    48
11670           DEFB    48
11680           DEFB    59
11690           DEFB    21      ;H
11700           DEFB    0
11710           DEFB    0
11720           DEFB    42
11730           DEFB    23
11740           DEFB    3
11750           DEFB    3
11760           DEFB    43
11770           DEFB    0       ;I
11780           DEFB    43
11790           DEFB    23
11800           DEFB    0
11810           DEFB    0
11820           DEFB    58
11830           DEFB    53
11840           DEFB    0
11850           DEFB    0       ;J
11860           DEFB    0
11870           DEFB    0
11880           DEFB    43
11890           DEFB    52
11900           DEFB    48
11910           DEFB    48
11920           DEFB    58
11930           DEFB    21      ;K
11940           DEFB    0
11950           DEFB    32
11960           DEFB    6
11970           DEFB    23
11980           DEFB    3
11990           DEFB    3
```

Listing continued

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Listing continued

```
12000   DEFB   36
12010   DEFB   21      ;L
12020   DEFB   0
12030   DEFB   0
12040   DEFB   0
12050   DEFB   53
12060   DEFB   48
12070   DEFB   48
12080   DEFB   48
12090   DEFB   31;M
12100   DEFB   16
12110   DEFB   32
12120   DEFB   47
12130   DEFB   21
12140   DEFB   2
12150   DEFB   1
12160   DEFB   42
12170   DEFB   23;N
12180   DEFB   36
12190   DEFB   0
12200   DEFB   42
12210   DEFB   21
12220   DEFB   0
12230   DEFB   9
12240   DEFB   58
12250   DEFB   22;O
12260   DEFB   3
12270   DEFB   3
12280   DEFB   41
12290   DEFB   37
12300   DEFB   48
12310   DEFB   48
12320   DEFB   26
12330   DEFB   23;P
12340   DEFB   3
12350   DEFB   3
12360   DEFB   43
12370   DEFB   23
12380   DEFB   3
12390   DEFB   3
12400   DEFB   3
12410   DEFB   22;Q
12420   DEFB   3
12430   DEFB   3
12440   DEFB   41
12450   DEFB   37
12460   DEFB   48
12470   DEFB   56
12480   DEFB   26
12490   DEFB   23;R
12500   DEFB   3
12510   DEFB   3
12520   DEFB   41
12530   DEFB   23
12540   DEFB   3
12550   DEFB   3
12560   DEFB   41
12570   DEFB   23;S
12580   DEFB   3
12590   DEFB   3
12600   DEFB   3
12610   DEFB   51
12620   DEFB   51
12630   DEFB   51
12640   DEFB   59
12650   DEFB   3;T
12660   DEFB   43
12670   DEFB   23
12680   DEFB   3
12690   DEFB   0
12700   DEFB   42
12710   DEFB   21
12720   DEFB   0
12730   DEFB   21;U
12740   DEFB   0
12750   DEFB   0
12760   DEFB   42
12770   DEFB   53
12780   DEFB   48
12790   DEFB   48
12800   DEFB   58
12810   DEFB   21;V
12820   DEFB   0
12830   DEFB   0
12840   DEFB   42
12850   DEFB   2
12860   DEFB   36
12870   DEFB   24
12880   DEFB   1
12890   DEFB   21;W
12900   DEFB   40
12910   DEFB   20
12920   DEFB   42
12930   DEFB   37
12940   DEFB   58
12950   DEFB   53
12960   DEFB   26
12970   DEFB   9;X
12980   DEFB   48
12990   DEFB   48
13000   DEFB   6
13010   DEFB   24
13020   DEFB   3
13030   DEFB   3
13040   DEFB   36
13050   DEFB   21;Y
13060   DEFB   0
13070   DEFB   0
13080   DEFB   42
13090   DEFB   3
13100   DEFB   43
13110   DEFB   23
13120   DEFB   3
13130   DEFB   3;Z
13140   DEFB   3
13150   DEFB   51
13160   DEFB   15
13170   DEFB   60
13180   DEFB   51
13190   DEFB   48
13200   DEFB   48
13210   DEFW   0
13220   DEFW   0
13230   DEFW   0
13240   DEFW   0
13250   DEFW   0;-
13260   DEFW   0
13270   DEFB   3
13280   DEFB   3
13290   DEFB   3
13300   DEFB   3
13310   DEFB   7;?
13320   DEFB   35
13330   DEFB   51
13340   DEFB   59
13350   DEFB   0
13360   DEFB   34
13370   DEFB   17
13380   DEFB   0
13390   DEFB   0;!
13400   DEFB   42
13410   DEFB   21
13420   DEFW   0
13430   DEFB   34
13440   DEFB   17
13450   DEFB   0
13460   END    START
```

End

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TRS-80+ MOD I, III, COCO, TIMEX 1000, OSBORNE, TI99/4a others

Eliminate disk reboots and data loss due to oxidized contacts at the card edge connectors. **GOLD PLUG 80** solders to the board edge connector. Use your existing cables. (if gold plated)

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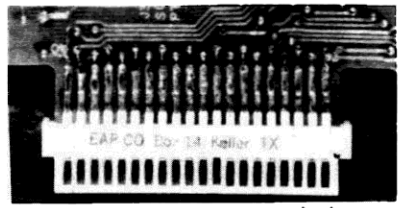

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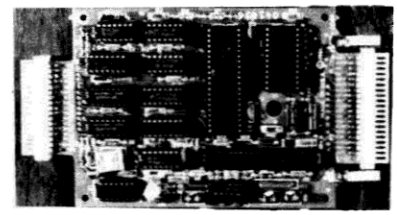

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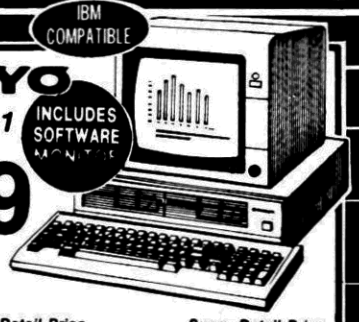

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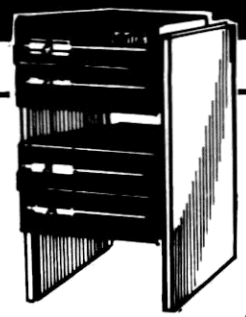

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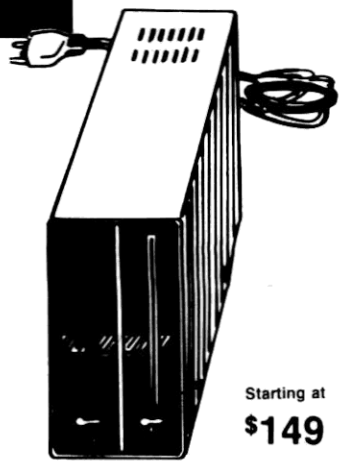

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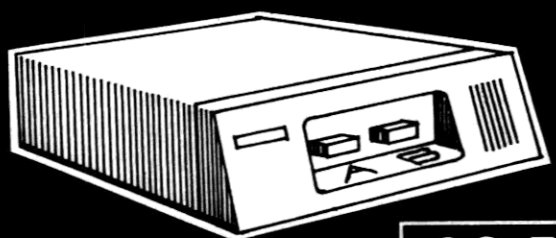

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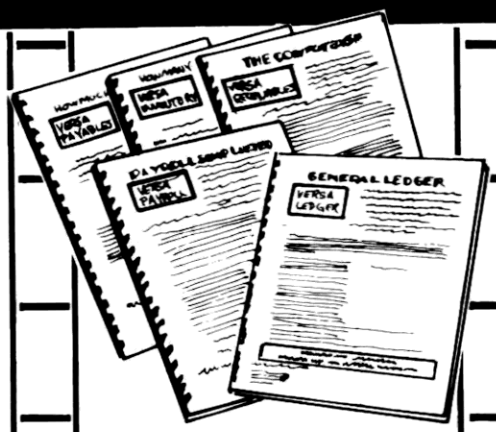

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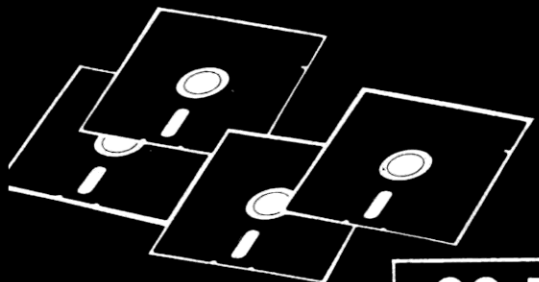

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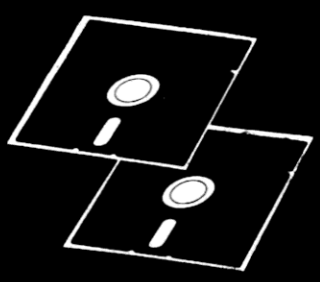

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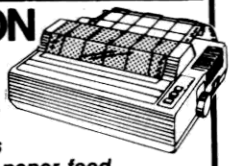

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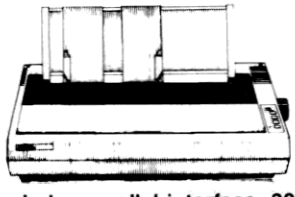

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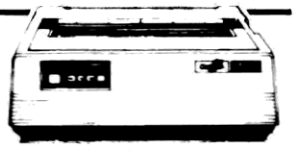

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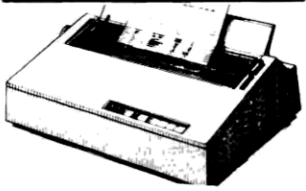

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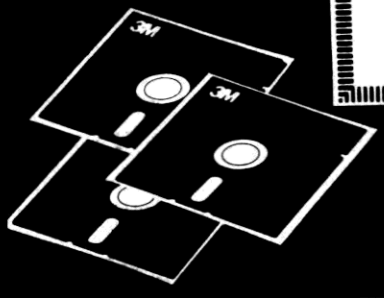

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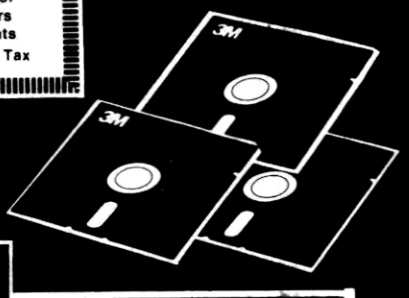

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Go Forth Into The World

Over the past few years, manufacturers have developed several single-chip microcontrollers. Microcontrollers consist of a microprocessor with on-board timers, input/output (I/O) lines, and RAM and ROM (or EPROM), with the ability to access off-chip memory and peripheral devices. Microcontrollers like this are increasingly popular in applications to control time-dependent devices or processes in real time.

Many microcontrollers (like the Intel 8048 or 8051) are known for their relatively limited instruction set. And since you have to program them in Assembly language, developing applications software is often tedious and awkward.

At some point, someone recognized the utility of a microcontroller with a limited, but usable, high-level language on-chip. Manufacturers began putting Tiny Basic in the few kilobytes of ROM space available on a microcontroller so that programmers could more easily use the chip for real-world control.

Rockwell International, a company dedicated to the 6500 family of processors and peripheral devices, decided to take this approach with one of their microcontrollers (the R6511), but felt that there was a better alternative than Basic. Rockwell chose Forth, a stack-oriented language particularly useful in control applications. The Rockwell R65F11 microcontroller includes the kernel for their own RSC-Forth language in 3K of on-chip ROM. They also offer an 8K Forth development ROM, the R65FR1, which has everything necessary to develop Forth-based programs, including a disk operating system. When you think about it, 11K of language/operating system ROM is considerable.

This month's project, a Forth microcontroller board, will help you learn the Forth language to control devices in real-world applications.

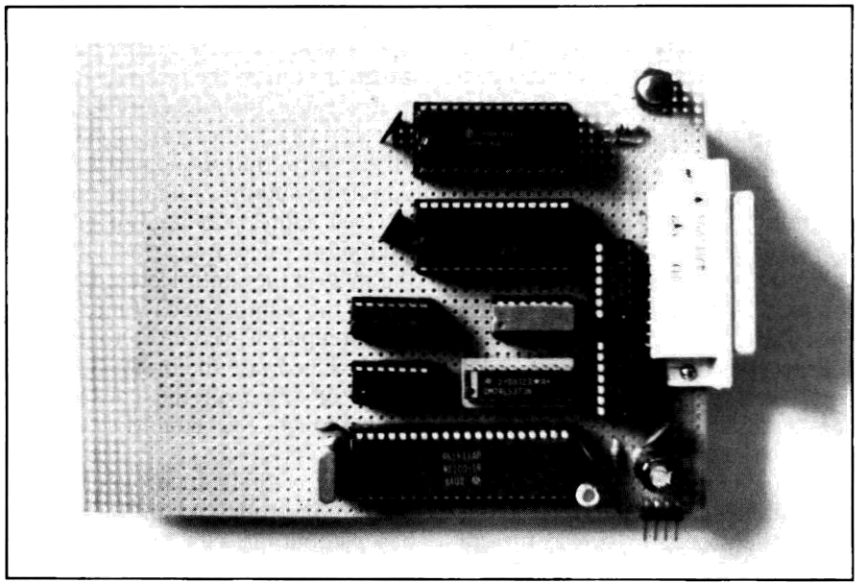

Photo. The Forth Microcontroller.

Although you can use it as a simple controller, you can also add on to the board to make it a Forth development system, complete with a disk drive and on-board EEROM (electrically eraseable ROM) programming capability, with additional circuitry available from Rockwell (described later).

The R65F11 Microcontroller

A block diagram of the R65F11 microcontroller is shown in Fig. 1. The kernel consists of subroutines that execute the primary Forth commands. Programs written in either Forth or Assembly language can then access these commands. The R65F11 also provides 192 bytes of internal RAM, 32 bytes of which you can back up with batteries.

One of the best things about the R65F11 is its CPU, the 6502. The R65F11 uses an expanded 6502 instruction set, which is a great improvement over many other microcontrollers (like the 8748, which will appear in an upcoming column).

The R65F11 features 16 bidirectional, TTL- (transistor-to-transistor

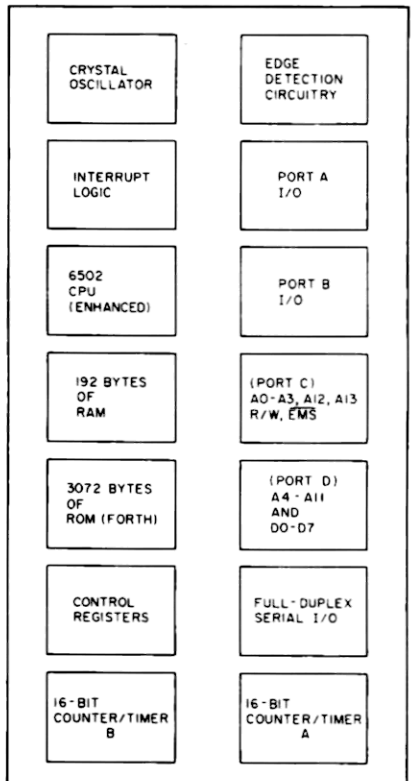

Figure 1. R65F11 block diagram.

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logic) compatible I/O lines (comprising two 8-bit ports), two 16-bit timers, 10 interrupts (including internal ones), on-chip crystal oscillator (that requires an external crystal), full duplex serial port with internal baud rate selection, and +5V-only operation. All this comes in a single 40-pin DIP (dual in-line package). The R65F11 is also available in 1 MHz and 2 MHz versions.

While the R65F11 technically has four ports (ports A, B, C, and D), you can use only two of them with Forth. This is because ports C and D address external program and data memory, leaving ports A and B for user control applications. (A similar Forth microcontroller available from Rockwell, the R65F12, has three additional usable ports [for a total of five], and comes in a 64-pin QUIP [quad in-line package].)

Port B is a general-purpose I/O port. You can program individual lines as input or output, or you can program the entire port for latched input (an external strobe signal latches the 8-bit value into the processor, allowing the processor to read the correct value even if the input signals on the port B lines change). In the normal, unlatched mode, the processor reads the lines as they are at read time.

The method used to make bits inputs or outputs is somewhat different from that which parallel I/O devices (like the Intel 8255A described in previous projects) normally use. Each port line (A and B) has an internal pull-up resistor (using an FET—field effect transistor). They act as open collector drivers coupled with inputs, as shown in Fig. 2.

The internal port control latch associated with each port, which actually outputs to the open-collector drivers, determines which lines act as inputs, and which as outputs. If you use a line as an input, you have to make sure the processor sets the corresponding bit (i.e., brings it high) in the port control latch, allowing the input bit to control the state of the line. A conflict occurs when an external device tries to drive the line to a logical high state, while the corresponding port latch bit output is low. Damage could occur to either or both of the devices.

If you use a line as an output, you can set and clear the corresponding bit in the port control latch to turn the output on and off. An input from the reserved address for a given port will read in the value of the port lines, not the value in the control latch. If a bit is set in the control latch (making the line an input) while an external device drives the corresponding line low, the processor will read the line as low, even though the control latch bit is high.

You may think there would be a problem in turning on and off certain bits without affecting others in the same latch, but you can get around this problem. The most obvious way is to keep a mirror image of the value in each port control latch in reserved memory locations. You should update these values whenever the controller writes to the respective ports. To alter a single bit, the CPU reads the current value from the mirror location and changes the desired bit. The CPU rewrites the resulting value to the mirror location, as well as to the respective port latch.

The R65F11, however, provides Assembly-language instructions to make this task easier. These read-modify-write instructions read the specified port control latch, modify the specified bit, and write the modified byte back to the port control latch. This is all done in a single operation, making these instructions efficient in terms of both time and memory space.

Port A is more versatile than port B, and you can use it in several ways. The internal serial port, mentioned earlier, uses bits 6 and 7 of port A. You can use these bits as general-purpose I/O lines or as the serial communication transmit and receive lines. PA5 (bit 5 of port A) doubles as an input or output signal used with counter/timer B, while you can use PA4 as an input or output signal with counter/timer A. You can also use PA4 as the receive clock input or the transmit clock output for the serial port. PA0 doubles as the latch strobe input for port B, when port B is in its latched-input mode. Use PA1–PA3 as general-purpose I/O lines only.

Port C (in the original R6511) generates several output signals necessary for external memory accesses: A0, A1, A2, A3, A12, A13 (address lines), R/W (read/write), and EMS/ (external memory select). Likewise, the R65F11 uses the original port D to generate other necessary memory access signals, but these eight lines are double-functioned (multiplexed). During the first portion of an external memory access cycle, they contain the A4–A11 address line values, latched in an external latch on the falling edge of EMS/ mentioned above. During the last portion of the external memory access cycle, these lines function as data lines, being inputs or outputs, depending upon whether the current cycle is a read or write.

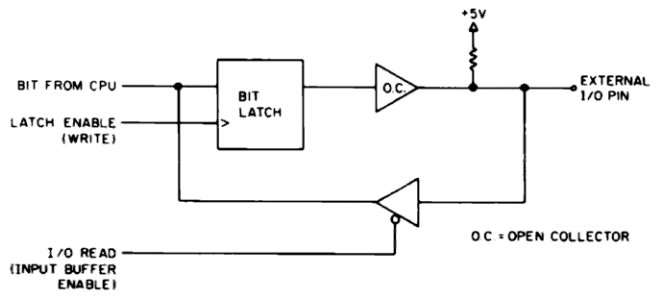

Figure 2. Functional diagram of general purpose I/O line.

R65F11 Mode Control Register

The R65F11's mode control register (MCR) appears in Fig. 3. This is the primary control register, responsible for configuring several microcontroller options. Bits 5, 6 and 7 configure the bus mode, and you must set them all (with a value of 1) for the R65F11. Bit 4 indicates whether port B is in the latched-input mode (bit set) or general-purpose I/O mode (bit clear). Bits 2 and 3 select the operating mode for counter/timer B, while bits zero and 1 select the operating mode for counter/timer A. Each counter/timer

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LPRINT/LPRINT USING	•	•			•
PRINT @	•	•			•
INPUT/LINE INPUT	•	•	•	•	•
INPUT #/LINE INPUT #	•	•			•
READ #/READ # LINE			•	•	•
LOC/LOF/EOF/ERROR	•				•
FIELD/GET/PUT	•	•			•
RSET/LSET/ERASE	•	•			•
MKD$/MKI$/MKS$	•	•			•
CVI/CVS/CVD/SPC	•	•			•
READ/DATA/RESTORE	•	•	•	•	•
TRON/TROFF	•				•
DEF FN/RANDOM/RND	•	•	•	•	•
DEF USR/SWAP/WAIT	•	•			•
CALL (ASSEMBLY LANG)	•				•
DEFSTR/DBL/SNG/INT	•	•			•
DOUBLE/REAL			•	•	•
INTEGER/STRING			•	•	•
GOTO/GOSUB	•	•	•	•	•
ON ERROR GOTO	•			•	•
RESUME/RESUME NEXT	•				•
ERL/ERR	•			•	•
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SIN/COS/TAN/ATN	•	•	•	•	•
LOG/EXP/ABS/SQR	•	•	•	•	•
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STRING$/SPACE$	•	•			•
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has four possible operating modes: interval timer, asymmetric pulse generator, event counter, and retriggerable interval timer. This isn't quite the selection offered by the 8253/8254 programmable interval timers described in a previous column, but it's pretty good for a microcontroller.

R65F11 Serial Communication Channel

The serial communication control register (SCCR) is shown in Fig. 4. It provides separate enable bits for the transmitter and receiver, and each has two modes of operation. Bit 7 is the enable bit for the transmitter; when set, the transmitter is enabled (PA6 is used as the transmitter output), and when clear, the transmitter is disabled (PA6 is used as a general-purpose I/O line). Similarly, bit 6 of the SCCR controls the enable status of the serial receiver, which uses PA7 when enabled.

The transmitter and receiver lines operate in two modes: asynchronous (ASYN) and shift/register (S/R). In the ASYN mode, the line acts as a normal asynchronous serial input or output line, including the addition of start, stop and (optionally) parity bits when transmitting, and looks for these when receiving. In the S/R mode, the transmitter and receiver act as shift registers, shifting bits in or out at a predetermined rate, but doesn't add or check for start, stop, or parity bits.

When in the ASYN mode, the transmitter uses counter/timer A to generate the baud rate. The frequency generated by counter/timer A must be 16 times the desired baud rate frequency. In the S/R mode, the bits are also shifted out at $1/16$ of the counter/timer A frequency, which is available on the PA4 line. When the receiver is in the S/R mode, the shift clock for the shift into the receiver register is the PA4 line. The transmitter and receiver cannot simultaneously be in the S/R mode. Bits 4 and 5 of the SCCR determine the mode configuration for the transmitter and receiver. As shown, the register does not allow both to be in the S/R mode at the same time.

Whenever the serial I/O section is enabled in a manner requiring an internal clock, counter/timer A is forced into the Interval Timer mode.

Bits 2 and 3 of the SCCR determine the number of bits per character the R65F11 sends and receives. Bit 1 indicates whether or not parity is enabled (bit 1 set equals parity enabled), and bit zero determines the parity, odd (where bit zero equals zero) or even (bit zero equals 1).

The R65F11 also has a serial communication status register (SCSR), shown in Fig. 5. It indicates the normal serial status conditions, such as communication errors, transmitter buffer empty, and receiver buffer full.

For a more in-depth discussion of serial communication, see the January 1984 Project 80 (p. 197).

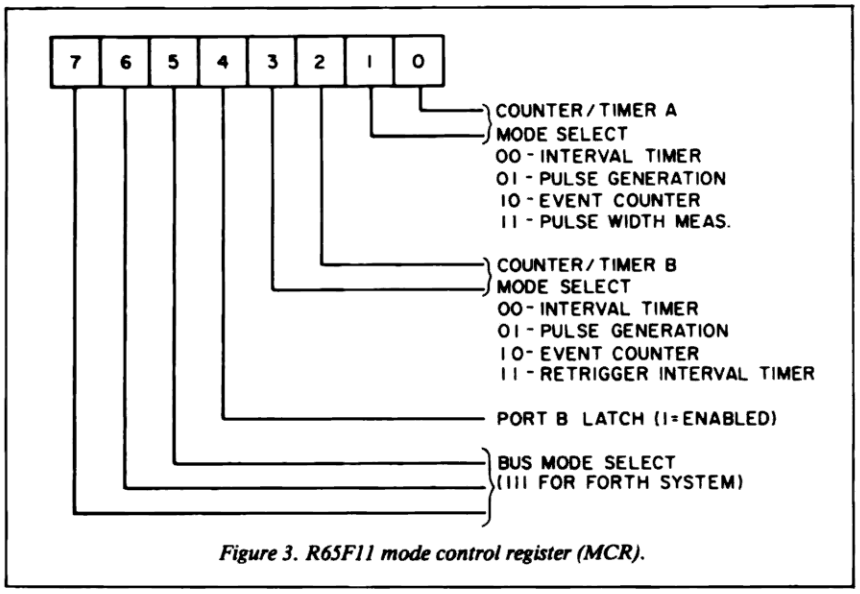

Figure 3. R65F11 mode control register (MCR).

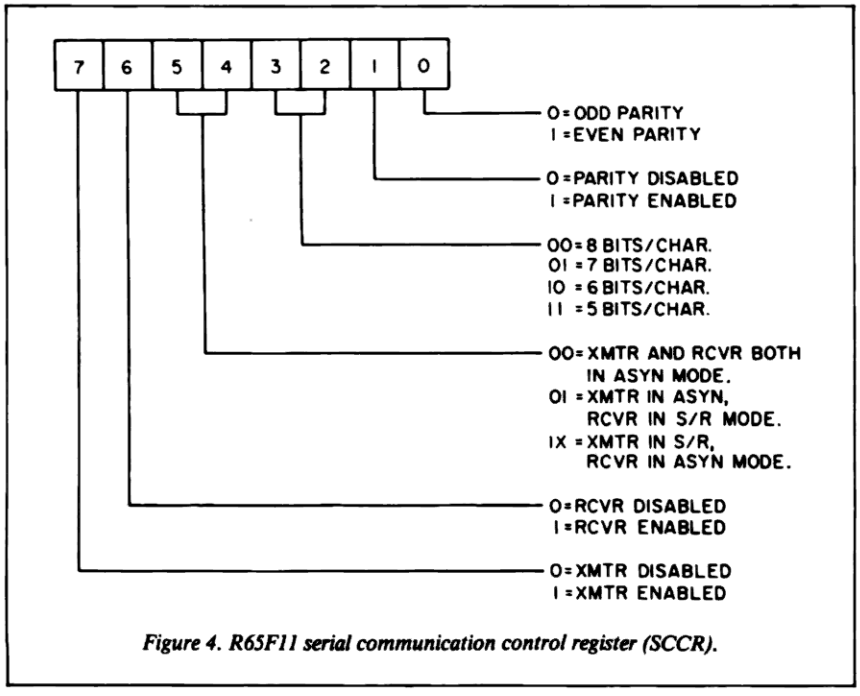

Figure 4. R65F11 serial communication control register (SCCR).

A Look at Stacks

As mentioned earlier, Forth is a stack-oriented language. A stack represents a last in/first out (LIFO) data structure. The last item put onto the stack is the first item taken off. The end of the stack where items (or data) are put is called the top of the stack. Putting an item on top of the stack is called pushing onto the stack; removing an item from the top of the stack is called popping off the stack.

A stack is usually a block of reserved memory. The stack pointer keeps track of the top of the stack. An illustration of a stack in memory is shown in Fig. 6. Since the memory al-

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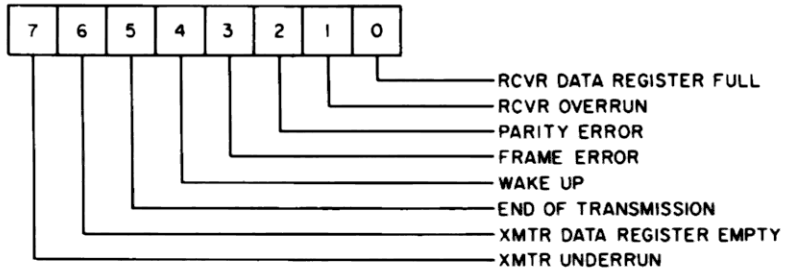


Figure 5. R65F11 serial communication status register (SCSR).

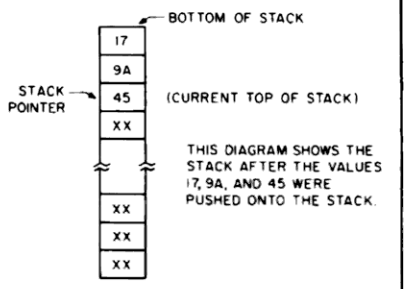


Figure 6. Illustration of a stack in memory.

located to the stack is limited, you need to define upper and lower limits. If you try to push more values onto the stack than allowed by memory, you'll get a stack overflow error. Similarly, if you try to pop off more items from the stack than you pushed onto the stack, you'll get a stack underflow error. When you use stacks in programs or languages, the software needs to check for overflow and underflow conditions.

Since stacks typically grow towards lower memory addresses, the CPU decrements the stack pointer whenever you push a new data value onto the stack. You can implement a stack pointer in two ways. With the first, the stack pointer always points to the last item put on the stack. When you push a new item onto the stack, the CPU first decrements the pointer, then loads your data on the stack at the new pointer location. If you want to pop data off the stack, the CPU pulls the data from the location the stack pointer points to and increments the pointer to indicate the new top-of-stack value.

The second approach is similar, but the stack pointer always points to the next location for a value. To push data on the stack, the CPU puts the data in memory at the location the stack pointer indicates; then it decrements the stack pointer. To pop a value off the stack, the CPU first increments the pointer, then pulls the value from the location to which the stack pointer points.

It really doesn't matter which of these methods you use in a particular system. It is important, however, that the system remain consistent. Pick an approach and stick with it. The most common approach, it seems, is the first one described above.

The RSC-Forth Language

Forth was originally developed for real-time control applications and is ideal for machine and process control, data acquisition, and automatic testing. Forth is designed to work easily with Assembly language for increased speed (where necessary), while at the same time providing a high-level language environment for greater programming efficiency and reliability.

The Rockwell RSC-Forth user's manual describes Forth this way: "Forth can be called a computer language, an operating system, an interactive compiler, a data structure, or an interpreter, depending upon your point of view. It was designed to combine the strengths of both compilers and interpreters. The result is a unique language based on pre-defined operations that minimizes software development time and costs, supports structured programming and program modularity, compiles interactively to ease debugging and to reduce programming errors, compacts into small object code and executes extremely fast. Additional words may be defined to allow usage by non-programmers."

While I haven't worked with Forth enough to verify all those statements, I have found it to be quite a good language for control applications.

Rockwell's RSC-Forth is modeled after fig-Forth, and implements nearly all fig-Forth functions (that's a tongue twister). There are also additional functions, mostly specific to the R65F11 microcontroller or its operating system (in the R65FR1 ROM), not found in the fig-Forth model. The development ROM even contains a special one-pass assembler for combining Assembly language with Forth programs.

The RSC-Forth user's manual (see the list of references) is an excellent resource for this system, describing the operation of all of the RSC-Forth functions, as well as interacting with mass storage, combining Forth and Assembly language programs, and putting programs in ROM. A coupon for a free copy of the book is included with the purchase of the R65FR1 development ROM. The book also includes a rather lengthy reference list of books on Forth.

Construction of the Forth Microcontroller

The finished Forth microcontroller is shown in Photo 1. The schematic for the Forth microcontroller is in Fig. 7, while the parts list is in Table 1. Table 2 shows the power and ground connections for the smaller ICs. You may notice that the schematic shows only eight ICs while the photo shows nine. I just did a little experimenting with my board.

Building the board is simple and straightforward. Most of the RAM and ROM lines are wired in parallel, since they're both JEDEC (standard) 8K by 8-bit devices. You will need one 40-pin socket, two 28-pin sockets, one 20-pin socket, one 16-pin socket, and three 14-pin sockets.

You may also notice the −12V supply coming into the board. This is required for the RS-232C interface. If you do not have this or a similar minus voltage available (between −5V and −18V), you may want to include the optional circuit shown in Fig. 8. This circuit, also used in the November 1984 modem project (p. 146), generates a −5V supply from the incoming +5V supply. You can then use the generated −5V to supply the minus voltage needed for the RS-232C interface (pin 1 of the 1488).

I used a female DB-25S connector as the RS-232C connector. You need

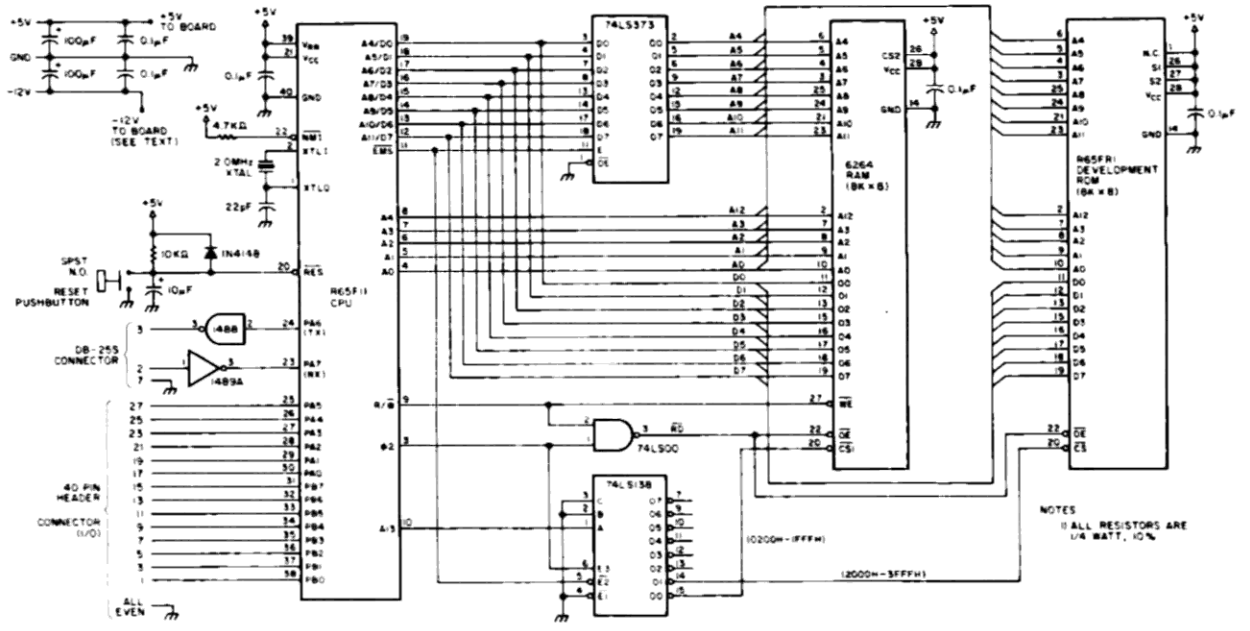


Figure 7. Forth-based microcontroller board.

only three wires: 2 (receive), 3 (transmit), and 7 (signal ground). I chose to wire the connector as a DCE (data communication equipment) device, with pins 2 and 3 swapped from the normal DTE (data terminal equipment) configuration. This lets you connect to your computer (used as a terminal) or another terminal using a "straight through" cable (a cable connecting pins 2-to-2, 3-to-3 and 7-to-7). This works since most terminals and computers are wired as DTE devices. If you have problems, try swapping pins 2 and 3.

Although not on my board, I specified a 40-pin expansion connector (header connector) to connect the R65F11 I/O lines. You should use this if you want to control an external device with the microcontroller. I grounded all even-numbered lines for shielding purposes.

I have heard of some confusion over header numbering. Headers always have pin 1 marked (generally with an arrow). All even-numbered pins are on that side of the connector. The pin opposite pin 1 is pin 2, and all even-numbered pins are on the same side as pin 2.

You will also need a power supply capable of +5V at 500mA and (optionally) −12V at 30mA. The R65F11 can dissipate up to 1 watt of power, which is considerable for a chip of its size.

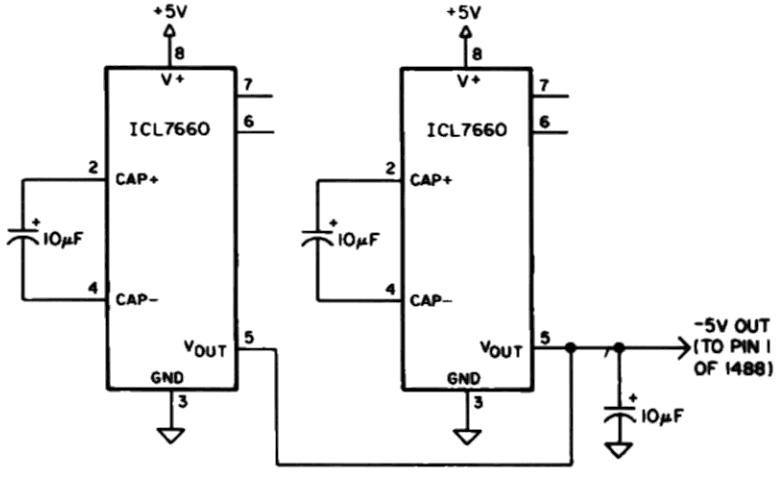
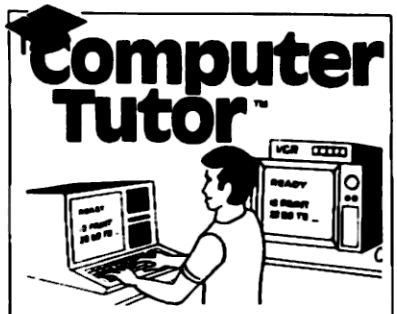


Figure 8. Alternate minus power supply to the 1488.

Operating the Forth Microcontroller

Figure 9 shows the external memory access timing for the R65F11 microcontroller. The phase-2 clock signal the microcontroller generates is the basic timing signal. It runs at one-half the crystal frequency (1 MHz in this system). During the first part of the cycle (when phase 2 is low), the R65F11 validates address lines (A0–A13), as it does the R/W signal (high for a read cycle, low for a write cycle). After these lines stabilize, the EMS/ line falls, making the 74LS373 latch the A4–A11 address lines. When phase 2 then goes high, the R65F11 enables the external memory. The RD/ (read) strobe also goes active (low) at this time, if the R65F11 is in a read cycle. When phase 2 returns low, the R65F11 completes the cycle to start the next memory cycle.

Note that EMS/ only goes active during external memory accesses. Internal memory accesses don't cause EMS/ to go active, so the internal addressing space (particularly for the RAM) does not need to be decoded out of the addressing space of the external memory. Internal RAM and device addressing space is from 0000–00FF hexadecimal (hex). You can't access these 256 bytes of addressing



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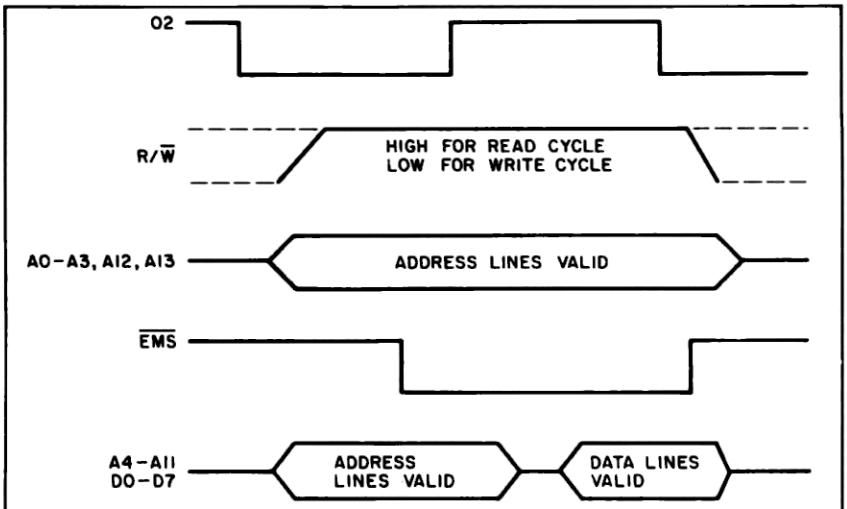

Figure 9. R65F11 external memory access timing.

in the external 6264 RAM chip. The loss of 256 bytes is not, however, significant when you have 8K bytes available.

When you power up or reset the board, the R65F11 executes a system startup function called Cold. This function initializes the various R65F11 registers to allow external memory access and sets up the serial channel for 1,200 baud (assuming a 1 MHz clock) asynchronous operation, with 7 data bits and parity disabled. The R65F11 then makes a test of the variable ("CLD/WRM") at location 030E hex. If it contains the value A55A, the R65F11 assumes a warm start; otherwise, it assumes a cold start. You can also initiate a cold start from your terminal using the Forth Cold command.

Whether a warm or a cold start occurs, the R65F11 checks system memory at every 1K byte boundary starting at 0400 hex. The R65F11 checks the first 2 bytes at each boundary for an A55A pattern. If the R65F11 finds such a pattern, it assumes an autostart ROM (like the R65FR1 development ROM or a custom user ROM), and the subsequent information indicates where execution should start. If it finds no auto ROM, the operating system sends the message "No ROM" to the terminal through the RS-232C channel, then attempts to boot a program from disk. The R65F11 assumes that a WD1793-type disk controller is installed.

In the case of your board, the R65F11 will find the development ROM, and an RSC-Forth prompt message should appear on the terminal screen. At this point, you're in business. You can define special function words, execute immediate functions, or develop entire programs.

Many of the Forth command words work on values on the stack. You put a value on the stack by typing in the data (16-bit integers only), separated by spaces or carriage returns. Arithmetic operations are in the postfix or reverse Polish notation (RPN), popularized by Hewlett-Packard calculators. To perform a calculation such as (12+3)*(24+5), you enter 12 3 + 24 5 + *.

Entering the 12 and 3 (followed by spaces) puts the two numbers on the stack. Typing in a plus sign adds the two stack values and puts the results on the stack. The R65F11 then puts the numbers 24 and 5 on the stack (remember the previous sum is still on the stack). The next plus sign adds the 24 and 5, then the multiplication sign multiplies the two sums, with the result put on the stack. To display the value that is on the top of the stack (and pop it off), you type in a period.

A very short program function, named PORT-B-INC is shown in Fig. 10. The initial colon indicates that

```
: PORT-B-INC 1
  BEGIN
      DUP PB C!
      1 + 0
  UNTIL ;
```

Figure 10. Example Forth program.

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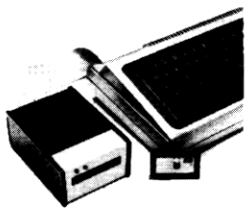

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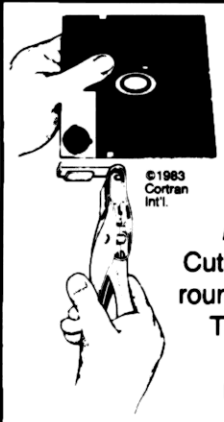

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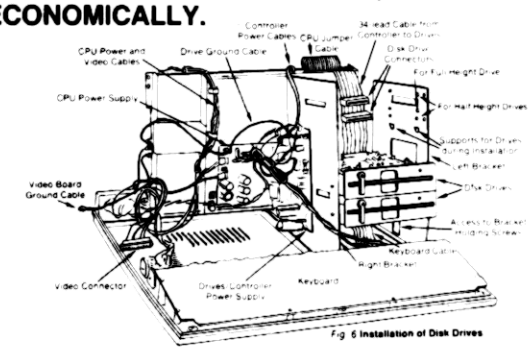

Fig. 6 Installation of Disk Drives

Illustration from E-C DATA's Disk Kit Installation Manual

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you're defining a new function. It's given the name following the colon (PORT-B-INC).

The R65F11 puts the number 1 on the stack. The Begin command starts a conditional operation section. DUP duplicates the value on top of the stack. PB C! then pops the top-of-stack value and sends it (as 8 bits) to port B (which is in general-purpose I/O mode by default). The 1 + then increments the top of stack value (previously duplicated so it wouldn't be lost) to send the next-higher value to port B during the next loop.

The R65F11 pushes number zero onto the stack and the Until command pops the value off the top of the stack. If it is zero, execution starts over at the Begin statement, otherwise the function is done. Since the value zero will always be seen by the Until function, this is an infinite loop. The ending semicolon indicates the end of the function definition. You can now execute the function by merely typing

Quantity	Description	Distributor	Part Number	Price (each)
1	R65F11P Rockwell Forth microcontroller IC (plastic)*	HA	R65F11P	$50
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1	6264 8K by 8-bit CMOS static RAM	DR	HM6264P-15	39.95
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1	74LS00 quad two-input NAND gate (LS TTL) IC	JDR	74LS00	.24
1	74LS138 3-to-8 decoder IC	JDR	74LS138	.55
1	LM1488 quad RS-232C driver IC	JDR	LM1488	.69
1	LM1489A quad RS-232C receiver IC	JDR	LM1489	.69
2	ICL7660 DC positive-to-negative voltage converter IC†	RS	276-2335	3.79
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5	.1 μF/50V disc capacitor	RS	272-135	.25
3	10 μF/35V electrolytic capacitor (PC mount)†	RS	272-1025	.59
1	10 μF/35V electrolytic capacitor (PC mount)	RS	272-1025	.59
1	2MHz crystal	DK	X001	2.70
1	4.7k ohm resistor (¼ watt)	RS	271-1330	.08
1	10k ohm resistor (¼ watt)	RS	271-1335	.08
1	1N914 small signal diode‡	RS	276-1122	.10
1	Momentary contact SPST switch (mini)	RS	275-1571	.80
1	40 position cable header (w/w)	DK	R241-ND	5.58
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* The R65F11 and R65FR1 cost around $100 combined. Check with Hamilton/Avnet for price and availability before ordering. Hamilton/Avnet ships orders C.O.D.
† Required only when using the optional – 5V circuit.
‡ You can substitute the 1N914 for the 1N4148 in this design.

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

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Table 1. Parts list and ordering information.

IC	GND	−12V (or −5V)	+5V	+5V (or +12V)
74LS373	10		20	
74LS138	8		16	
74LS00	7		14	
1488	7	1		14
1489A	7		14	

Table 2. IC Power/Ground pin connections.

the function's name, PORT-B-INC. If you were to look at the Port B pins on an oscilloscope, you would see a square wave on each pin, with the frequency cut in half for each higher-order bit.

Conclusion

If you decide to build this project, you should read the R65F11 data sheet and the RSC-Forth user's manual. If you want to include a disk drive and possibly a printer port with your system, Rockwell has a useful application note, "A Low-Cost Development Module for the R65F11 Forth Microcomputer" (see references), which is complete with schematics (even P.C. board masks for photographing).

The Forth high-level language and the 6502 instruction set combine to make a very powerful and effective controller. ■

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.

Forth Microcontroller References

R6511 and R65F12 Forth Based Microcomputors.
(document number 29651N49)
A Low-Cost Development Module for the R65F11 Forth Microcomputor.
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Branching Out With Your BBS

Computer bulletin board systems (BBSes) often need to search for information, and the BBS Express is no exception. The BBS searches two lists constantly—the membership log and the data base catalog. Searching lists like these is potentially messy when you consider that they're often long and randomly compiled. Common search methods, such as sorting and sequential searching, aren't efficient because of the random nature of our lists. Using a binary tree, however, is an efficient and conveniently applied method that allows easy access to random information.

This month, we'll discuss the binary tree as it applies exclusively to the membership log. This is an ideal place for a binary tree because the more random the information supplied, the more efficient the binary tree. When employed here, the binary tree produces a sorted list when needed, and finds an entry in a 256-record file with surprisingly few disk accesses.

The example listing in Fig. 1 sets up a random-access file that lets the caller enter his first name. Two additional fields are added to the membership list: a left pointer (LP$) and a right pointer (RP$). The GOSUB 870 in line 90 manipulates the two pointers in a way that lets you quickly find a name.

When a user enters a new name on the binary tree, the BBS compares it to the name at the first junction where the tree splits into its left and right branches (see Fig. 2). If the new name is lower in the alphabet than the name it's compared with, it goes to the left branch. Otherwise, it goes to the right branch. The same comparison is made at the next junction, where again the lower name goes to the left. If at the end of the branch, there are no more junctions, the name is added.

At each junction, the remaining items are divided in half. If the tree is balanced, half of the remaining list lies on the left path, the other half on the right. By taking the left or right branch, you effectively ignore half the remaining list. Therefore, if you start with 256 entries on the tree, 128 entries are eliminated after the first comparison. With each respective comparison, you reduce this figure to 64, 32, 16, eight, four, two, and eventually, one. With the binary tree method, we're able to locate an item in just nine comparisons.

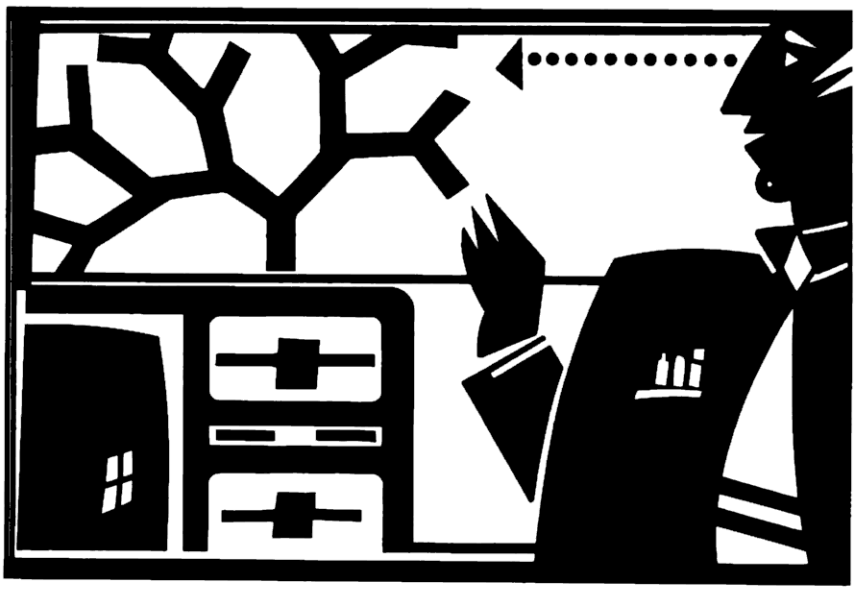

Illustration by Phil Geraci

Proper Coding

Because the records on a disk are lined up one after another, you're able to arrange the pointers so that they contain an offset from the present record to the next smaller record (for LP$), or the next larger record (for RP$). If, for example, you're at record 1, and the next record alphabetically smaller than the name in record 1 is in record 5, and the next larger is record 4, LP$ will contain 4, and RP$ will contain 3. When the pointer you want to move is a zero, you've reached the end of a branch, and the BBS adds the name.

Line 870 of both Fig. 1 and the Program Listing tests for EN=1. If there's only one record in the file, the program exits the search with a return. Otherwise, the BBS initializes record Y to 1.

Line 890 compares CK$, the name that you want to position, with N1$, the name from record Y. If CK$ is greater than NI$, the BBS sets FS equal to the value of the right pointer. CVI simply converts the string representation of a number in a random file to a number.

If this right pointer is zero, it's set to the difference between record Y and EN, the record written to disk by line 80 of Fig. 1. Then the BBS unites record Y with the updated pointer before it exits the program. If CK$ is less than or equal to the name in record Y, the BBS repeats the procedure with the left pointer, LP$. Otherwise, you

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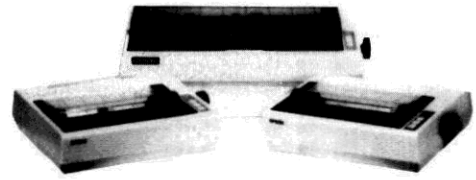

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```
10 CLS:CLEAR1000:NM=1:CK$=STRING$(20,32)
20 OPEN"R",2,"TEST/DAT:0"
30 FIELD 2, 20 AS N1$,2 AS LP$,2 AS RP$
40 INPUT"ENTER NAME, QUIT TO STOP";N$
50 IF N$="QUIT" THEN CLOSE:END
60 LSET N1$=N$:LSET LP$=MKI$(0): LSET RP$=MKI$(0)
70 NM=NM+1
80 PUT 2,NM
90 EN=NM:LSET CK$=N$:GOSUB 870
100 GOTO 40
870 Y=1:IFEN=1 THEN RETURN
880 GET 2,Y
890 IF CK$>N1$ THEN FS=CVI(RP$):IF FS=0 THEN LSET
RP$=MKI$(EN-Y):PUT 2,Y:RETURN
900 IF CK$<=N1$ THEN FS=CVI(LP$):IF FS=0 THEN LSET
LP$=MKI$(EN-Y):PUT 2,Y:RETURN
910 Y=Y+FS:GOTO880
```

Figure 1. Sample code for binary tree sort.

```
10 CLS:CLEAR1000:EN=256:CK$=STRING$(20,32)
20 OPEN"R",2,"TEST/DAT:0"
30 FIELD 2, 20 AS N1$,2 AS LP$,2 AS RP$
40 INPUT"ENTER NAME, QUIT TO STOP";N$
50 IF N$="QUIT" THEN CLOSE:END
60 LSET CK$=N$:GOSUB 940
70 IF ER THEN ?"NO SUCH NAME ON THE LIST"
80 IF NOTER THEN PRINT "NAME FOUND IN RECORD";MR
90 GOTO 40
940 IF EN=0 THEN 1010
950 MR=1:ER=0
960 GET 2,MR
970 IF CK$<N1$ THEN FS=CVI(LP$):GOTO1000
980 IF CK$>N1$ THEN FS=CVI(RP$):GOTO1000
990 RETURN
1000 MR=MR+FS:IF FS>0 THEN 960  '  REENTER HERE
1010 ER=-1:RETURN
```

Figure 3. Sample code to search the membership log.

```
10 CLS:CLEAR1000:EN=256:SR$=STRING$(255,32)
20 OPEN"R",2,"TEST/DAT:0"
30 FIELD 2, 20 AS N1$,2 AS LP$,2 AS RP$
40 GOSUB 1020
50 PRINT N1$
60 IF NOTER THEN GOSUB 1080:GOTO50
70 CLOSE:END
1020 PRINT"Sorting...":MR=1:ER=0:Z=1:FS=1:LSET SR$=CHR$(0)
1030 IF DS=0 THEN ER=-1:CLOSE:RETURN
1040 IF FS>0 THEN GET
2,MR:Z=Z+1:MID$(SR$,Z,1)=CHR$(MR):FS=CVI(LP$):MR=MR+FS:GOTO1
040
1050 MR=ASC(MID$(SR$,Z,1)):Z=Z-1:IF MR=0 THEN
ER=-1:CLOSE:RETURN
1060 GET 2,MR:IF LEFT$(P1$,1)=CHR$(0) THEN 1080
1070 RETURN
1080 FS=CVI(RP$):MR=MR+FS:GOTO1040 '  REENTER HERE
```

Figure 4. Sample code to produce a sorted list.

Program Listing. BBS module that creates the membership log binary tree.

```
870 Y=1:IFEN=1 THEN RETURN
880 GET 2,Y
890 IF CK$>N1$ THEN FS=CVI(RP$):IF FS=0 THEN LSET
RP$=MKI$(EN-Y):PUT 2,Y:RETURN
900 IF CK$<=N1$ THEN FS=CVI(LP$):IF FS=0 THEN LSET
LP$=MKI$(EN-Y):PUT 2,Y:RETURN
910 Y=Y+FS:GOTO880
940 IF EN=0 THEN 1010
950 MR=1:ER=0
960 GET 2,MR
```

Listing continued

make Y equal to Y plus FS, which is the offset for either the left branch or the right branch, and then loop to line 880 to repeat the process.

The program code in Fig. 3 lets a caller retrieve a name from the BBS. Lines 10–50 open the file, and let the caller input the name for which he's looking. Line 60 LSETs that name into CK$ before jumping to the routine that starts at line 940. EN has a value of 256, assuming that the file contains 256 records. The BBS initializes MR, the record number, to 1, while it sets ER, the flag that tells you if the record is found, to zero. If the name from record MR is less than CK$, line 970 sets FS to CVI(LP$). If greater, it's sent to the right branch in line 980.

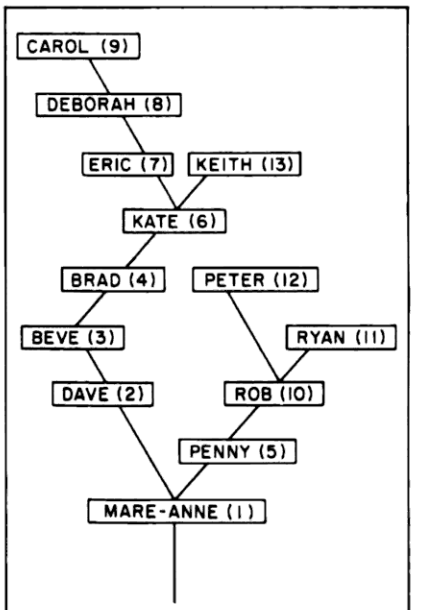

Figure 2. A graphic representation of a binary tree sort. The numbers refer to the order in which the user entered the names.

Line 1000 adds the value of FS to MR. If FS is greater than zero, the routine loops back to line 960 to check the next record. If however, FS is zero, the BBS sets ER to −1 and informs the calling routine that it hasn't found the name.

A Sorted List

The example listing in Fig. 4 produces a sorted list from the binary tree. Line 1040 follows the left pointers to find a zero, creating a path as it moves along. This path, SR$, is a string of 255 blanks, with its first char-

The program code lets a caller retrieve a name from the BBS.

acter set to CHR$(0) by the LSET command in line 1020. The entire list has been printed when the program backs out of SR to find the CHR$(0) at the end. The DS in line 1030 of the listing keeps track of the current position in SR for the BBS, though not for the example in Fig. 4.

When line 1040 finds zero, indicating the lowest item on the list, MR is set to the ASCII value of the Zth element of SR in line 1050. If MR is zero, you've printed the entire list. The test for P1$ = CHR$(0) in line 1060 is part of the module in this month's listing, though it's not part of the sample routine. From this point on, the calling routine in line 1080 loops to line 1040 until you print the entire list.

Because your membership log will most likely contain more than 255 names, no attempt is made in the actual coding to produce a membership log sorted by first names only.

For a further discussion on binary tree operation, we recommend Ken Knecht's article, "Plant a Binary Tree" (*80 Micro*, November 1982, p. 242). ■

Listing continued

```
970 IF CK$<N1$ THEN FS=CVI(LP$):GOTO1000
980 IF CK$>N1$ THEN FS=CVI(RP$):GOTO1000
990 RETURN
1000 MR=MR+FS:IF FS>0 THEN 960  '  REENTER HERE
1010 ER=-1:RETURN
1020 PRINT"Sorting...":MR=1:ER=0:Z=1:FS=1:LSET SR$=CHR$(0)
1030 IF DS=0 THEN ER=-1:CLOSE:RETURN
1040 IF FS>0 THEN GET
2,MR:Z=Z+1:MID$(SR$,Z,1)=CHR$(MR):FS=CVI(LP$):MR=MR+FS:GOTO1
040
1050 MR=ASC(MID$(SR$,Z,1)):Z=Z-1:IF MR=0 THEN
ER=-1:CLOSE:RETURN
1060 GET 2,MR:IF LEFT$(P1$,1)=CHR$(0) THEN 1080
1070 RETURN
1080 FS=CVI(RP$):MR=MR+FS:GOTO1040 '  REENTER HERE
```

End

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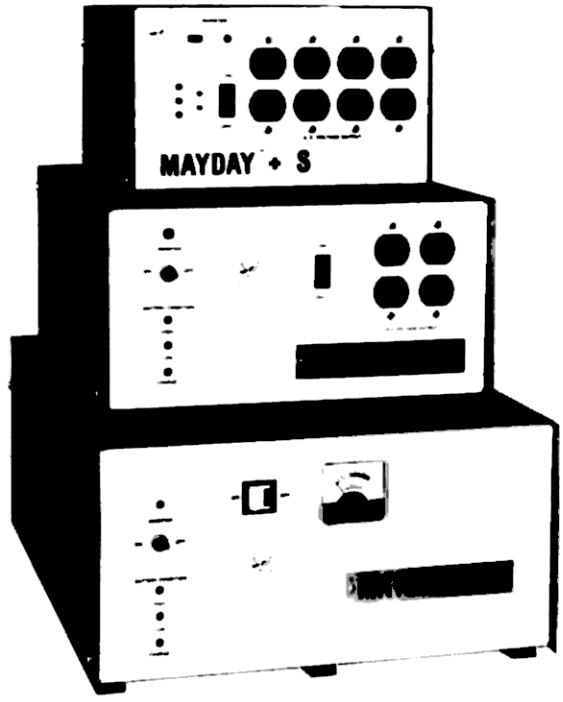

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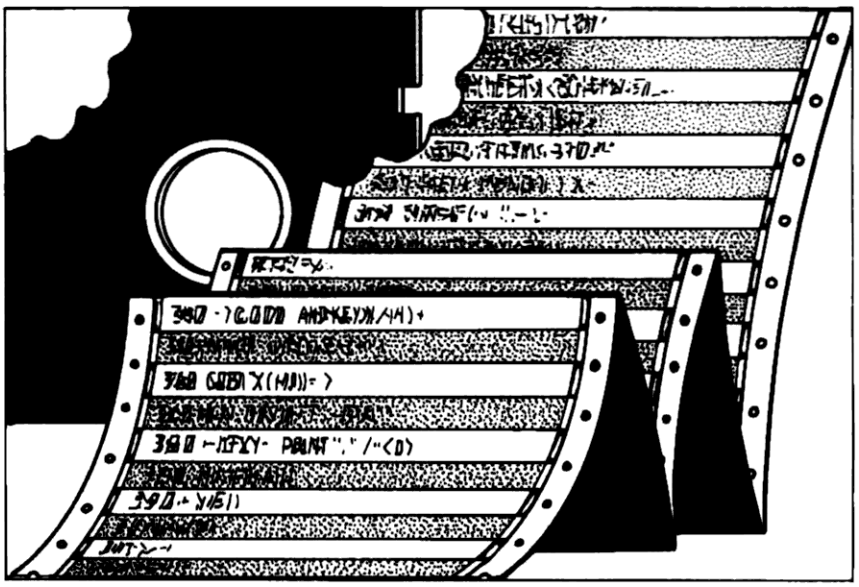

Illustration by Mark S. Fisher

In the beginning you're responsible only to yourself. Your early programming efforts may be ragged and awkward, but lack of elegance is no sin if the program does what you want.

Once your programs gain length and complexity, however, they use more memory and run slower. You need to learn to make listings as short as possible.

Compacted, or "crunched," programs use 20–30 percent less memory and run 5–10 percent faster than standard code. In addition, they use less disk storage space and print out on less paper.

Program crunching falls into two categories: mechanical steps and programming techniques. The former you can learn quickly, while the latter comes with experience.

Candidates for crunching include programs you write yourself and those you key in from *80 Micro* or other sources. When typing in someone else's programs, follow the author's style exactly. Once you've debugged the program and saved it to disk, you can start compressing it.

Mechanical Crunching

Mechanical methods for shortening programs include eliminating spaces, combining material from several lines into one line, removing Remark statements, and using lower line numbers—in that order.

Start by eliminating spaces. This is the simplest change and saves the most space. Once you've debugged a program and understand its flow, you can erase spaces. You can write programs this way, but I suggest using spaces to start so you can pick out routines easily.

On the Models I and III, you must edit each line individually. Type in 500 IF A = 15 THEN GOSUB 1000 ELSE 110 and hit the enter key. Now type in EDIT 500 and move through the line, hitting the D key to delete each space. Hit the enter key when you're finished, then list 500. You've crunched your first line.

On the Model 100 you can edit the whole program at once. Be sure that the program exists in Basic mode, then type in EDIT. You can then edit the entire listing as you would a text file.

In the Edit mode, press the F1 key for string search, then hit the space bar and press the enter key. This lets you search for each space in the program.

When you get to a space you want to erase, then press shift and the delete/backspace key at the same time to erase the spaces. Don't eliminate spaces within quotation marks, or from string array material in data lines.

You can also compact programs by combining several lines into one. A Model III Basic line can hold up to 255 characters, including the line number.

```
110 A = 5
120 Z = 20
130 IF A = 5 THEN PRINT "KING"
```

The above listing reduces to one line:

```
110 A = 5:Z = 20:IFA = 5THENPRINT "KING"
```

Notice that I've separated each Basic statement by a colon. Here are a few rules to remember when combining lines:

- You can combine two data lines into one. For example, 110 DATA 1,2,3 and 120 DATA 4,5,6 reduce to 110 DATA 1,2,3,4,5,6. You can't combine a data line with other statements, however.
- You must put a GOTO statement at the end of a line. Your program will never reach statements appearing in the same line after GOTO, since control goes to another line. However, you can put statements after a GOSUB statement. The program reads these statements when it returns.
- You must retain line numbers that are the objects of GOTO, GOSUB, Else, Then, and Resume statements. Here's an example:

```
100 CLS:INPUT X:IFX = 10THEN120
110 GOTO 100
120 PRINT "YOU ENTERED 10"
```

You can't add lines 110 and 120 to line 100 because line 100 branches to line

120 and line 110 sends control to line 100.

● When compacting your programs, go through the listing and list all line numbers to which the program can branch. Refer to the list as you combine lines.

● Don't put statements after an If...Then test. For example:

```
100 INPUTZ
110 IFZ=2THENPRINT "TWO"
120 A=5
130 PRINTA
```

You can't combine lines 110 and 120 because all material following an If...Then test is valid only if the program meets the test. If you combine the lines, variable A would get a value of zero if Z didn't equal 2. This isn't the intent of the program.

● You can follow an If...Then statement with other statements if your intent is to perform the following statements only if the program passes the If...Then test.

As you gain programming experience, you'll begin to recognize Basic statements that logically go together. The start of your program might look like this:

```
110 CLS:CLEAR100:DIMA(54):Z=3:M=
  8:A$= "VICTORY":S=3.2
```

Consider this style as a one-line checklist for including fundamental program preparations, i.e., clearing string space, dimensioning and initializing variables, and so on.

● For...Next loops, If...Then statements, and small subroutines fit logically together:

```
100 FORX=1TO5:PRINTX:NEXT
110 INPUTL:IFL=5THENGOSUB1000ELSE
  100
120 END
1000 PRINT "THIS IS FUN":RETURN
```

Another way to reduce program size is by eliminating Remark statements (' or REM) and all material that follows. Remark statements are not necessary for program execution. If program control branches to a line containing a Remark statement, delete only the material after the REM.

Some programs contain a remark statement to the right of a Basic statement, for example:

```
100 A=Z: REM This is the value of sales
```

You could cut this line to 100 A=Z.

If you want to use routines in other

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Another way to reduce program size is to eliminate Remark statements since they aren't necessary for program execution.

programs, save a version of the program with Remark statements to keep the routines easily recognizable.

Because a line 6300 uses more characters than a line 5, lower line numbers save memory. Even short programs profit from renumbering.

Lines containing GOSUB, GOTO, Else, Then, and Resume statements have objective line numbers within them that make program renumbering tricky. The safest way to renumber a long program is with a utility program.

For Level II Basic I recommend using Line Renumber from Radio Shack. Use the Name command in Disk Basic. For the Model 100, use Beve Woodbury's Renumber 100 program (August 1983, p. 206).

When writing a program, increment line numbers by at least 10 to leave room for adding new lines.

Experienced Crunching

Beyond the rules suggested above, techniques for shorter programs come from experience. You can always find exceptions to every rule, and the list of techniques is too cumbersome to detail.

However, here are some tips that I found valuable in learning programming:

- Use variables instead of literals if the program uses the same value more than once in a program.
- Use subroutines for any repeated program action. A good example is a timing routine:

```
1000 FORT = 1TO1000:NEXTT:RETURN
```

Enter a GOSUB where needed.

- Always dimension arrays, but don't reserve more space than necessary.
- Shorten long variable names to two characters (LIGHT$ to LI$). The computer only reads the first two characters.
- Shorten If...Then tests. For example, the lines

```
100 INPUTX
110 IF X = 1 THEN GOSUB 1000
120 IF X = 2 THEN GOSUB 2000
130 IF X = 3 THEN GOSUB 3000
```

reduce to one line:

```
1000INPUTX:ONXGOSUB1000,2000,3000
```

- Store values in arrays. This makes it easier to keep track of them for use.
- Pack the longest string into the smallest variable possible. Use DEFSTR to express an often used string variable by a single letter (A instead of A$).
- Avoid parentheses when possible, but don't hesitate to use them when needed.

Finally, here's a byte-eating mistake that drove me to distraction as a beginner. I included a GOSUB without a Return statement. A nonreturned GOSUB uses several bytes every time the GOSUB occurs. Type in and run the following listing:

```
100 REM * Byte Eater
110 CLS
120 GOSUB 140
130 GOTO 120
140 PRINT FRE(0)
150 GOTO 120
160 RETURN
```

Lines 130 and 160 never execute. The program GOSUBs from lines 120 to 140, where it prints the remaining memory. Then the GOTO in line 150 returns the program to line 120. This is where the error occurs.

This cycle repeats until an OM (out of memory) error occurs. A long listing doesn't take long to crash. The moral is to exit a subroutine only with a Return statement. The only exception is if you're ending the program.

Look at the listings of some of the first programs you wrote and see where you can cut without damaging the program. You'll be surprised by the succinct listings that result, and by the sophistication you've obtained since you started programming. See you next month.

For...Next Month

In my next column I'll cover For... Next loops. See you then. ■

Contact Richard Ramella at 1493 Mountain View Ave., Chico, CA 95926.

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Encore! Encore! More Basic Tricks

Last month I discussed three ways to add new commands to TRS-80 Basic: taking over an existing command in Disk Basic, adding to a command such as CMD, and interrupting Basic's parser routing. As I stated in that column, there is yet another way to add extensions to Basic.

Basic's low memory (41A6–41E4 hexadecimal [hex]) contains a set of 21 3-byte DOS exits, or links to normal Basic processing. These exits let DOS programmers add extra features to Disk Basic; the differences in the Basics supplied with the various DOSes result from how the DOS programmers implemented the DOS exit routines.

In a tape-based system, Basic fills almost all these exits with a Return instruction. The Return command (0C9 hex) is a tip-off that the Basic interpreter is looking for a subroutine in each location, and that it calls each from one or more specific locations in ROM. To add new features to Basic, all you need to do is link a subroutine to the correct DOS exit. If you write the new routine correctly, you can add features without giving up anything that already exists in your favorite Disk Basic.

The Table lists the DOS exits, their call addresses in ROM, the normal use of each, and possible additional uses. As in past columns, I've drawn from Jack Decker's *TRS-80 ROM Routines Documented* (The Alternate Source, 704 N. Pennsylvania Ave., Lansing, MI 48906) and James Farvour's *Microsoft Basic Decoded* (IJG Inc., 1953 W. 11th St., Upland, CA 91786).

Illustration by Peter Bono

The Key Box

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Table. Model I/III DOS exits. Shown are the DOS exits, their call addresses in ROM, the normal use of each, and possible additional uses.

Error-handling 41A6 hex	Called from 19EC hex to report an error when Basic stops normal processing. Used by Disk Basic to provide long error messages. Use this link to provide your own error messages or to trap certain kinds of errors and offer new ways to deal with them.
USR routine 41A9 hex	Called from 27FE hex, the entrance to the USR handler in Basic. Used by Disk Basic to add the necessary code for 10 USR routines instead of the single routine in cassette Basic. You can use this link to add several more USR commands (perhaps USR A–USR Z) in addition to the 10 normally available.
Ready prompt 41AC hex	Called from 1A1C hex just before entering or reentering Basic's command mode. You could link a program here to change the Ready prompt or add new activities just before each Ready message appears. With carefully written code, you could change the entire action of Basic, perhaps even merging it with a "foreign" language or interpreter.
Input buffer 41AF	Called from 0368 hex, near the start of Basic's routine, to input a line from the keyboard to the I/O buffer.
Line is tokenized 41B2 hex	Called from 1AA1 hex, immediately after you've tokenized a new line of Basic. When Basic calls this link, HL points to the tokenized line. You could patch a utility into this link to trap syntax errors as you write program code instead of when the program runs.
Place line in program 41B5 hex	Called from 1AEC hex, immediately after you update Basic's table of program lines. After the call to 41B5 hex, Basic calls the Clear routine at 1B5D hex and then calls this DOS exit from 1AF2

Table continued

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Table continued

	hex. If you want to keep Basic from erasing variables values each time you change a line, you could patch through these two points. However, your program would have to recognize if the program had expanded into the variables tables during an editing session.
Automatic close 41BB hex	Called from 1B8C hex and 1DB0 hex, during New and End processing, to allow disk Basic to close any files that a program has left open.
PRINT # processing 41BE hex	At the end of each Print command, Basic calls this link from 2174 hex. Use it to mark the end of disk output after a PRINT# statement.
Byte output 41C1 hex	Use the ROM routine that begins at 032A hex to send a single byte to any device. It calls this DOS exit from 032C hex so that it can handle output to disk in the same manner as output to other devices.
Keyboard scan 41C4 hex	The ROM keyboard scan, at 0358 hex, calls this DOS exit. Basic uses this scan to process INKEY$ and after the completion of each command when the system searches for either a break or a shift @ pause. Most single-step utilities are linked into the system here; however, unless you skillfully code them, such routines are often incompatible with any program that uses the INKEY$ function.
Run processing 41C7 hex	Called from 1EA6 hex whenever you follow the Run command by either a file name or a line number. By using special parameters instead of a file name, you could patch new utilities and programs into this DOS Exit.
PRINT # processing 41CA hex	This link is related to 41BE hex above. It is called at the beginning of print processing from 206F hex to check for possible output to disk with a PRINT # statement.
Print a number 41CD hex	During print processing, a call is made from 20C6 hex to this exit after the computer converts a numeric item into an ASCII string and just before it prints it. If you want to print numbers in binary or hex, you could interrupt Basic through this link and change the print string.
Carriage return 41D0 hex	Called from 2103 hex (from the Print routine just after code that sends a carriage return), you usually use this exit to keep the computer from splitting numeric items between two screen lines. You could use it to add screen wraparound of words in a string.
Tab processing 41D3	Called from 2108 and 2141 hex. The first is during printing with comma tabs and the second during processing of Tab statements. You could use this link to increase the length of permissible tabs to the range of 0-255 instead of 0-63 or 0-127, since the original tab value is still held in Basic's numeric accumulator at 4121 and 4122 hex.
INPUT# processing 41D6 hex	Called at the beginning of input processing from 219E hex to check for an INPUT # command and provide input from a disk file.
Left-side MID$ 41D9 hex	The only DOS exit the Basic interpreter jumps to instead of calls. Use it to allow MID$ on the left side of an equals sign.
Variables assignment 41DC hex	During processing of Read and Input statements, after the computer receives a value and just before it assigns a variable, Basic calls this Exit from 222D hex.
Input and List 41DF hex	Basic calls this exit twice: from 2278 hex, just after the computer assigns an input value to a variable and just before Basic starts to search for extra data that will generate an "?Extra Ignored" message, and again from 2B44 hex, in the middle of list processing. The second call is the most interesting, because Basic has already found the beginning and end of the program in memory and you can change the manner in which Basic displays the program.

Table continued

Some DOS exits offer more possibilities for extending Basic than others. The Program Listing demonstrates one change you can make with the USR exit at 41A9 hex. This program adds a new command, USR A, to the 10 possible USR routines Basic allows. You could easily modify the program to allow USR B–USR Z as well. The demonstration program merely returns the address of a string in memory; however, it also demonstrates how you can use additional USR routines.

The first section of the program, up to line 340, implements the new routine at the DOS USR routine link. Load the program into memory while you're in Basic (or load it before you enter Basic), then type in:

```
DEFUSR = &H7800: A = USR(0)
CLEAR
```

The computer links the actual program (lines 440–750) into the system, moves it to the top of available memory, and protects it there.

The program begins by looking for an A following the USR command. If it doesn't find the A, control passes to the regular DOS USR code. When it does find an A, the program looks for a left parenthesis; if it can't find one, it stops execution and generates a syntax error message.

The program begins its work (from line 620 on) only when it finds "USR A (" in the input string. The program calls a ROM routine to evaluate the expression in parentheses and uses another ROM routine to ensure that the expression is a string. Notice that the computer saves the updated HL pointer on the stack, as well as a return address of 0890 hex; you need both for a successful return to Basic with a jump to 0A9A hex.

Besides using the USR link to add commands to Basic, you could also use the error link at 41A6 hex. Basic sees a new command as a syntax error, so it calls 41A6 hex if you haven't set up an error trap with an On Error GOTO statement in your Basic program. Basic only calls 41A6 hex when it wants to stop normal processing with an error message; once you establish an error trap, Basic passes control to it instead of halting and completely ignoring your new feature. New commands that you patch into the error link, therefore, don't function nor-

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Table continued

SYSTEM Command 41E2 hex	Called from 02B2 hex, during processing of the System command and just before the "*?" prompt. If a system tape, while loading, places a jump to its starting address here, it will begin execution without returning to the prompt. However, unless the program replaces the Return instruction to 41E2 hex, the computer can execute no other system commands until you reboot.

End

Program Listing. Demonstration of a change to a DOS exit.

```
                00100 ;     Demonstration of 'USR A'
                00110 ;     connected to Basic through
                00120 ;     the 41A9H USR DOS Exit
                00130 ;
                00140 ;*** Initialize 'USR A' command
                00150 ;
                00160 ;       To run program, see text
                00170 ;
40B1            00180 BHIMEM  EQU     40B1H           ;Basic's memory top
                00190 ;
7800            00200         ORG     7800H           ;Temporary address
7800 2AB140     00210 INIT    LD      HL,(BHIMEM)     ;Get current memory top
7803 012700     00220         LD      BC,LAST-START+1 ;BC = program length
7806 AF         00230         XOR     A               ;Clear carry flag
7807 ED42       00240         SBC     HL,BC           ;HL==> New memory top
7809 22B140     00250         LD      (BHIMEM),HL     ;Save new address
780C 23         00260         INC     HL              ;HL==> new routine addr.
780D DD21A941   00270         LD      IX,41A9H        ;IX==> USR DOS Exit
7811 DD5E01     00280         LD      E,(IX+1)        ;Load DOS's USR addr.
7814 DD5602     00290         LD      D,(IX+2)        ;  into DE
7817 DD7501     00300         LD      (IX+1),L        ;Hook in our routine
781A DD7402     00310         LD      (IX+2),H        ;  as first in line
781D EB         00320         EX      DE,HL           ;DE==> destination addr.
781E 222D78     00330         LD      (RETURN+1),HL   ;Save original addr.
7821 212778     00340         LD      HL,START        ;HL==> Beg. of program
7824 EDB0       00350         LDIR                    ;Relocate to prot. memory
7826 C9         00360         RET                     ;Return to Basic
                00370 ;
                00380 ;NOTE -- Be sure to issue a CLEAR command after
                00390 ;        running this initialization program
                00400 ;
                00410 ;Beginning of actual routine
                00420 ;   Check for 'USR A'
                00430 ;
7827 E5         00440 START   PUSH    HL              ;Save Basic's pointer
7828 D7         00450         RST     10H             ;Get next character
7829 FE41       00460         CP      'A'             ;Our turn?
782B E1         00470         POP     HL              ;Restore pointer
782C C20000     00480 RETURN  JP      NZ,$-$          ;Go to regular USR if not
                00490 ;
                00500 ;    'USR A' found -- check for '('
                00510 ;
782F F1         00520         POP     AF              ;Clear return addr.
7830 D7         00530         RST     10H             ;HL==> 'A'
7831 D7         00540         RST     10H             ;HL==> '('
7832 7E         00550         LD      A,(HL)          ;Get character
7833 FE28       00560         CP      '('             ;Is it a '(' ?
7835 C29719     00570         JP      NZ,1997H        ;Syntax error if not
                00580 ;
                00590 ;    'USR A (' found -- evaluate expression
                00600 ;                       and find string address
                00610 ;
7838 CD2C25     00620         CALL    252CH           ;Evaluate expression
783B E5         00630         PUSH    HL              ;Save ptr. on stack
783C 219000     00640         LD      HL,0090H        ;Return addr.
783F E5         00650         PUSH    HL              ;Put it on stack
                00660 ;
7840 CDF40A     00670         CALL    0AF4H           ;Check for string
                00680                                 ;Type Mismatch if not
7843 2A2141     00690         LD      HL,(4121H)      ;VARPTR into HL
7846 23         00700         INC     HL              ;HL==>String addr.
7847 5E         00710         LD      E,(HL)          ;Put string addr.
7848 23         00720         INC     HL              ;  into
7849 56         00730         LD      D,(HL)          ;  DE register
784A EB         00740         EX      DE,HL           ;HL has string addr.
784B C39A0A     00750         JP      0A9AH           ;Return addr. to Basic
784D            00760 LAST    EQU     $-1             ;Mark prog. end
                00770 ;
                00780 ;
                00790 ;  Test program for Basic:
                00800 ;   10 A$ = "Where am I?"
                00810 ;   20 B = USR A (A$)
                00820 ;   30 PRINT B
                00830 ;   40 FOR I = B TO B+10
                00840 ;   50   PRINT CHR$(PEEK(I));
                00850 ;   60 NEXT I
                00860 ;
7800            00870         END     INIT
00000 Total errors
```

End

Radio Shack just recently changed Model III ROMs in the newest Model 4's at addresses below 3000 hex.

mally in all Basic programs, so you're probably better off using one of the other techniques instead.

A Warning

Just as I was finishing this column (in late September 1984), I read a report that Radio Shack changed the Model III ROMs in the newest Model 4's at addresses below 3000 hex. Radio Shack has changed the Model III ROM addresses above 3000 hex so many times that most programmers have learned to use only those routines through the jump addresses at the beginning of that section of ROM. However, if the report is true, this is the first time (that I know of) that Radio Shack has altered the ROMs below 3000 hex since the Model III was introduced, and the changes could mean that programs such as the Listing, which use those routines, will no longer work.

If any reader can send me a list of the changes that have been made or the differences between any Model III ROMs and the newest Model 4 ROMs, I'll devote part of a future column to the changes and, of course, give you credit. Until then, I cannot guarantee that programs presented in this column will always run on the newest versions of the Model 4, although I hope the changes are not extensive and that most programs will still perform normally. ■

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.

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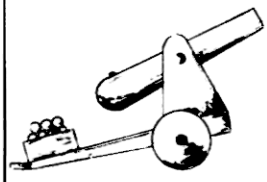

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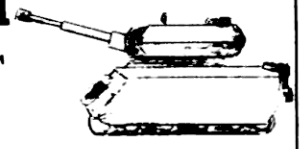

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ALPS' Utilities To the Rescue

This month I'll concentrate on commercial programs for the Model 2000: ALPS' new line of utilities, Lotus' 1-2-3 printer support, and file security software. But I'll begin with a brief mention of the 2000's new competition in the high-end microcomputer market.

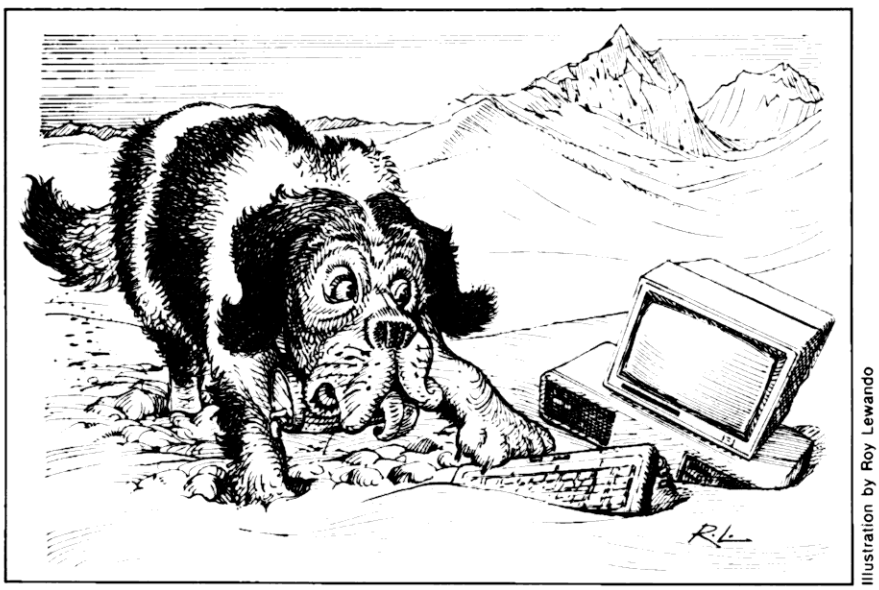

Illustration by Roy Lewando

Something Old, Something New

The closing months of 1984 brought some startling introductions. Tandy released its Model 1200, compatible with IBM's PC/XT hard disk system. The 1200 (and the PC-compatible Model 1000) should appease the many users who want stringent compatibility at the sacrifice of performance.

In addition, IBM introduced the PC/AT (Advanced Technology), a 16-bit machine that runs significantly faster than the PC. This computer uses an Intel 80286 processor clocked at 6MHz, and provides an expandable system that operates in a multi-programming environment with up to 3 megabytes of memory. The AT's 80286 is a close relative of the Tandy 2000's 80186; its identical instruction architecture with added on-board memory management features give the 80286 the advantage in this application.

Unfortunately, IBM chose to operate the processor at a slower speed than the Model 2000, so the AT runs only about 75 percent as fast as the 2000. The bottom line is that the Tandy 2000 is still one of the hottest single-user machines on the market, and a full year after its introduction, its superiority remains unchallenged. That speaks very well for Tandy.

High on ALPS

If you've ever used the Scripsit family of word processors, you'll probably recognize ALPS as the producer of specialized Scripsit printer drivers. ALPS has now branched out into the 16-bit world with a badly needed set of utilities for the IBM PC and Tandy 2000.

I've extensively used three of the five ALPS utilities packages listed in Table 1, and I find that they perform exactly as advertised. Each package includes a disk and instruction booklet; the documentation is clear and concise.

The Directory/File/Backup package contains routines that display a sorted multicolumn directory on the screen (DI), find a file located anywhere on a disk in any subdirectory (FINDF), list the directory tree structure of a disk drive or partial directory (DTREE), and back up only modified files (BACKMOD).

The DI utility lets you select any drive or partial directory. It supports wild-card file selection using the familiar MS-DOS wild-card characters. In fact, its parameters are mostly identical to those of MS-DOS's Directory command. You can also use DI to list only modified files or display hidden files.

FINDF and DTREE are exceptional utilities for a hard disk system. FINDF searches a specified disk for all occurrences of a file name and displays the full path for each file it en-

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Table 1. Product information.

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counters. DTREE displays the directories' hierarchies on the disk you specify. Indentations in the display clearly show the nested directories' relationships.

If you've ever had the unpleasant task of backing up a 10-megabyte hard disk, you'll love BACKMOD. It saves time by backing up only updated files. MS-DOS maintains an attribute bit that indicates whether you've updated a file; BACKMOD checks the attribute bit and moves only files you've updated since the last back-up.

The second package, User Tool Assortment, provides four useful routines that define a command as one key (KB), count the files in a file (LINECNT), dump files in hexadecimal and character format (HEXDUMP), and change a file's attributes (CHMOD).

The KB command lets you redefine any key as a character string; it can be a simple string or a complex set of commands. You can also inhibit keys so the computer doesn't respond to them.

If you've ever had the unpleasant task of backing up a 10-megabyte hard disk, you'll love BACKMOD.

LINECNT counts the number of lines in a text file. You must terminate lines with the standard MS-DOS end-of-line sequence (0DH, 0AH) or the utility won't recognize them. HEXDUMP displays a file's hexadecimal and ASCII character contents on the screen in 256-byte "pages." You can page through the file in either direction.

The last program in this package, lets you change a file's attributes. These attributes are pieces of information that MS-DOS maintains about each file stored on disk: the operator or the DOS can mark files as hidden, system, read-only, or archived files.

You can designate files as hidden; they're excluded from normal directory searches and won't appear as part of the directory. System files, such as IO.SYS and MSDOS.SYS, carry the system attribute and don't show up in normal directory searches, either. You can assign any file the read-only attribute, which prohibits attempts to open the file to write to or kill it. The archive attribute indicates when you've updated a file; the DOS automatically sets it whenever you properly close a file after writing to it.

The CHMOD utility lets you easily manipulate these file attributes. You can set or reset each attribute to get the configuration you want. You can use this feature with BACKMOD to mark files you want copied in a backup operation.

The last ALPS package I tried was RAMDISK, which lets you speed up an application by using some of the installed random-access memory as a

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RAMDISK is flexible and self-loading. You install the appropriate command in your configuration file (CONFIG.SYS), and the RAM disk is automatically in place when you reset the computer. You can add disk size in 1K increments up to the maximum amount of free memory available. However, you must remember the overall requirements of the software you're using. In general, 256K is the smallest practical memory size; I recommend 512K.

An example will help illustrate this program's usefulness. On a 256K Model 2000, I allocated a 128K RAM disk and copied all of the Multiplan files to it. If I load Multiplan from the floppy disks, it takes about seven seconds from the time I press the enter key until the program displays its command menu. I was unable to time loading from the RAM disk: The command menu was on the screen before I could remove my finger from the enter key. A rough estimate of the loading time is 0.4 second.

I've found that the 2000's biggest limitation is its lack of good utilities. Therefore, I heartily recommend these packages. I've found many uses for them and have enjoyed experimenting with them. Well done, ALPS.

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Table 2. Graphics printers supported by the IBM PC version of Lotus' 1-2-3.

1-2-3 Printer Support

It doesn't speak as well for Tandy that it has resolutely produced hardware and software packages that support only Tandy peripherals. For example, the Tandy 2000's Basic input/output system (BIOS) code intercepts line-feed characters, making non-Tandy printers overprint each line.

Lotus' 1-2-3 for the 2000 suffers from a similar problem. Its PrintGraph configuration supports only those graphics dot-matrix printers that Tandy supports. Also, there's no support program that lets you configure a nonstandard printer.

If you've seen the number of printer configurations the IBM PC version of 1-2-3 supports (see Table 2), you'll be as surprised as I am at the Tandy version's omissions. However, if you have access to the IBM version, you can easily transfer these printer support files by copying the file called LOTUS.DLB from the IBM PrintGraph disk to your Model 2000 disk.

Generally, 1-2-3's Tandy and IBM versions can share software modules. Apart from the printer support files mentioned above and the DOSes, the only difference is the files containing the drivers (KB.DRV, PR.DRV, GD.DRV, and TD.DRV).

Security or Lack Thereof

One of MS-DOS's most serious drawbacks is its close relationship to CP/M, which means many of CP/M's limitations have proliferated throughout the computer industry. For many MS-DOS users, the worst of these limitations is the total lack of a file security system. Even TRSDOS 1.X for the Model I provided a workable password system to limit file access.

Because of this omission, many software publishers have implemented their own security systems. A prime example is the file encryption command of Microsoft's Basic interpreter (SAVEfilename,P). Now, MCTel is marketing a sophisticated file security program called P/C Privacy: Personal/Confidential. PC Privacy contains two easy-to-use routines that allow full encryption and decryption using a key of up to 100 characters. You can use any character, letter, or number in the key; the program ignores blanks. You can encrypt any type of text or data file.

The longer the key you select and the shorter the file, the harder it is to decipher the text using decoding techniques. MCTel says that over 21 million combinations are available from a key only four characters long.

PC Privacy marks the boundaries of encrypted text with a header and a footer. This means you can encrypt a file for insertion into another document and later decrypt only the coded portion of the document. The program handles text rapidly and efficiently and has neat bells and whistles. I highly recommend this product to those who need increased file security. ■

John B. Harrell III is an associate editor of 80 Micro. *You can write to him c/o this column,* 80 Micro, *80 Pine St., Peterborough, NH 03458.*

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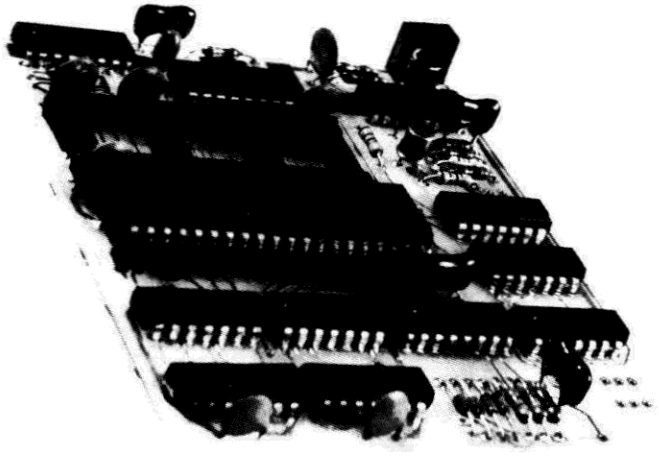

The Story

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 addressing. 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 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.

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 infinitely variable tuning. The attack and settling times are optimum for 5.25" diskettes. The oft-stated fears of adjustment problems 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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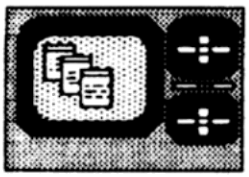

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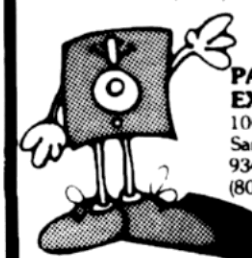

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Continued from p. 40

Type in the starting check number and each transaction comes up on the screen so you can verify that you want to cancel it.

You enable Checkbook's printer function from the main menu. If you prefer on-screen reports, set the printer off. The available printouts are the month's checkbook listing, outstanding transactions, and checks listed by account (category).

While the printouts are complete, they're hard to read for two reasons: the extra-long comments and the transactions you've divided among accounts. To reduce the confusion, you can avoid using extra-long comments. But the multiple-account transactions are almost a necessity. Any time these appear in the printouts, Checkbook Plus draws a double line and enters a total in the check amount column. It isn't clear just how much of the column Checkbook is totaling.

Drawbacks

The program operates slowly when moving from the main menu to many of the functions. It took 45 seconds to go to the Category routine, and 41 seconds to go to the Add Transactions section when moving from a different part of the program. Once you're in the desired section, Checkbook's operating speed is reasonable. I improved the speed a little by moving the programs from TDOS to the full implementation of DOSPLUS. This shaved about 10 seconds from the load times.

Checkbook Plus has disabled the automatic repeat on the Model III keys, a nuisance when you use the left-arrow key to erase errors. Most program modules will accept lowercase command entry, but not all. Starting a new data disk involved backing up the old one, then killing all the data files on the disk so you could reuse the old disk.

Several years ago I reviewed Maxi Cras, a checkbook program in this price range still available for the TRS-80 (*80 Micro*, July 1982, p. 330). I've used Maxi Cras since writing that review and some comparisons might be helpful.

Unlike Checkbook Plus, Maxi Cras doesn't allow editing or deleting transactions once you've verified them. While this is supposed to be good accounting practice, I find it annoying. I like the ability to fix my errors with Checkbook Plus.

Checkbook Plus also offers a search and sort, something Maxi Cras lacks, although I normally don't use this part of the program. If I need to look for an old transaction, I usually do it on the printouts.

Making back-up copies with Checkbook Plus requires only one disk (the data disk), while Maxi Cras requires that you copy both the data and program disks. Checkbook allows more than one check register on a disk, while Maxi Cras requires a separate set of disks for each register.

Checkbook provides automatic check numbering on-screen and automatic payment to regular accounts. While I personally don't have any need for automatic payments, I like the fact that Checkbook Plus automatically numbers the checks. Checkbook also automatically saves data as you enter it, reducing the chances of losing anything.

While these advances are considerable, I found Checkbook Plus deficient in two areas where Maxi Cras fared much better. The first is speed; Maxi Cras is much faster and it loads each module quickly.

The other area is the multiple account transactions. Maxi Cras makes the distribution of one check among several accounts simple. You enter the check total, then specify the account numbers and the amount applicable to each. As you work, Maxi Cras displays the remaining amount on the screen, making it easy to dump the last bit to "Miscellaneous," if desired, without your having to resort to a calculator. You can even apportion check amounts by specifying a percentage of the entire check to various accounts and letting the program calculate the correct amounts.

Checkbook Plus is written in Basic. The manual suggests that you could improve execution speed if you compiled the program, but H&C Electronics wants to keep it in Basic so that users can modify the program. Per-

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haps the best solution would be to offer both compiled and Basic versions on the same disk so those who prefer the increase in speed can use the compiled version. ■

DISnDATa Thinks Twice

by Terry Kepner

DISnDATa is an intelligent Model I/III/4 disassembler that deciphers programs and recognizes which parts are data items and which are instructions. DISnDATa scans your program and finds all the program messages and directions intended for display and disassembles them as such, instead of blindly translating all the machine-code data as mnemonic instructions.

If you've ever disassembled a machine-language program, you'll immediately understand the value of a disassembler that can differentiate between machine instructions and simple screen messages or data. Most standard disassemblers interpret the messages as load instructions with address specifications and disassemble them.

DISnDATa's most obvious advantage is that when you reassemble the program to a new location, DISnDATa won't alter the messages and data in the mistaken impression that it should change their target addresses.

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Instead, DISnDATa simply relocates such code.

A second advantage is that DISnDATa saves you hours of time trying to find those messages and decipher the data. The finished DISnDATa disassembly is almost as easy to read as the original source code, and that's before you even begin tracing program flow and adding comments and explanations. After seeing a DISnDATa disassembly, I wouldn't go back to a standard disassembler for any reason. Of course, if you need a simple disassembly, DISnDATa will do that for you as well.

Tracing the Flow

Using DISnDATa is easy. You just load the program in memory, relocate it so it doesn't interfere with your target program, load the target program, and disassemble it. DISnDATa works by taking the entry address of your program and actually tracing its logic flow, following calls, jumps, and other transfer-of-control instructions until it's disassembled the entire program. DISnDATa considers anything not pointed at by a jump or a call instruction data and so disassembles it. You can send the finished output to tape, disk, the video, or a printer (the disk disassembly uses either Apparat or Radio Shack's EDTASM I format; tape uses Radio Shack's EDTASM I tape format).

While the disassembler logic sounds simple, it's actually quite complex. DISnDATa must not only decide which program sections are data, but how it should disassemble that data (as DEFW, DEFB, DEFS, DEFM, or EQU) so you can read it with a standard editor/assembler.

Disadvantages

DISnDATa does have a few disadvantages, but these are related to the TRS-80 disk operating systems. For instance, it would be convenient for

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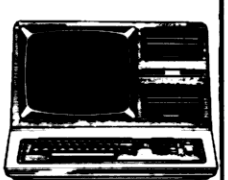

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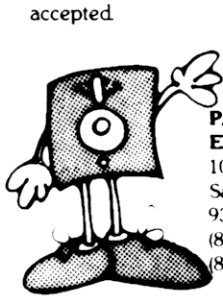

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DISnDATa to warn you when a target program is about to overwrite it. And it would be helpful for DISnDATa to display the starting and ending addresses of the target program as well as the entry point address when DISnDATa loads it.

The problem is that different DOSes use their own methods to indicate the starting and ending locations of programs on disk, and each uses its own method for disk loading. Rather than limit you to a particular DOS and hardware arrangement, DISnDATa takes the file name you give it and turns it over to the DOS. The DOS takes care of finding and loading the program and, when done, returns control back to DISnDATa (in fact, error messages during disk I/O are DOS messages, not DISnDATa error messages).

Consequently, DISnDATa has no idea where or how the program loads. All it knows is the entry point address the DOS leaves on the CPU stack. Both complaints are actually tradeoffs in compatibility. While Pro/AM Software could've added the code necessary for each DOS to return the start and end addresses, DISnDATa would've been much larger, restricting its use to smaller programs.

Fortunately, you can look at the directory entry for a program and thereby determine its size. Since most programs start with their entry point, you shouldn't have too many problems using those crude approximations as starting and ending values. If it's really necessary, you can use a machine-language monitor to load the program to find out the addresses. Tape programs don't have this problem, since there is a standard tape format. For tape programs, DISnDATa tells you the start, end, and entry point addresses.

As mentioned earlier, you can relocate DISnDATa anywhere in RAM, but you must remember two rules. First, DISnDATa uses 100 bytes above the program for disk output (you can ignore this for tape, video, or printer disassemblies). Second, the stack DISnDATa uses to trace program flow during disassembly starts at the bottom of DISnDATa and grows downward in memory until DISnDATa finishes the disassembly, reaches the target program, or runs out of RAM. As a result, you might have problems with extremely large or complex programs, which is why DISnDATa's size is important.

Using an entry point to trace program flow presents one problem: The disassembler can't handle computed transfer-of-control instructions. Since DISnDATa traces the program instead of executing it, it doesn't know what computations the program is making and how those affect the finished disassembly.

DISnDATa can't correctly disassemble programs that modify themselves by computing an address and putting that address into a location inside the program (rather than in a data location outside the program) the first time.

Disassembling these types of programs requires a little detective work on your part. You need to disassemble them with both methods, straight and intelligent. By comparing the two disassemblies, you should be able to quickly spot those areas of computed transfer-of-control.

Armed with these addresses, you have to re-disassemble the target program, giving DISnDATa all the transfer-of-control addresses as well as the entry point addresses.

Your finished disassembly should be perfect. DISnDATa will properly decode all the instructions, and properly label all the messages. You'll have to repeat this several times, but compared to working with a standard disassembly, it's not that much trouble.

Conclusion

Currently, DISnDATa is available in two versions, one for the Models I and III, and one for the Model 4. But because of ROM-code jumps DISnDATa uses, you can't use it on Lobo Max-80 or LNW-80 computers. On the other hand, because it doesn't use its own disk I/O routines, you can use it with hard disks and other special hardware arrangements.

If you need a machine-language disassembler, DISnDATa can save you lots of time and hard work. Its advantages far outweigh its minor difficulties. ■

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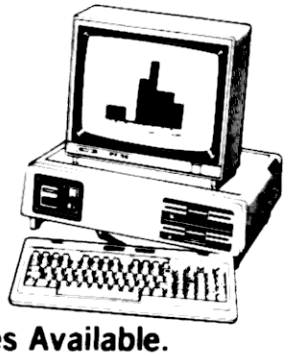

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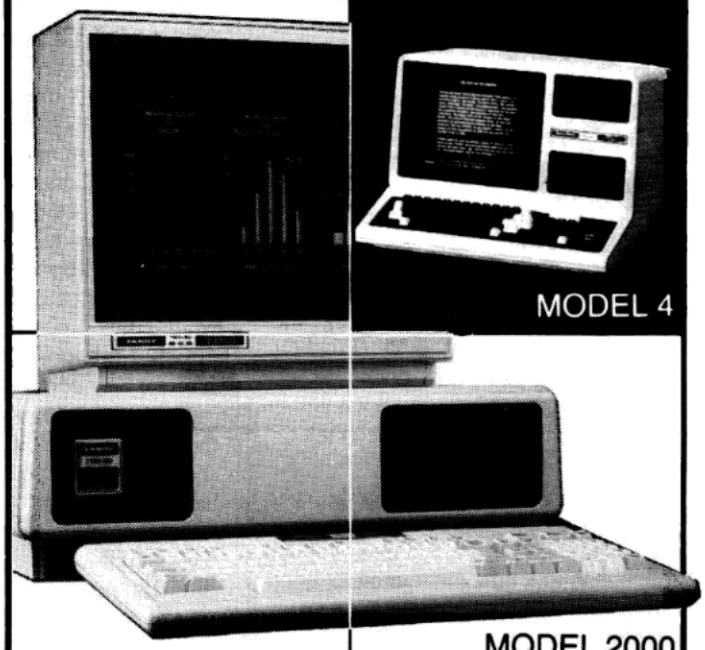

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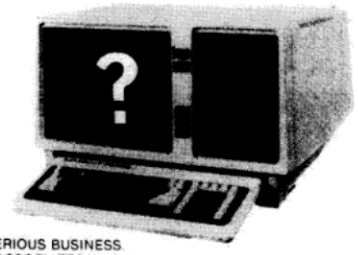

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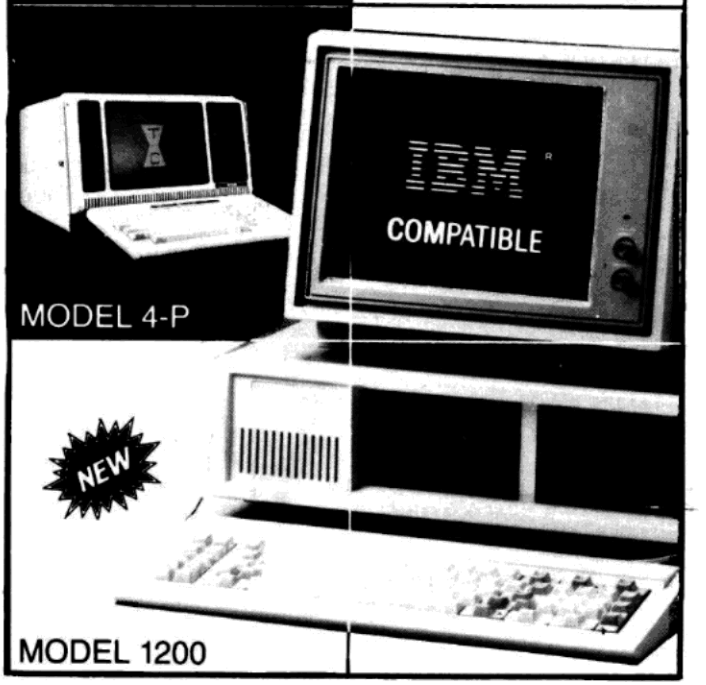

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ListKey: The People's Program

by Thomas L. Quindry

List/Key is a data base management system that performs one specific function: It maintains lists of people. You can use List/Key to generate a list of names, addresses, telephone numbers, and other specific information about the people listed. You can configure List/Key for one of three applications: the home, the small business, or professional offices. But I found the program too inflexible for any but the most simple data bases.

List/Key comes with its own operating system. This native DOS prohibits your transferring List/Key to other DOSes by conventional means and serves as a form of copy protection. This protection scheme is the source of many of List/Key's problems because it limits your ability to work with and modify the program. The DOS also generates a couple of machine-crashing bugs.

You can buy a List/Key demonstration disk for $25 to see if the program's right for your needs, and you can later update the demo disk to the full List/Key program (with the demo cost credited).

Installation

To install List/Key, you follow a one-time menu-driven procedure. First, you need an access code, which comes with your version of the program. Then you answer prompts relating to your data base needs, your name, address, phone number, and company name. You can also specify a password for further protection.

The installation process formats List/Key to your specifications. You first select how many drives you want to use (from one to four). If you use only one drive, List/Key stores data on the same disk with its operating system.

List/Key's data base comes formatted for name, address, and phone number fields, and you can add fields for a title, position, company name, date, special category, and memo. In addition, you can specify titles for the nine category fields. Within certain limits, you can dictate the length of each field.

List/Key's native DOS serves as a form of copy protection, limiting your ability to modify the program.

Once you set up all the fields and field lengths, you then establish printer parameters for print size and any other features.

Using List/Key

Several menus direct you through the program. The main menu offers options to access the data base, print out items in any of three formats, or maintain the list.

In the access option, you can add, edit, delete, or get items in the data base, or use the data base's multilog function. The multilog function lets you selectively retrieve items according to one of nine different sets of parameters (selection logs) you create. For example, one log may retrieve items with last names from A–D. Another may choose items according to a zip code range. You can set logs up to scan through one of the nine special-category fields. You can also customize prompts relating to each log set up using List/Key's on-line help function. (You can also develop your own help messages for any mode of operation.)

List/Key offers a delete function, as well as an undelete function, which restores all deleted items unless you've overwritten them.

The printout mode has four options: to print a formatted list of all information, of names and addresses for a telephone directory, of mailing labels, or of envelope addresses. You can also use the multilog function to selectively print.

The maintenance functions provide for disk back-up, indexing, and changing certain printing parameters. The indexing function sets the default field for ordering your data base. As installed, the data base is ordered alphabetically by last name. But you can order (or index) the data base by any of the other fields.

The index is where your trouble starts. Everything is fine when you set up the index, but the next time you select the maintenance mode, the pro-

gram hangs up. It seems that you can inadvertently overwrite the maintenance program. For instance, while I was verifying another List/Key feature for this review (with a good back-up copy), I mistakenly overwrote the maintenance program after I used the expansion option and the back-up option. Both the List/Key back-up and the original were unusable.

This is an error that only The Soft Place can correct. I'm sure that by now other users have brought it to their attention. I assume that the manufacturers will correct it.

Limited Operation

After you finally get List/Key installed, its use is somewhat limited. Because of the protection scheme The Soft Place chose, you can't get into the protected Basic program to make modifications. You can't even back up the List/Key program before you choose the install options. And once they're invoked, you're stuck with most of them regarding fields and field lengths. If you misjudge your needs, you can't make corrections later; you're at the mercy of The Soft Place.

List/Key lets you use non-zero drives for data disks, with one exception. If you use the program disk for data also, you can't expand to any more drives. The procedure to expand the system is to go into the maintenance mode, select the utility option, and elect to add a drive. According to the manual, the next procedure is to insert an initialized disk into the expansion drive. (You get an initialized disk by using an old back-up copy of the List/Key program disk to make one.) But you can't convert a back-up of the program disk to a data disk for the expansion. Not having more than two drives, I couldn't verify that you could expand from two to four drives.

After you expand to other drives, data disks become drive-specific; you shouldn't put a disk written for one drive in a different one.

The Documentation

The List/Key manual is the same size as a floppy disk (5¼ inches square) and contains 172 pages, equivalent to 75 pages of a normal-size manual. It includes an index as well as a table of contents. On-line help messages that appear throughout the program have a handy key indicating page numbers in the manual for more information.

Overprotected

The Soft Place's penchant for software protection has defeated their objective in providing a useful program. The program disk shouldn't be write-protected, since certain operations in the program require updates. The errors I mentioned wouldn't have occured if the program disk had a tab over the write-protect notch. If I didn't have special tools available to keep my copy of List/Key running, I wouldn't have been able to write this review. A typical user would have to call The Soft Place more than once.

The dependency of this program on the specialized operating system also doesn't allow transportability of data to programs other than those produced by The Soft Place. You can't create special data bases by combining several data disks; you'd have to rekey all the data to another program.

Perhaps the most limiting thing about List/Key is its inability to create more than one type of data base. You can't format one list for home use and another for business.

List/Key prints messages for all errors encountered. The error location is pinpointed and the probable cause given. Judging from the manual, The Soft Place is prepared to provide user support during the warranty period and afterward (for a fee). In my opinion, you'll need it. ■

List/Key

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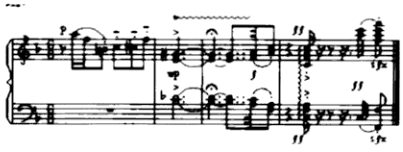

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Fullview Word Processor: Too Little, Too Late

by Alan Neibauer

On the surface, the Fullview Word Processor has everything you'd expect in a full-blown word processor. But once you start using it, Fullview seems to be behind the times compared to the features available with current word processors. A word processing system should be easy to use, perform the editing functions needed, and support the writer in getting the job done as quickly and effortlessly as possible. Unfortunately, Fullview falls short of these requirements. Those who need a serious word processor should buy a more convenient (and probably more expensive) system. And I think casual users can find a more suitable word processor for about the same price as Fullview.

To be fair, Fullview attempts to do everything that a word processor should. It automatically prints a table of contents and numbers document subsections with either Arabic or Roman numerals. It supports a variety of print features, including all the fonts of the Epson series printers (as well as others). And Fullview offers a configuration program to adjust the word processor for almost any printer, either letter-quality or dot-matrix. The system can print form letters and can even stop in mid-printing to request relevant information.

RAMDOS, the operating system supplied with Fullview's editor, loads extremely fast and is TRSDOS-compatible.

The Approach

Fullview uses a two-step approach to word processing, including a text editor and a text formatter. You use Fullview's editor to enter and edit text, and embed special codes within the text to produce the desired final document. For example, embedding ".Bold On" in a document prints the subsequent text in bold face. Fullview's formatter, the second part of the system, structures and prints the text according to the codes. You switch back and forth between the two modes to format and print a document. If you're not satisfied with the results, you have to reload the editor, change the codes, and switch back to the formatter.

While the editor can print simple text in one step, you use the formatter for more complex operations to access Fullview's other features.

This two-step approach leads to problems. I like seeing the final format of my document on-screen during text entry. If I must memorize a set of commands, I'd rather use them to format the text as I enter it. It's easier to test different formats and detect errors without switching programs.

The Editor

After loading the editor, the cursor sits at mid-screen. You do all editing at this position and the text scrolls up rather than the cursor scrolling down. Since the text scrolls up from mid-screen during entry, you can see only 10 lines on the screen at a time. When you're editing longer documents, the screen fills above and below the mid-point cursor. But I consider a 10-line limitation during entry too limiting.

Fullview can display a ruler showing the locations of margins and tabs. This is a common feature found on almost all serious word processors. However, Fullview's ruler (which you can turn on and off) appears at mid-screen, just above the cursor. As text

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scrolls, the line above the cursor disappears behind the ruler and you can see it only by turning off the ruler. You can't display the ruler, the cursor line, and the line above them at once.

Fullview doesn't support word wraparound. You must press the return key at the end of each line, and if you continue typing past the right margin, the screen scrolls by horizontally. You can use the Fill option to adjust the text to fit between the margins. But this is an extra step that you can only invoke after you enter text. It won't engage word wraparound to format the text automatically.

The editor provides two print commands, one for serial and one for parallel output. While the editor can print a complete simple document, it also prints any codes you've embedded in the text. You have to print documents with these commands through the formatting program. If you forget to use the Fill option, the editor prints long lines across the width of the paper. Evidently the print command from the editor is a simple ASCII file dump to the printer. It has no way to determine what is text, what are the nonprinting commands, or what the margins should be according to the ruler.

The Formatter

Fullview's formatter produces text according to the embedded codes with great speed, displaying the finished document on either the screen or on paper. It doesn't print format codes as the editor does, but it does require a good deal of forethought. For example, the formatter doesn't recognize a carriage return as the desired start of a new line. Unless you embed codes specifically at the start of each new paragraph (or to indicate when blank lines are desired), Fullview formats all text as a single paragraph.

Getting the most out of Fullview requires entering a lot of code while you're in the editor. This makes the editor's print function suitable only for archive copies of raw text.

The usefulness of using so many codes is questionable. The manual displays an example of an outline created with the embedded codes. It's something that you could easily type in using a number of tabs along with the ruler. But using the editor and formatter requires that you first enter six lines of code, then type four more keystrokes before each single-word entry. The unformatted code doesn't look anything like an outline and would be quite difficult to edit.

Fullview is ostensibly designed for large files. While you can chain any number of individual documents together for formatting and printing, Fullview is memory- (not disk-) based. On a 48K machine, you can't have documents that exceed 20K, so you still have to load and edit longer files individually.

The Manual

The manual is divided into three sections (Overview, Editor, and Formatter) and it appears to have been produced on a dot-matrix printer with a hard-to-read sans serif font. It doesn't provide a tutorial and requires that you do some searching to understand how to use the program. The authors do, however, include a section covering all system functions. But it is written in the pseudo-code of the programming CASE statement. Nonprogrammers unfamiliar with the C or Pascal CASE statement, or the If... Then...Else...Endif format, will find this section confusing.

Extras

The Fullview package contains a reference card and a plastic keyboard overlay of the commands. The card displays pictorials of the different cursors, editor and format commands, and the RAMDOS functions. It was a big help in learning the Fullview system.

The keyboard overlay, however, was unprofessionally done. It was unevenly cut and amateurish. The printing on the plastic was too light to read and it had broken characters. In fact, I had to keep lifting it off the keyboard to read the commands.

Summary

Fullview is certainly a complete word processor that provides most text editing and formatting functions. It's just the execution that's cumbersome. If I were buying a Model I again, Fullview would give Scripsit I a run for its money. But times have changed and, unfortunately, Fullview seems not to have noticed. ■

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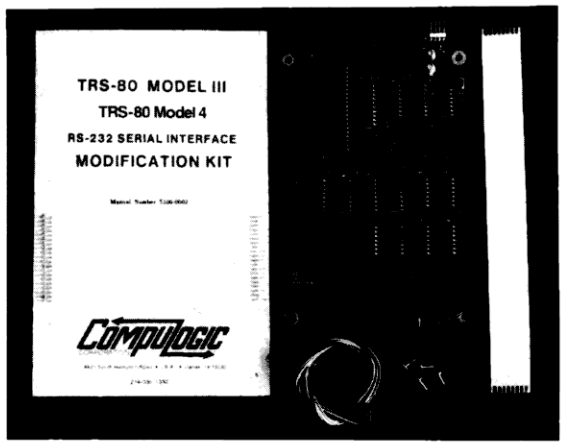

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For more information, contact Superex Home Software, 151 Ludlow St., Yonkers, NY 10705, 800-862-8800 (in New York, 914-964-5200).

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Spreadsheet on a Chip

Portable Computer Support Group's new Model 100 spreadsheet is a solid product—literally. Lucid ($149) comes on a Snap-in ROM chip that plugs into the Model 100's expansion compartment underneath the unit.

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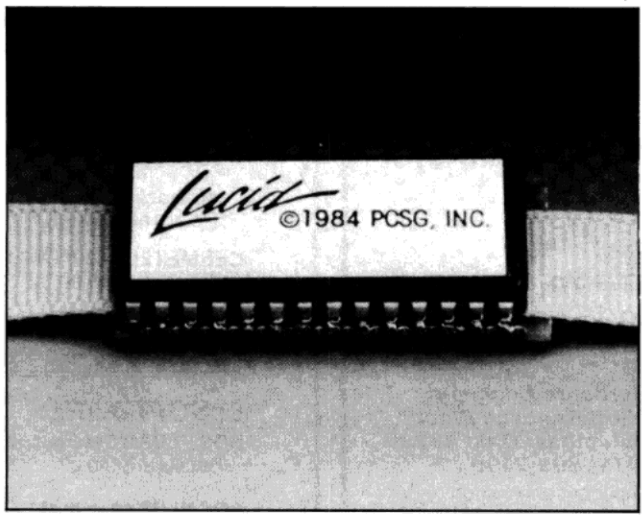

Lucid is a plug-in spreadsheet for the Model 100.

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Contact PCSG at 11035 Harry Hines Blvd. #207, Dallas, TX 75229, 214-351-0564 for more information.

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Extended Math

The Math Master Series from PAB Software Inc. (Box 15397, Fort Wayne, IN 46885, 219-485-6980) consists of 20 Basic enhancement programs that add advanced math functions to Model I/III Basic.

Programs are available for matrix, polynomial, and vector arithmetic, statistics, fast Fourier transformations, and signal processing. Single- and double-precision versions and complex-formula versions are available starting at $24.95.

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Structured Software also offers a Model 100 monitor program ($27) that translates Z80-style mnemonics to machine instructions and loads them in memory. The program requires 16K and features 23 commands for debugging and searching programs and monitoring registers. It includes two manuals.

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Optional programs are $39 each. The complete package is $89. For more information, contact Micro Architect Inc., 6 Great Pine Ave., Burlington, MA 01803, 617-273-5658.

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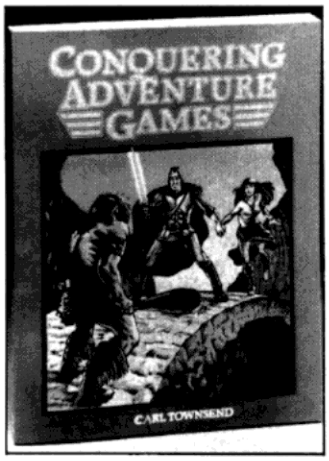

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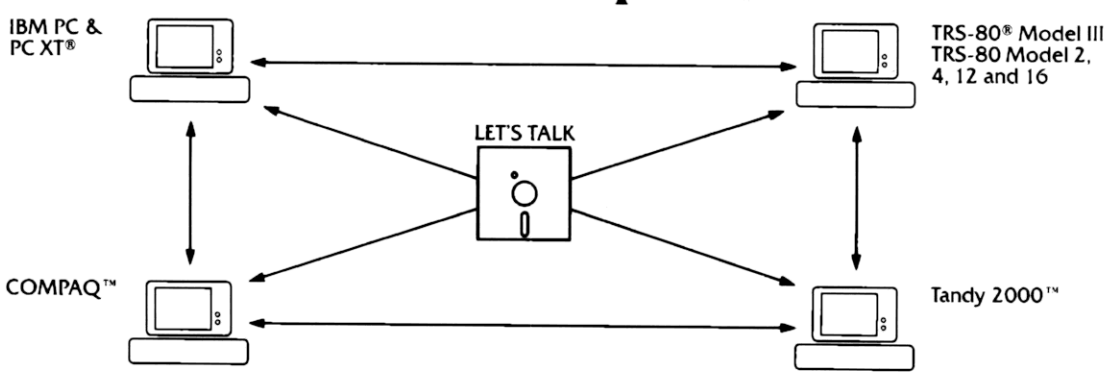

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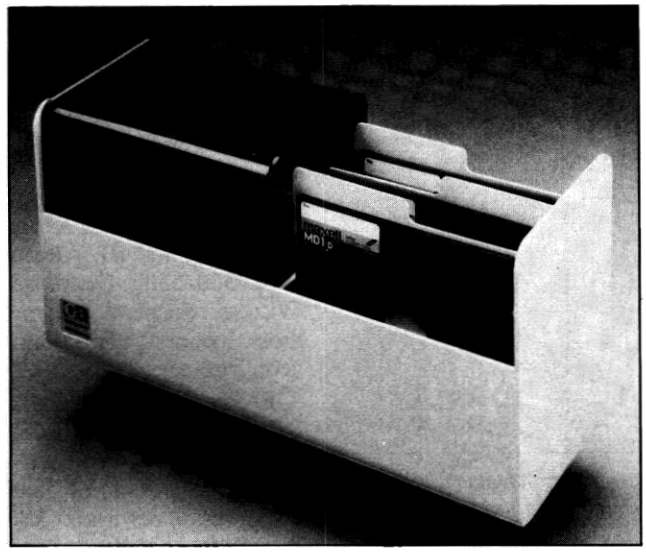

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The menu-driven series includes programs on normal distributions, binomial distributions, central limit theorem simulation, confidence intervals, T distributions, and linear regression.

The programs are flexible so you can choose input data and parameters without programming knowledge. For more details, contact MatheGraphics Software, 61 Cedar Road, E. Northport, NY 11731, 516-368-3781.

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Pins and Ribbons

Models I and III owners can get high-resolution graphics on the Epson (with Graftrax) and Gemini printers with the Hi-Res Screen Dump utility ($19.95).

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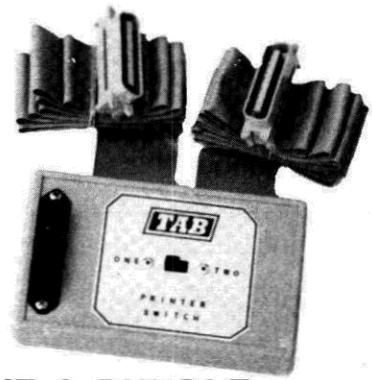

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two keystrokes. It's available on tape or disk. For more information, contact Softbyte Computing, Box 217, Wallingford, CT 06492, 203-239-6923.

Reader Service ✓ 563

Keyboard Bridge

Bridge-80 ($16.95) lets you play bridge card games with your Model I, III, or 4. The program features bidding, playing with the computer as your partner, and popular card-playing configurations.

You can play hands-open, and Bridge-80 replays hands for review. Documentation includes the basic rules for playing bridge.

For more details, contact Recreational Mathemagical Software, 129 Carol Drive, Clarks Summit, PA 18411, 717-586-2784.

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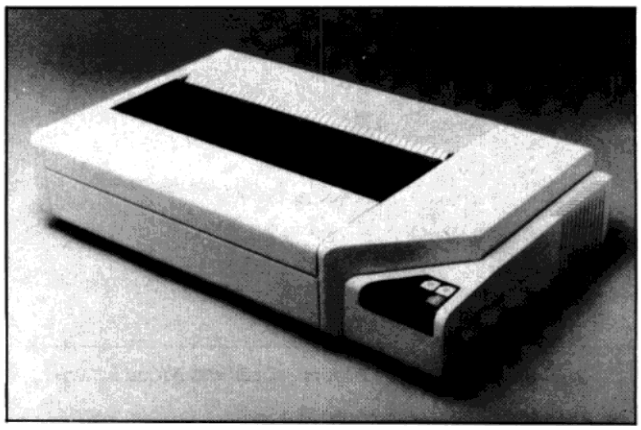

The OT-700 700-cps dot-matrix printer.

Jiffy Printing

Output Technology Corp. (606 110 Ave. N.E., Suite 205, Bellevue, WA 98004, 206-453-9794) offers the OT-700, a 700-character-per-second (cps) dot-matrix printer that runs at 350 cps in correspondence mode and features dot-addressable graphics.

The OT-700 has a 136-column carriage with adjustable sprocket-feed tractors, control switches, and indicator lights. The unit is quieter at full speed than a standard office typewriter.

The OT-700 is $1,595, including Centronics and parallel interfaces. Additional character sets and foreign-language fonts are also available.

Reader Service ✓ 556

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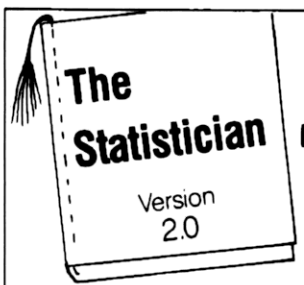

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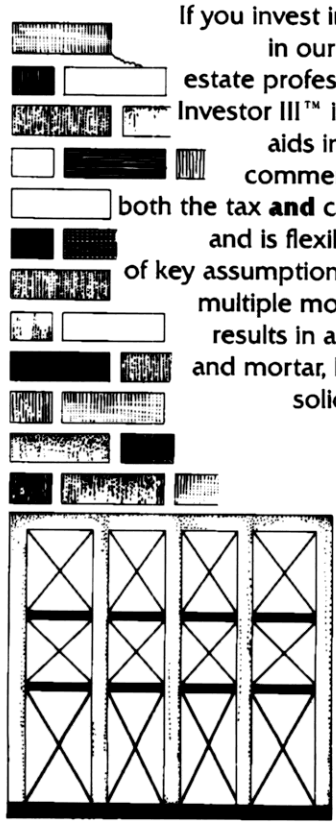

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and articles of interest from the Features section.

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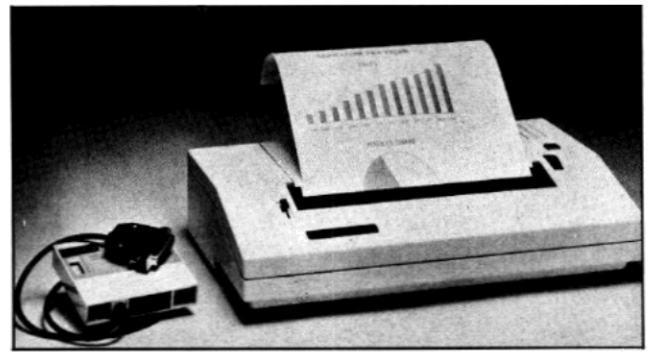
Reader Service ✓ 557

Printers Revealed

Alphacom Inc. (2323 S. Bascom Ave., Campbell, CA 95008, 408-559-8000) offers the Traveler and Alphapro printers for the office and the road.

The Traveler ($199) is a 60-cps, 5¼-lb. thermal printer that fits into a standard briefcase and prints up to 100 pages of text using rechargeable NiCad batteries. It comes with a roll of thermal paper, batteries, and an ac adapter/recharger. Serial and parallel interfaces are $49.95. A carrying case is also available.



The Alphacom Traveler thermal printer uses NiCad batteries.

The Alphapro 18-cps letter-quality printer uses Qume and Diablo print wheels and ribbon cartridges, and features a 93-byte buffer (or an optional 4000-byte buffer), proportional spacing, boldface, double-strike, phantom spaces, super- and subscripts, and reverse line feeds.

An intelligent interface cable ($49.95) connects to parallel and serial ports.

Reader Service ✓ 561

Put Yourself In Control

Logical Systems Inc. (8970 N. 55th St., Box 23956, Milwaukee, WI 53223, 414-355-5454) offers two utility packages for the Model 4.

The Overdrive ($99) performance utility for the 128K Model 4 with TRS-DOS 6.2 features dynamic track buffering for up to two drives, using part of alternate memory. It also places nonlibrary system overlays in alternate memory for fast access.

The LS-Utility disk ($49) comprises eight filters and utilities for TRSDOS 6.X. The keyboard filter converts numbers between hexadecimal, decimal, and binary format. Trap lets you locate and throw away a character during input and/or output on any device.

RDTEST performs a nondestructive read verify for disk drives. READ40 reads a 40-track disk in an 80-track drive for back-ups, conversions, and other read-only operations.

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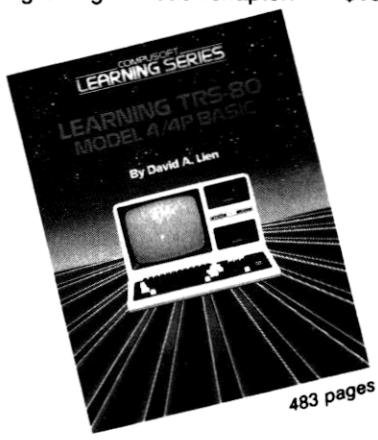

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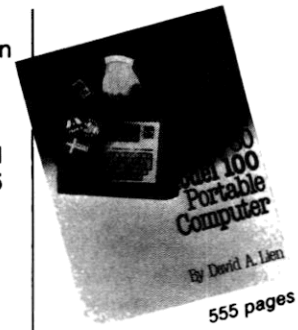

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LEARNING TRS-80 MODEL III BASIC (includes the Model I)
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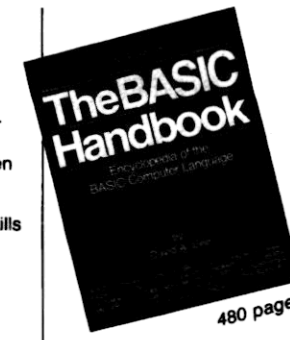

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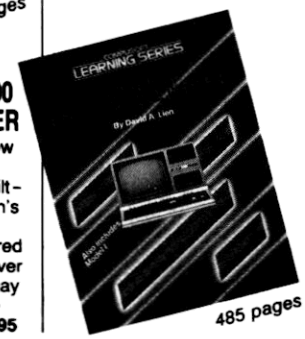
THE TRS-80 MODEL 100 PORTABLE COMPUTER
Everything you need to know to master the Model 100. Instructions for all of the built-in software as well as Lien's comprehensive course in BASIC programming tailored for the Model 100. Whatever your use of the computer may be, this book provides the guidance you need. **$19.95**



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THE BASIC HANDBOOK, 2nd Edition
The most complete BASIC reference ever! 500 BASIC words alphabetically listed with test programs, sample runs, and variations in usage. Perfect reference for all programmers and especially valuable to those translating programs written for one computer to run on another. **$19.95**

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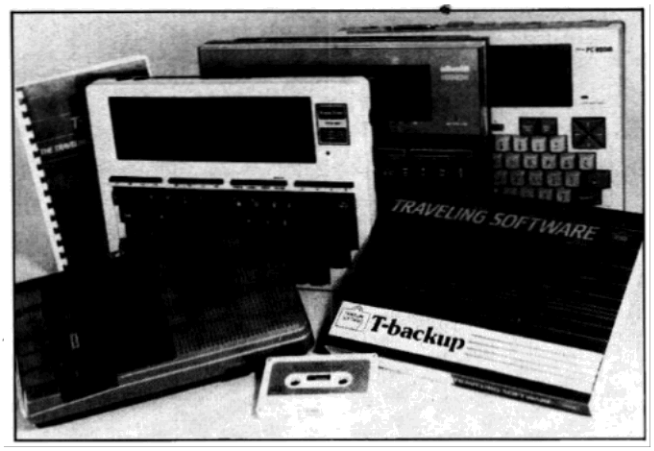
with a JCL file. KSMPLUS provides predefined key macros, redefines keys, repeats the last DOS command, sends a top-of-form character to the printer, returns system data or time, and defines shifted and unshifted function keys.

Other utilities build character translation tables and provide slashed zeros on printers with backspacing.

Reader Service ✓ 558



T-Backup backs up Model 100 memory in four minutes.

Better Back-Ups

T-Backup ($19.95), a Model 100 back-up utility, quickly copies computer memory to cassette, verifies back-up copies and restores them to the computer.

Back-up copies take about four minutes, and include all text, Basic, and machine-language files. You can tag copies with the date and time of back-up and a comment identifying the data.

T-Backup includes a taped tutorial and manual with step-by-step instructions. Contact Traveling Software Inc., 11050 Fifth Ave. N.E., Seattle, WA 98125, 206-367-8090 for more information.

Reader Service ✓ 565

Get into the Swing

The CBIO System ($155) biorhythm profile program for the Models III (48K) and 4 (64K) lets you predict people's good and bad days according to physiological indicators and intellectual acuity.

The program contains 20 menu-driven modules that use data input screens. The modules process orders; generate reports, invoices, and labels; provide on-line information, record a client's history; and let you develop a customized biorhythm.

The report generator produces a commercial-quality report with a choice of five covers, a preface, and an introduction describing biorhythms and the CBIO report. CBIO prints biorhythmic curves and a short analysis for each day, followed by a day-by-day interpretation for the month.

CBIO processes up to 100 reports automatically. The program requires two disk drives. For more information, contact Bluebirds Computer Software, P.O. Box 339, Wyandotte, MI 48192, 313-285-4455.

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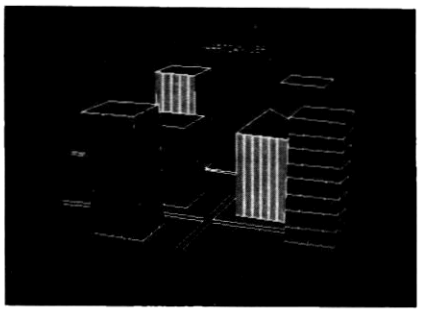
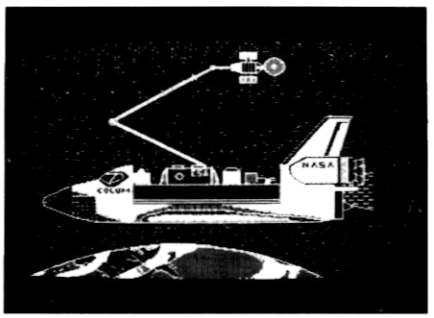
Grafyx Solution™ Save $100.00

High-Resolution Graphics for Mod 4/4P/III



Superior Hardware. The Grafyx Solution provides 153,600 pixel elements which are arranged in a 640 × 240 or on the Model III a 512 × 192 matrix. Hundreds of new business, personal, engineering, and educational applications are now possible. The hi-res display can be shown on top of the standard display containing text, special characters, and block graphics. This simplifies program debugging, text labeling, and upgrading current programs to use graphics. The Grafyx Solution fits completely within any tape or disk based Model 4, 4P, or III. Installation is easy with the plug-in, clip-on board.

Superior Basic. Over 20 commands are added to the Basic language. These commands will set, clear or complement points, lines, boxes, circles, ellipses, or arcs. The hi-res screen can be printed on any of 20 popular printers or saved or loaded to disk without leaving Basic. Areas may be filled in with any of 256 patterns. Sections of the screen may be saved and then put back using any of five logical functions. Labels can be printed in any direction. The viewing area can be changed. The entire screen can be complemented or cleared. Graphics Basic provides dot densities of 640 × 240, 320 × 240, 160 × 240, and 160 × 120, all of which can be used in the same display.



Superior Software. The board comes with over 40 programs and files which make it easier to use, serve as practical applications, demonstrate its capabilities, and serve as programming examples. The software works with TRSDOS 1.3, 6.1.2, 6.2, LDOS, NEWDOS80, and DOSPLUS. The Grafyx Solution is also supported by a number of optional applications programs: Draw, Bizgraph, xT.CAD, 3D-Plot, Mathplot, Surface Plot, Biorhythm & USA, Music.

The Grafyx Solution package is shipped complete for $199.95 (reduced from $299.95). A manual for review is $15. Payment may be by check, Visa/MC, or COD. Domestic shipping is free on pre-paid orders. Texas residents add 5⅛% tax. ✓464

MICRO-LABS, INC. 214-235-0915
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✓ See List of Advertisers on Page 128

Wood 'N' Disks

Hand-crafted wooden Diskette Chests from Smith & Bellows Co. (One Amherst Office Park, P.O. Box 668, Amherst, NH 03031, 603-673-8482) store your disks elegantly. Each chest features fine joinery, hand-finished lacquer surfaces, and brass-finish hardware.

Diskette Chests are available in four sizes to accommodate 40, 60, or 80 5¼-inch disks, or 60 3½-inch disks. Prices start at $29.95.

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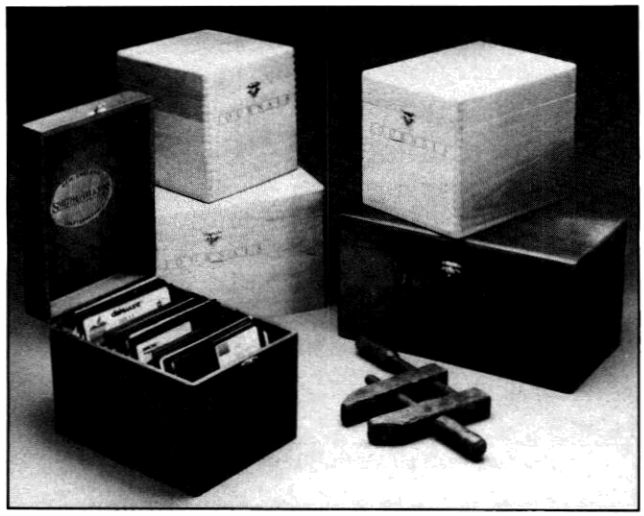

Wooden Diskette Chests from Smith & Bellows Co. are hand-crafted.

Through Rain or Sleet Or Snow...

Post Plus ($160) integrates message processing and telecommunications on the Models II, 4, 12, and 16. This package creates and sends letter-perfect text with communications services such as MCI Mail, Easy-Link, CompuServe, The Source, and the Dow Jones News/Retrieval Service.

The Post Plus message processor produces ASCII files for convenient communication. Features include auto-log-on sequences, programmable user keys, automatic data capture to disk, simultaneous printer output, and a help function.

Post Plus includes $500 worth of subscriptions, passwords, and on-line time with electronic mail and information services. For information, contact MCTel, Three Bala Plaza E., Suite 505, Bala Cynwyd, PA 19004, 215-668-0983.

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Copy Clipboard

The Non-Magnetic Copy-Holder from Wilson Jones Co. (6150 Touhy Ave., Chicago, IL 60648, 312-774-7700) makes word processing easy: it provides clips to secure documents and hold book pages open while you type, and a transparent line guide highlights the line you're typing. The line guide contains a pica/elite type guage and an inch/centimeter ruler. Copy-Holder doesn't damage data stored on magnetic media.

CopyHolder is made of steel with rubber feet. It's available in black or putty colors and in letter ($29.80) and legal ($31.90) sizes.

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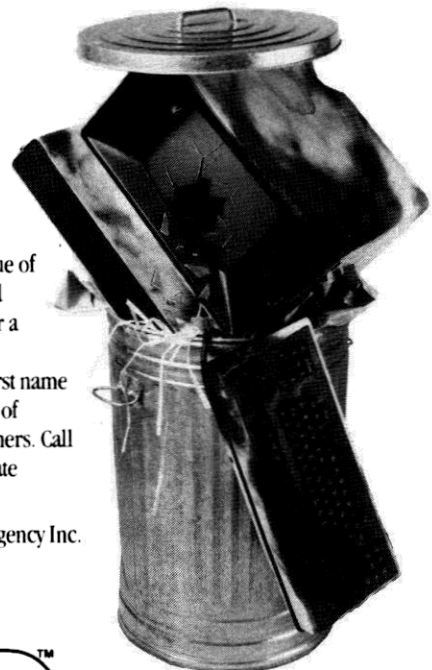

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DIFFERENT TRACK

Heat Seeker

The Programmable Furnace Controller (PFC) from Future Projects Corp. (Box 11, Hawleyville, CT 06440, 203-775-6872) is a hardware and software package that monitors and controls your furnace.

PFC connects to any computer with an RS-232 port. Once you program PFC, it operates independently of your computer. To monitor the system's performance or make adjustments, reconnect PFC to your computer.

Features include programmable temperature settings, override controls, cycle and temperature history for each zone and sensor, a real-time clock and calendar, and a battery back up.

PFC uses a simple command structure for easy programming and works in parallel with 24-volt thermostats. It comes with a built-in power supply, two temperature sensors (3 for 2-zone systems), wire, and a manual and programming guide.

PFC requires a furnace with a 24-volt ac control circuit (rated 1 amp max), and is available in one-($349) and two- ($399) zone systems.

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How to Keep In Touch with Tandy

Send your questions about Tandy products and services to Ask Tandy, 80 Micro, 80 Pine St., Peterborough, NH 03458.

Q: Tandy claims to have an extensive customer support capability, yet I've never received anything about bugs in or upgrades to my Model 4. My letters to one Tandy executive have gone unanswered. This is customer service?

A: *Tandy's support system sends letters to every registered owner of a product, every time we issue a customer support bulletin that affects all owners of that product.*

Many customers never send in their registration cards, apparently figuring they can send them in when they have trouble, thereby extending their warranties by the elapsed amount of time. Tandy bases its warranties on the date on your original sales ticket, nothing else. We have no "warranty cards."

Some of the cards we receive are incomplete; however we do try to follow up on them. Some are illegible. Some people move without leaving a forwarding address. Our system works, and we use it religiously, but it won't work for you without your help. You must register with us, legibly, and keep us informed of your correct address.

Letters to Tandy executives are another subject. We answer all mail, but we forward each letter to the person or department responsible for handling it. Questions, problems, or complaints should go to our Computer Customer Services address. Sending them elsewhere simply delays our response.

Q: With TRSDOS 1.3 (Model III mode), I have 38,202 bytes of RAM available in Basic on my Model 4. LDOS 5.1.4 gives me 34,171 bytes. The IBM PC and Compaq provide 61,818 bytes.

Why didn't Tandy make more RAM available on the Model 4?

A: *TRSDOS 6.0 (LDOS), for the Model 4 mode, is much more powerful and therefore takes up more room than TRSDOS 1.3 for Model III mode operation. The other bank of RAM isn't available on the Model 4 from BASIC; to our knowledge, there isn't a bank-switching Basic for the Z80. The reason you get more RAM on the PC or Compaq is that they're 128K, 16-bit machines, and are capable of directly addressing more memory than an 8-bit system.*

Maximum usable RAM is always a prime consideration with us, but there's a tradeoff between that and the power of the system. By the way, our check of a Model 4 found 29,948 bytes available, but that'll vary with the version of Basic and the operating system in use.

Q: Why has Tandy decided to abandon loyal tape customers by not bringing out a cassette-based computer with all the Model 4's features, like an 80-column by 24-line screen?

A: *The Model 4 features you refer to are a function of the hardware as well as the disk operating system. It simply isn't possible to produce a cost-effective cassette-based unit with those capabilities. Now that the price of the dual-drive Model 4 is $1,299, enthusiasm for the cassette version among new purchasers is very limited.*

Q: Will Tandy publish a more detailed version of the Tandy 2000 programmer's reference manual that documents more BIOS (Basic input/output system) and interrupt vector calls.

A: *No, since we don't have facilities in-house to support that type of information for the non-professional programmer. The information is available to software houses through our Third Party Software Support Group.*

Q: Are you planning to sell an 8087 math coprocessor for the Tandy 2000, and if so, when?

A: *My experts tell me the current 8087 chip won't function with the Tandy 2000's 80186 processor. Our people are actively investigating the question with Intel now, but we've made no firm decision. We'd suspect the possibilities are good, but don't count on it until further notice.*

Q: The May 1984 *80 Micro* mentions an MS-DOS update, version 3.0 (see "Up Close...Tandy's Model 2000," p. 84). When will it be available?

A: *As of this writing, MS-DOS 3.0 seems to require more memory space, and offers no real advantage to the Tandy 2000 owner. We still haven't decided whether to bring it out or to wait for the next version.*

Q: Is it true that Tandy's developing a new line of Model 4's, called the Model 4C, featuring color graphics?

A: *You probably heard rumors about the now-public Tandy 1000, which falls into the same price class as the 4, but is a member of our MS-DOS family. We expect the 8-bit Model 4 to continue to sell, and don't consider the Tandy 1000 a replacement for it. We have no plans for a color version of the Model 4 or an Apple IIc look-alike.*

Q: Since the Model 4 has a Model III mode using a ROM image, can it also have a Model I mode?

A: *The Model 4 doesn't use a ROM image, but actually contains the Model III ROM. It might be possible to load in a Model I image, as in the Model 4P, which loads in a Model III ROM image. But most Model I software runs on the Model III, so a Model I mode isn't needed.* ■

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