

80 micro

the magazine for TRS-80 users*

JULY 1985
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|-----------------------------|
| REVIEWED THIS ISSUE: |
| The Tandy 200 |
| BEEP |
| Word Machine |
| PFS:File |
| Rapidos |

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Once again we present our line up of quality software for TRS-80 Models I, III and 4. Also, keep your eye out for Model 1000/1200 software coming real soon, and other new surprises. Two new products worthy of note: WARRIORS AND WARLOCKS, a sophisticated D&D type adventure/role playing game for true D & D fans (write for more information), and TFC-BBS, by far the best TRS-80 BBS program around anywhere and for only \$99.50. Also, note the special sale prices for ALCOR's C and MultiBasic compilers; these great programs now have great prices to match.

APPLICATIONS/BUSINESS

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

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

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

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- 36. **On the Boards**
by Bradford N. Dixon and Eric Maloney
The authors go looking for a few good BBSes.
- 41. **BBS Directory**
A convenient guide to hundreds of boards from California to the New York island.
- 48. **Language Arts**
by Hardin Brothers
Plain talk about three products for Basic programmers. (Models I, III, and 4)
- 54. **Total Recall**
by John D. Wolfskill
Display up to 16 help screens at any operating level. (Model 4, Load 80)
- 70. **Made-to-Order Sorts**
by Robert C. Wilson
Have it your way—create custom sorts by answering 10 prompts. (Models I, III, and 4; Load 80; Models 1000 and 1200)

Features

- 64. **Getting Ahead**
by Mark D. Goodwin
Add a type-ahead feature to TRSDOS 1.3 or Model III Cassette Basic. (Model III; Load 80)
- 78. **Run-O-Matic**
by Alan D. Smith
Disk menus that let you load programs instantly. (Model 4; Load 80)

Departments

- | | |
|--|---|
| 6. Load 80 Directory | 93. Tidbit #24 |
| 8. Side Tracks. <i>by Eric Maloney</i> | 96. Basic Takes <i>by Richard Ramella</i> |
| 12. Input | 100. The Next Step <i>by Hardin Brothers</i> |
| 14. Feedback Loop <i>by Terry Kepner</i> | 108. Spreadsheet Beat <i>by John B. Harrell III</i> |
| 21. Pulse Train <i>by Bradford N. Dixon</i> | 112. Tidbit #25 |
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| 84. Project 80 <i>by Roger C. Alford</i> | 128. Ask Tandy |

LOAD 80

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

Load 80 programs are ready to run, and can save you hours of time typing in and debugging listings. Load 80 also gives you access to Assembly-language programs if you don't have an editor/assembler. And, it helps you build a substantial software library.

Using Load 80 is simple. If you own a tape system, load the Load 80 tape as per the instructions provided. If you own a Model I or III disk system, you boot the

Load 80 disk and transfer the files to a TRSDOS system disk according to simple on-screen directions. If you own a Model 4, copy the Model 4 programs from the Load 80 disk to your TRSDOS 6.X disk using the COPY command.

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

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

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Directory

Helper

Article: Total Recall (p. 54).

System: Model 4, 64K RAM.

Display custom help screens from any operating level.

Language: Disk Basic.

Cassette filespec: B.

Disk filespec: HELPER/BAS.

Repair

Article: Getting Ahead (p.64).

System: Model III, 32K RAM, Radio Shack EDTASM.

A type-ahead utility for TRSDOS 1.3 or Cassette Basic.

Language: Assembly.

Cassette filespec: TYPE (source code), TYPE (object).

Disk filespec: TYPE/SRC (source code), TYPE/CMD (object code).

Sorter

Article: Made-to-Order Sorts (p. 70).

Systems: Models I, III, and 4, 32K RAM.

A custom sort generator.

Language: Disk Basic.

Cassette filespec: C.

Disk filespec: SORTER/BAS.

Autorun

Article: Run-O-Matic (p. 78).

System: Model 4, 64K RAM.

Load disk files from a menu.

Language: Disk Basic.

Cassette filespec: D.

Disk filespec: AUTORUN/BAS.

Display

Article: Project 80 (p. 84).

Systems: Models I and III, RS-232C, 8748 assembler.

Remote display board controller.

Language: Assembly.

Cassette filespec: DSPLAY (object code).

Disk filespec: DSPLAY/SRC (source code), DSPLAY/CMD (object code).

Window

Article: The Next Step (p. 100).

System: Model 4/4P, 128K RAM, ALDS editor/assembler.

The second part of a windowing system.

Language: Disk Basic, Assembly.

Cassette filespec: WS (object code), E.

Disk filespec: WS/SRC (source code), WS/CMD (object code),

TEST/BAS.

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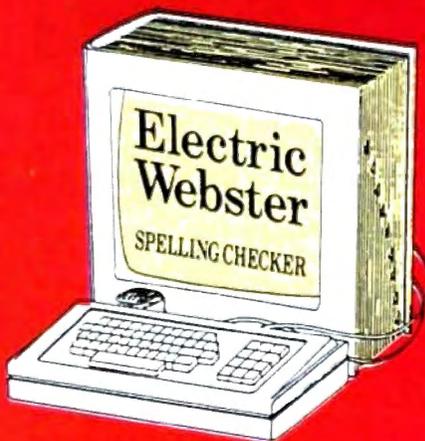
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— 80 *Microcomputing*, 9/82



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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, a fantastic spelling and grammar checker" 80 *Micro* 4/85

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The Lost Tribe Of TRS-80 Users

The following welcome is for new Model I/III/4 owners only. The rest of you can move on to the next subject.

The Lost Tribe of Tandy

Welcome to the strange, dark land of TRS-80 microcomputing. Have a seat, and let's talk for a few minutes.

I'm tempted to ask how on earth you ever got here. The old and tangled trails that wind through the MS-DOS jungles are dangerous, and not too many people make the trip. Most are discouraged by their friends, who have heard the horror stories of what it's like in the savage world of 8-bit computing. But no matter. Perhaps you're simply one of those curious, carefree souls who likes the smell of danger. The fact is that you're here, so you might as well know what we're all about.

I can't say that the horror stories are entirely unfounded. It's a long way to civilization, and you've got to have a stomach for wilderness living. Even many of the toughest old leather-skinned explorers have forsaken these impenetrable swamps and forests for the comforts of the modern world. You might have seen signs of their departure on the trail, the broken expansion interfaces and rusted drive casings and ruined monitors, tossed carelessly aside to rot.

But there's another side to it as well. While survival can sometimes be rough, you can also live comfortably here. And there's a certain undeniable satisfaction in knowing that your success is based partly on your own resourcefulness and creativity.

Anyway, let's take a look around. This is the main compound. As you can see, you're not the only new one; many of these houses are newly built. You'll undoubtedly get to know their owners before too long; around here, a sense of community is the key to well-being and happiness.

The compound is much smaller than it used to be, as the ruins that surround us testify. We were once the largest settlement in the jungle, with thousands of acres cleared for cultivation; you could see the fields and roads and clusters of houses to the horizon.



Then IBM started up, and we began to have trouble holding people here. Our benefactors, Tandy Corp., looked on as one caravan after another wended its way back, waving the MS-DOS standard in the breeze. It was pretty damned depressing at the time, with the dozens of boarded up shops and the weeds taking over the streets. But you get used to modest living.

As you might guess, we've got a closed economy, without much interaction with the rest of the world. A handful of craftsmen sell their goods—a few DBMs, a half-dozen or so word processors, some spreadsheets, and the like—but we do a lot of our own work. You're probably going to have to learn some Basic if you don't know it already. Many of us also know at least a smattering of Assembly.

Fortunately, we're blessed with a lot of good tools, including TRSDOS 6.X and the utility packages supplied by third-party vendors. Visitors from the outside marvel at what our backwater culture can do, and on occasion will even admit that we can do things better.

You might be interested to know the advantages to living here. For starters, it won't cost you much to get by. Also, the equipment is pretty good; you won't find a computer around that will give you as much for the money as the Model 4 does. And whatever we might think of some of Tandy's peculiar ideas on marketing, they provide pretty decent support, and will be doing business for the foreseeable future.

Most important, though, is that we're a tight-knit community. Those who have been here for a while are willing to share their knowledge. The people who sell software, peripherals, and add-ons will give you personal and reliable service.

The disadvantages? Well, you won't get much respect when you visit the outside world. When you say "TRS-80," you'll get a lot of blank stares, a few nostalgic comments from those who lived here once, and perhaps an inquisitive comment from an anthropology student. You'll feel like you belong to a lost tribe.

You'll also find yourself losing touch with the rest of the world if you're not careful. You can live here for years without knowing anything about MS-DOS, dBase II, 1-2-3, or Sidekick—not that you have much reason to.

As for *80 Micro*, we're the local rag, a combination of shopper, town crier, and information service. We'll give you the low-down on how to make your experiences here less stressful and more rewarding.

So enjoy your stay. And if you ever get a bit frustrated, or feel like you're living life in the slow lane, just remember: It's a jungle out there.

MS-DOS Returns

Fans of our deceased 2000 Plus column will be glad to know that we're replacing it with a new MS-DOS column starting next month. Authored by *80 Micro* technical editor Dave Rowell, who wrote the June cover story on the Model 1000, it will feature hints, tips, and advice for MS-DOS owners. The column will focus primarily on the Model 1000, but will also cover the 1200 and 2000.

Naturally, we welcome reader input. If you own a Tandy MS-DOS machine, send us your ideas and comments, as well as a wish list of the kinds of material you'd like Dave to include.

Also, in the same issue, we'll be splitting our New Products section between Tandy (200, 1000, 1200, and 2000) and TRS-80 (I/III/4/4P) products. This will help owners of different systems more quickly find the information relevant to their needs. ■

NEW!



Circle 91 on Reader Service card

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!

★★★★★
80 MICRO
June, 1985

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?

DOTWRITER uses the "bit-image graphics" of your printer to produce the kinds of stunning results shown inside the box. It is a full-function text printing program, so you can inter-mix different character sets, do centering, paragraphs, pagination, magnification, draw horizontal and vertical lines, reversals (white on black), and even print right-justified proportional text.

DOTWRITER includes the printing program, complete documentation, and fourteen useful sets of typefaces (60 to 90 characters in each set). We will include the 160 page Letterset Reference Summary at half-price (\$10.00) with your order.

To use DOTWRITER, just write your text with any popular TRS-80 Word Processor, add the necessary format-

ting commands, and DOTWRITER will do the rest.

35 more disks are available separately. Each has 3-12 complete typefaces (60-95 characters in each set).

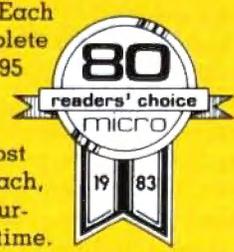
These disks cost less than \$25 each, and may be purchased at any time.

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 Grafrax, MX-100 with Grafrax-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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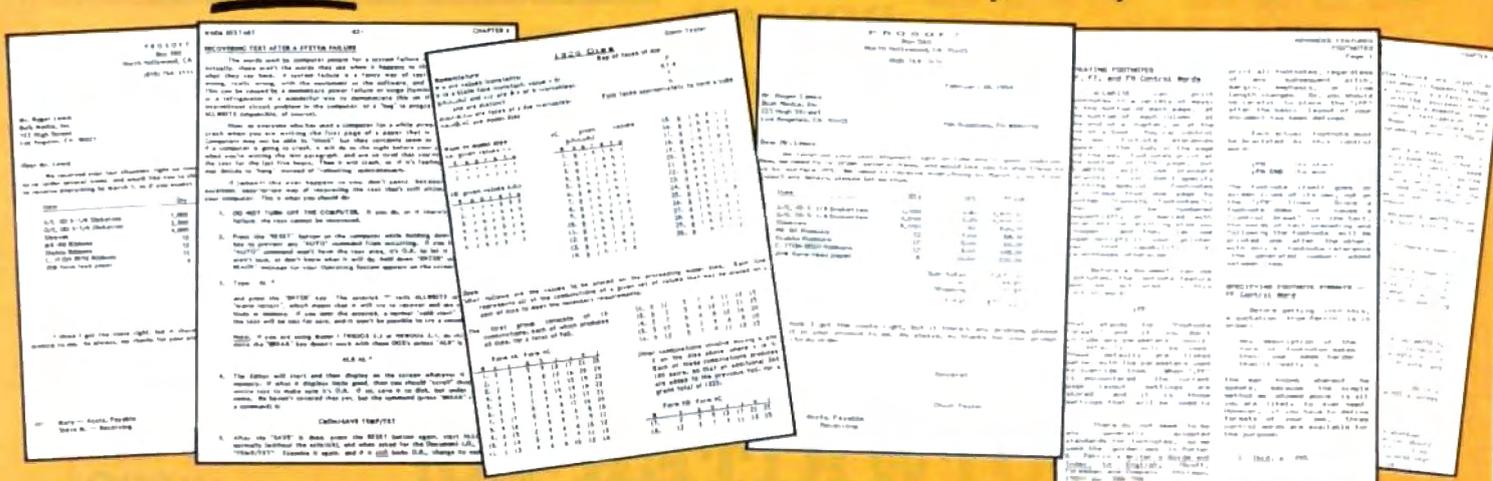
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In an attempt to push the public into expensive 16-bit computers, many manufacturers have been saying that the TRS-80 is obsolete. The truth is that the software, not the hardware, makes the difference. And the best word processor of all is now available *only* on the humble TRS-80, not on those expensive 16-bit machines!

ALLWRITE is based on the proven methods that made NEWSSCRIPT 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

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

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.

NEWSSCRIPT'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.)

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

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

BENEFITS OF OWNING

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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.

Circle 30 on Reader Service card.

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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Minus 2000 Plus

I read with shock and anger of your decision to discontinue John B. Harrell III's excellent column (2000 Plus), the primary reason I subscribe to your magazine.

I do not know how you conducted your survey, from which you concluded that not enough readers owned a Tandy 2000 to justify the column. I do know that I did not participate in it, nor did several other 2000 owners with whom I have spoken.

At a time when the popularity of the 2000 seems to be increasing, your decision seems curious at best. I looked seriously at the 2000 and its competitors for over a year before opting for it. Perhaps many others have done the same, and another survey would deliver different results.

*Paul A. White
Ablene, TX*

I just read that 2000 Plus is being discontinued. It is fortunate I learned about this before I renewed my subscription. I wonder how you know how many Tandy 2000 owners are reading your magazine. Are we supposed to call and tell you?

*W. A. Fronck
Houston, TX*

We based our decision to drop the column on Reader Service card questionnaires, which showed the number of 2000 owners leveling off at about 3.5 percent of our readers.

—Eds.

Name That Program

Thanks for giving us credit for creativity in naming our program xT.CAD. The name T.CAD has humble roots: CAD is a popular acronym for computer-assisted drafting, and every draftsman can still easily relate to the old T-square that our system makes, alas, obsolete. The lowercase "x" distinguishes the extended version of T.CAD Professional from its smaller brother, T.CAD Apprentice.

But we also love your criticism and therefore announce a competition for a better name. It's open to anyone; just send your idea to my attention by July 31, 1985. The winner will get a free copy of xT.CAD (a \$450 value) and the first



runner-up will get T.CAD, even if we don't change the names.

*Chris Brozek, President
Microdex Corp.
1212 N. Sawtelle Ave.
Tucson, AZ 8571*

Stay tuned for contest results.

—Eds.

A Screen Gem

I found Jim Heid's article "The GW Difference" (February 1985, p. 42) interesting and a joy to read. But he missed one point about display formatting.

Heid explained that the Print @ feature is "gone, thank goodness," and went on to praise GW Basic's Locate X,Y feature. He didn't mention that the Model 4's Print @ statement is almost the same as Locate X,Y. You can format it two ways:

PRINT @ X, "Whatever"
PRINT @ (X,Y), "Whatever"

*Thomas Szilagyi
Cranston, RI*

Dynamic Duo

As a stand-alone computer, the Model 100 is extremely limited, as are most lap-sized computers in its price range. Adding disk drives and other paraphernalia simply raises the cost without increasing efficiency.

However, for the price of add-ons, you could buy a Model 4P (an excellent computer), free yourself from the computer station, and use the 100 as a portable modem. I don't know why Tandy

doesn't package the 100 with the 4P. The 100 costs no more than a good modem and provides considerable convenience and power when used with a desktop.

*Charles Harris
Island Heights, NJ*

They Also Ran

What ever happens to all of those programs that don't win the grand prize or first place in the Young Programmer's contest? Is there a way to get listings and documentation for other winners?

*Kim Williams
Las Vegas, NV*

Some winning programs are available for downloading from our bulletin board system (603-924-6985).

—Eds.

80 ALERT

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

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

At the request of some of our readers, we have attempted to contact Micro Projects Engineering Inc., 3951 Higuera St., Suite B, Culver City, CA 90230. Our letters remain unanswered and their telephone is disconnected. This company has advertised in 80 Micro; also, we published a New Product announcement about their Xcallbur board in our January 1986 issue.

Send your correspondence to Input, 80 Micro, 80 Pine St., Peterborough, NH 03458.

Check these features:

Talker 2.0 and Talker 4.0 software:

- ✓ Unlimited translation of English text to clear speech.
- ✓ Powerful video or keyboard echo can be switched on or off at any time.
- ✓ Can be used in BASIC with 2 new commands: PRINT* "I can talk" speaks any expression. PRINT! "Hello" speaks *and* prints on screen.
- ✓ Reads numbers up to 999 trillion.
- ✓ Speaks many abbreviations, such as Mrs., Mr., lb., oz., Co., etc.
- Walks the dog.
- ✓ Many control codes to tailor the system to your wishes. (Pitch, speed, etc.)
- ✓ Only 6¼K long.
- ✓ Talker relocates itself into available high memory. Compatible with any DOS (not CPM).

The VS-100 hardware:

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

See the detailed review in *80-Micro* December 1984.



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

"Doctor SIGMUND"
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Send questions or problems dealing with any area of Tandy/Radio Shack microcomputing to Feedback Loop, 80 Micro, 80 Pine St., Peterborough, NH 03458. Enclose a stamped, addressed envelope for a reply.

Q: My 16K Model I has served me well until recently. Now, whenever I type in characters or the computer displays messages on the screen, the letters O-Z and numerals 0-9 appear as A-N and uppercase symbols. The letters A-N print correctly. The computer seems to recognize the correct letters even though they're wrong on the screen. In fact, the command PRINT "ABCDEFGHIJKLMN O PQRSTU VWXYZ" gives me the correct letters. Can you suggest where to start troubleshooting? (*John Matkisch, Morris Plains, NJ*)

A: My first instinct is to say that your video display chip has gone bad and needs to be replaced, or that one of the character generator output lines is flaky. Beyond that I can't help. I suggest you take the unit to a Radio Shack computer repair center.

Q: I own a 4K Model III. Because of the cost, it's foolish to buy an upgrade from Radio Shack. Is there a financially sensible way to upgrade to a fancier level with more memory? (*Bob Amls, Hopkinsville, KY*)

A: Yes, it's easy to do your own upgrade. First, call Radio Shack's National Parts Division (817-870-5662) and order the appropriate technical manual. Then buy three eight-chip sets of 16K RAM—one chip is 16K by 1 bit, so eight chips give you 16K by 8 bits. Unplug your computer and remove the top according to the technical manual's disassembly instructions. Remove the bank of 4K chips and replace them with the 16K chips, then fill the 32 empty sockets beside them with the remaining 16K chips. The technical manual has diagrams of memory chip positions. Make sure you've inserted all chips properly, with the notches lined up in the right direction. Reassemble the computer and check memory size. If it's only 32K or 16K, you may have a bad chip.



Through trial and error, you'll get a full system. Now, get a Level II ROM chip from National Parts. To install the chip, you'll need the full installation instruction package. Disk drives and an RS-232 board are just as easy to add. You can order them from National Parts or from other companies that sell Model III upgrade kits. By doing the upgrade yourself, you should save several hundred dollars.

Q: I have an answer to Rodney Maglente's question about saving long programs with Radio Shack's Series I Editor/Assembler (January 1985, p. 18). He should change the byte at 4AEA hexadecimal (hex) from 00 to FF hex. The editor/assembler's Save routine uses the BC register to count the lines saved. The program enters this routine with BC containing 00D3 hex (211 decimal). The patch changes this to FFD3 hex, which lets you store as many lines of source code as you'll ever be able to fit in memory and assemble. I used Howe Software's Monitor #3 to make the patch and write the modified program to tape. I lost count of the hours I spent solving this problem, but the effort was worth it. I have some source programs that take eight to 10 minutes to load. Be forewarned that saving lengthy source code requires long, good tapes. (*Merritt H. Derr, Inman, SC*)

A: Thanks for the information. See Greg Wolking's letter below for a method that doesn't require a monitor program.

Q: Solving Rodney Maglente's problem involves changing only 1 byte in the Series I Editor/Assembler program, but you need a high-memory monitor to make the fix permanent. If you don't have a monitor program, use the System command to load EDTASM. When the *? prompt appears, type in /181 and press the enter key. This returns you to the memory size prompt; type in 17980, which protects the editor/assembler from Basic. Now type in POKE 19177,14 to fix the file length problem. Type in SYSTEM. Answer the *? prompt with /19434 to start the program.

It's wise to PEEK address 19177 to make sure you have the same EDTASM version; the result of the PEEK should be 6. Otherwise, you'll have to look elsewhere to solve the problem.

You must follow these steps every time you load EDTASM. Note that the procedure doesn't affect the L-command since EDTASM loads the entire file at once, no matter how long it is. Also, it's especially important to save your files more than once. The longer the file, the greater the chance of losing a byte or two. It takes only one bad byte to trash an entire file, and as yet I know of no way to repair a bad cassette file.

Note that there's no problem with the length of object files as long as you have enough RAM to assemble the program. (*Greg Wolking, Orlando, FL*)

A: Thanks for your solution.

Q: I own a 128K Model 4P. When I invoke the MEM command, the computer replies with 29,992. What happens to my other 64K of memory? Do you know of a way I can see all of my 128K? (*Robert Mantis, Hilton Head Island, SC*)

A: The extra RAM is there, but it's available only as a RAMdisk. There's no way to have 128K of contiguous RAM on the 4P, not in DOS and not in Basic. Microsoft's Basic can address only 64K of contiguous memory, including the space Basic occupies.

But don't feel put out by that; the IBM PC, with up to 512K of RAM, is stuck with the same Basic RAM limitation as your Model 4P. And your 4P cost a lot less than the IBM.

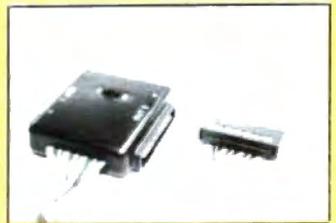
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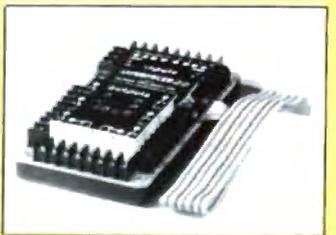
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When it's time for fun, don't be without your Alpha Joystick. Do you know that most action games are Joystick compatible? Stop pounding on your keyboard and enjoy real arcade control. The joystick can also be used with BASIC programs; simply do J=INP(0)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



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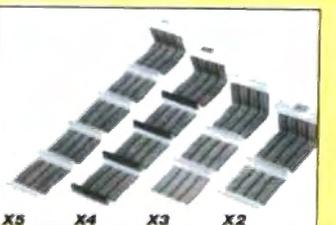
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FEEDBACK LOOP

Some programs take advantage of the extra 64K bank of memory, but most machine-language and Basic programs restrict themselves to using the extra RAM as a RAMdisk.

Q•I use cassette Scriptit 3.1, the inexpensive version, on my Model III with a Radio Shack DMP-200, a smart printer that supports many typefaces. From Basic, I can change print styles, but in Scriptit I'm stuck with the modes in effect when I load the word processor. How can I get bold and other typefaces from Scriptit? (Ralph H. Turner, Oberlin, OH)

A•I know of several programs or patches to modify disk Scriptit to use the DMP-200's special features, but I find nothing for cassette Scriptit. Can anyone else help?

Q•I have a suggestion for Chris Seigler, who was looking for an accounts receivable program for a dual-drive Model III (December 1984, p. 18). He needed a balance-forward program that could handle 1,500 accounts with an average of five entries per month. You said he'd need a hard disk drive to handle that many accounts. I think H.D.P.'s program is what Chris wants. It handles up to 5,000 accounts and 15,000 transactions on floppy disks with a split disk feature. I've been using this program for several years and find it consistent and concise.

An advertisement for the program appears on p. 197 of the December 80 Micro. You can reach H.D.P. at 2366 Lincoln, Oroville, CA 95965, 916-533-5992. (George M. Blankenship, Matewan, WV)

A•With all the advertisements in all the magazines I read each month, sometimes I miss a few. Thanks for the suggestion.

Q•Like Chuck Fullgraf, I had trouble converting my Model I to operate with a double-sided disk drive (January 1985, p. 18). To condense weeks of disappointments, here's what happened.

Micro Systems Software's technical department told me DOSPLUS 3.5 could not support double-sided operation on drive zero due to the Model I's hardware limitations. They told me that drives other than zero can be double-sided, and said the problem was probably in the drive-cable.

Aerocomp was more specific. They told me that Radio Shack's programmed drive cable uses pin 32 to control drive 3, so pin 32 is missing from the cable edge card connector on drives 1 and 2. Tandon uses pin 32 to tell a drive it's

supposed to be double-sided. I made a new cable with pin 32 on drive 1. This gives me satisfactory results with a single-sided drive zero and a double-sided drive 1. If there's a way to get double-sided operation on drive zero, I'd like to know about it. Also, is the terminator's correct location on the final drive, or on drive zero? My computer seems to work equally well both ways. (Oscar A. Hevia, Tampa, FL)

A•The terminator resistor can be anywhere on a four-drive system, as long as one and only one drive has the resistor pack. Tandon prefers that the pack be in drive 1, while Radio Shack, the last I heard, prefers that it be in drive zero. For more advice on double-sided disk drive operation, read on.

Q•I had problems similar to Chuck Fullgraf's when I upgraded to double-sided disk drives. I went to the nearest Radio Shack and bought a normal 34-pin edge card connector to replace the one with the missing pins. Another solution is to make a new cable with two new ends.

Once you've installed the new cable, configure the drives using the DIP (dual in-line package) switches, or jumpers, as internal 0,1 and/or 0,1 external. However, if you do this to the external drive, TRSDOS 6.1 or 1.3 won't acknowledge that drive. Another of life's mysteries.

Be aware that the Model III/4's drives are configured as 0,1 internal and 0,1 external. Radio Shack chose to make the external connector on the disk controller's PC board the same as the internal pin out. If you set the external drives' DIP switches to 2,3, they won't work properly. (Mel Patrick, Surrey, BC)

A•Thanks for the warnings about the external drives' DIP switch settings, but what do you mean TRSDOS won't acknowledge the external drive? All you have to do is use the System command to tell the DOS that you installed an external drive.

Q•Regarding Chuck Fullgraf's questions: I've made some discoveries about double-sided disk drive operation using DOSPLUS 3.5. If you have one drive,

the only way to get double-sided operation is to have the DOS already on a double-sided disk. For the format utility to work correctly with only one drive, you must still have the terminating resistor in place. On the other hand, on a dual-drive computer, you must remove both resistors.

You can't use the back-up utility to back up a single-sided disk to a double-sided disk or vice versa. I haven't been able to back up a double-sided disk that has the complete DOS on it.

I've used the following method to back up DOSPLUS 3.5 from a single-sided disk to a double-sided disk, or from double-sided to double-sided: Put a single-sided DOS disk in drive zero, and load the format utility. At the prompt, put the destination disk in drive 1 and format it using the Sides = 2 parameter. Use SYSGEN to copy system files to the back-up disk. To copy the remaining files, use the command COPY !:0:1,I,E,SP = "PASSWORD",D = "PASSWORD". If you need only a few of the files, copy them one at a time; don't forget the file password where necessary. This disk boots up as a double-sided disk in drive zero, but you must create a configuration file using the Save command to configure both drives on boot-up. You can also use the I.Mount command, when you have disks in both drives, to set the drive to the disks' format. (Joseph Conte, New Hyde Park, NY)

A•Thanks for writing. We all appreciate it when someone explains how he managed to do what Radio Shack calls impossible.

Q•In the January 1985 Feedback Loop (p. 18), Gerald Crosby asked for a patch to resolve a conflict between the Model 4's click filter and SuperScriptit. I have such a patch (see the Program Listing); it works with TRSDOS 6.2 only, however.

The problem with the pre-6.2 filter is that it's poorly written and that SuperScriptit accesses the keyboard via a proprietary @CTL supervisor call (SVC). The filter doesn't check what type of request (@GET, @PUT, or @CTL) has entered the filter. After @CHNIOing to the keyboard driver, it checks only whether the zero flag is set. If so, it produces a

Program Listing. Patch to correct the Model 4's click filter with SuperScriptit under TRSDOS 6.2.

```
.Click/Fix
.Modified 6.2 Click/FLT to work with SuperScriptit and *DO
.
.Change C9 (return) to BC (CP H)
.This usually results in a C, NZ condition
.
.D00,93=BC
.F00,93=C9
.
.Apply patch to Click/FLT.FILTER
.End of patch
```

click. The @CTL #255 function call that SuperScript uses returns the 8-byte image of the keyboard RAM starting at the address indicated by the IY register's entry value. This call is always CHNIO'd to the driver and always returns zero. Therefore, the filter produces a click whether or not you press a key.

Tandy rewrote the click filter for TRSDOS 6.2. This time, the filter screens the primitive and processes it properly. It returns @PUTs to the calling program without CHNIOing to the driver; it CHNIO's @CTL #255, H = F4 hex, and CHNIO's @GETs (@KBD, @KEY, and @KEYIN) and screens them on return for the zero flag. If the flag is set, the filter makes a click.

The patch changes the return byte that @PUT and @CTL use to a CP H. On return from a @CTL #255, H = F4 hex, so it's an extremely rare event that A, which holds the last keyboard RAM byte's image, would be equal to or greater than H. The CP H thus creates the nonzero, carry conditions which are the entry flags for a @GET primitive.

So, on return from the @CTL # 255 venture into the keyboard driver, instead of returning to the caller, the computer resets the zero flag, sets the carry flag, and drops control down into the filter's code that handles @GET requests. When SuperScript sends its @CTL to the keyboard with the click filter installed, the filter processes the @CTL and then a @GET primitive. If you haven't pressed a key since the last call, @GET returns a nonzero and the filter doesn't click. The probability of the @GET call's masking a new key press from the @CTL call is extremely small. (Mike Zarowitz, St. Paul, MN)

A: Great detective work. Thanks for the patch.

Q: I've been considering converting my Models I and III to CP/M. In the December 1983 *80 Micro* (p. 122), you reviewed three Model III kits. My objective is to convert both computers so they can run the same software and read the same files, as well as run their respective TRSDOS programs. I'd also like to expand to 128K if it's practical. Am I dreaming? If not, which kits would accomplish what I want and which would you recommend. Also, can I convert a Color Computer to CP/M to spread the compatibility three ways? (Fred B. Criegler, Roswell, GA)

A: Yes, it's possible to convert both computers to CP/M so that they'll run the same CP/M software. You can convert a Model I by setting it up as a 48K or as a 64K system. However, the 48K configuration causes problems. Because of a conflict with the Model III

ROM/RAM, you have to alter CP/M to start at 4000 hex. This gives you a non-standard version incapable of running about 90 percent of the CP/M software on the market.

The second conversion method requires a hardware modification that lets you switch RAM into the logical positions that the ROM occupies, making the computer into a 64K machine. This way, you can run standard CP/M and all available software. The Model I hardware modification is tricky because of close tolerances inside the keyboard case. As I explained in my article, the Model III conversion isn't that difficult.

Model I CP/M kits are available from Microhatch (P.O. Box 501, DeWitt, NY 13214) and from Holmes Engineering (3555 S. 3200 W., Salt Lake City, UT 84119). You'll also have to upgrade your Model I disk drives to double-density operation before you can swap disks with your Model III, unless you restrict Model III disks to single-density. As for getting 128K of RAM, you can't actually address more than 64K with Z80 CP/M.

You might be able to get a Color Computer CP/M card from Wayne Technology (P.O. Box 5196, Anaheim, CA 92804), even though they've discontinued the product, or from Color Power Unlimited (1260 Springfield Ave., P.O. Box 606F, New Providence, NJ 07974). Both units require an external 80-column by 24-line display monitor. Both also use double-density disks and require a 64K Color Computer.

Q: I believe owners of cassette-based Model III's would find my method of handling Basic data files, which I've called TBase, interesting.

TBase is a set of 19 Assembly-language subroutines for conveniently using the Model III 1,500-baud cassette interface to store and retrieve data files for Basic programs, such as disk Basic uses ASCII data files. It takes only 27 bytes of data statements to let any Basic program load TBase via a programmed System statement. TBase data files are in cassette Scriptit format, so you can use Scriptit's full-screen capabilities to create or edit them. However, Scriptit isn't necessary; Basic programs using TBase can create, modify, and display their own data files.

A TBase data file is a relational data base. That is, it consists of numbers and strings logically arranged in related rows and columns. TBase accepts more than one data file at a time, limited only by installed memory. The tape input/output routine provides for multiple copies, verification, and tape-off delay, to avoid capstan damage to the end of a tape file.

TBase enables the CVI function unused in cassette Basic. This makes it

easy to transfer data records between TBase's text buffer and Basic variables. TBase can sort any nested set of fields of a data file, using a fast vectored shell algorithm. TBase functions delete and insert records in any data file, or delete an entire data file while retaining all other files in memory. A search function finds the first, or next, record in a data file that matches a profile based on one or more fields, such as "Find John Brown's telephone number."

I'm placing TBase in the public domain for the benefit of *80 Micro* readers. Interested readers should send me \$15 to cover the cost of reproducing TBase's documentation and assembled source listing, preparing a C-90 cassette with the five modules of editor/assembler source text and assembled system file, and mailing them. (David B. Dillon, 16533 Baederwood Lane, Derwood, MD 20855.)

A: Sounds like a great deal for owners of cassette-based computers.

Q: In your answer to Daniel E. Roth's letter (May 1985, p. 14), you said you'd been unable to find a third-party source of printwheels for any Radio Shack daisy-wheel printers. Your readers might be interested to know that Quill Corp., a mail-order office supply company, has seven standard printwheels in 10, 12, and 15 pitch and proportional spacing for the Daisy Wheel II and DW-410 printers.

I've bought most of my printwheels and ribbons from Quill and can vouch for their excellent service and prices. Their address is 100 S. Schelter Road, P.O. Box 4700, Lincolnshire, IL 60197. (Ron Lee, Severna Park, MD)

A: I knew Quill sold ribbons for the Daisy Wheel, but I didn't know about the print wheels. Thanks for the information.

Q: I'm responding to Jean-Pierre Guggenheim's request for help in converting his Level I game cassettes to Level II for use on his Model III (May 1985, p. 17). Even if he finds copies of Radio Shack's conversion programs, they won't work with his Model III. I've revised the originals to work with the Model III, and would be happy to supply copies to Mr. Guggenheim or to anyone else who could use them; please send a blank cassette and return postage. (Paul F. Barnett, 19 Wilshire Blvd. E., Louisville, KY 40214)

A: Thanks for the offer.

Terry Kepner is a freelance writer and programmer and an 80 Micro associate editor.

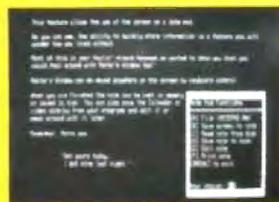


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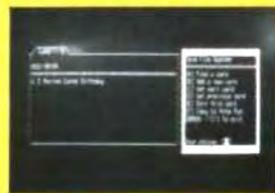


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IBM's Loss Tandy's Gain?

Hot Items

With spring came the news that IBM would stop production of its PCjr in April. Ironically, the jr had just come off its best sales period since its introduction a year and a half ago. Fourth-quarter sales totaled 200,000 units; sales for all of 1984 were only 250,000.

The jr was burdened with flaws from the start. You had to aim its notorious infra-red keyboard, which operated remotely, directly at the CPU box for it to work. Its original Chiclet-style keyboard was a laughing-stock. Memory size limitations, a slow processor, a single disk drive, incompatibilities with the PC, and the complete system's high price all contributed to the jr's decline and fall.

IBM did fix some of their blunders. They improved the keyboard, increased the amount of memory Basic could access, and speeded up the microprocessor. But the stigma of failure remained until IBM cut the jr's price by \$1,000—to \$995—late in 1984, just in time for Christmas. Suddenly, people started buying jrs. Then in February 1985, IBM took the fatal step of raising the jr's price back to \$1,400. The sales boom stopped cold. A month later, jr was gone.

Don't expect IBM to stay out of the home computer market for long, however. William Ablondi of Future Computing Inc. looks for a new machine, priced at about \$1,000, in 1985's third quarter.

Meanwhile, Tandy has a golden opportunity to cash in on IBM's misfortune. The Tandy 1000 now lacks a serious rival among low- to mid-range MS-DOS computers. IBM's first big failure may, in fact, enhance Tandy's first big success in the MS-DOS mainstream.

Update

"Who'll give me \$500 for this little gem of a computer? How about \$300?"



C'mon, this baby once retailed for \$1,195."

"I'll take 150 of 'em for \$125 a piece."
"Sold!"

It was a painful end for Convergent Technologies' Workslate as the last 6,000 units went on the auction block at fire-sale prices.

Introduced in August 1983, the Workslate was an early competitor of Radio Shack's Model 100 briefcase computer. But Convergent ran into trouble manufacturing and marketing the machine and stopped producing it last summer, at an \$8.5 million loss.

The auction raised some badly needed cash for Convergent. Auctioneer Ross Dove had hoped to get \$150 to \$200 per computer, but he didn't quite make his goal. Nonetheless, the sale took in about a million dollars, and Convergent called it a success.

Tandyland

This is one of those good news, bad news stories. Tandy's share of the home computer market dropped from 8 percent in 1983 to 7 percent in 1984. That's the bad news. The good news is that the industry-wide factory value of shipments for all home computers rose by \$800 million from 1983 to 1984. So Tandy made more money. Tandy executives have always claimed that market

share isn't especially important to them; they say it's the bottom line that counts.

At this point, though, Tandy's looking forward to a better start for fiscal 1986, which begins on July 1, 1985.

Recently, stock market investors have liked Tandy's prospects, too. While other high-tech stocks slumped this spring, Tandy became a market leader.

In late March, Martin Miller, a stock analyst for E.F. Hutton in New York, told me, "Tandy's stocks have been ahead of the mar-

ket over the last few weeks. In fact, Tandy's become a market favorite."

Mark Manson of Donaldson, Lufkin, and Jenerette Securities, echoed Miller's comments. "Tandy is one of the hottest stocks on the market," he said. "Since the first of the year, Tandy's gone from \$24 to \$34."

Neither analyst seemed to think the PCjr's exit from the home computer scene would significantly affect the performance of Tandy stock. Miller said it would be only a "modest positive." Because Tandy's stock has always moved in cycles, Miller said Tandy's benefit from decreased competition would be short term. Manson put it differently: "In the long run, the demise of the PCjr can only help Tandy, but they were doing very well anyway, even while the jr was still around."

Now that Tandy's 6000 has superseded the Tandy 16B, you might wonder what Tandy's doing with all those out-of-date computers. It turns out the government's taking a lot of them off Tandy's hands.

The Army is buying 283 units, and has taken an option on 45 more. Since 16Bs cost about \$4,000 apiece, the deal could bring in almost \$1 million for Tandy. The Army will use the computers at Fort Stewart in Georgia and in West Germany to track supplies and equipment.

"There's no deal, no conversation," said Ron Stegal, senior VP of Tandy's business products division. He was talking about rumors that Radio Shack Computer Centers might sell Ataris in the near future. Stegal told the *San Jose Mercury News* that Tandy wouldn't even consider selling Atari computers unless it had Atari all to itself.

How this rumor even got started is a mystery. Consider the two companies' sales strategies. Radio Shack sells only its own products or products to which it holds exclusive rights. Atari is a mass-merchandiser that shuns computer specialty stores.

James L. Copland, Atari's vice president of marketing, says his company's mission is, "selling to the masses, not to the classes." Though the two computer companies may compete for buyers in the same market, it's unlikely you'll see their products on the same shelf.

The Atari rumor wasn't the only one to reach 80 Micro this spring. There were rumblings on CompuServe and other sources about a new Tandy computer: an MS-DOS briefcase model to be called the Tandy 800.

According to the scuttlebutt, the computer will have one disk drive and a Fresnel lens flip-up screen. (Fresnel lenses, like those in lighthouses, use a series of concentric lenses to concentrate light.) When I asked Stewart Weinstock, Tandy's product manager for portable computers, about all this, he said he knew nothing about an MS-DOS portable about to come out.

Weinstock, by the way, has some new responsibilities at Radio Shack. He's now product manager for the Model 4, replacing David Frager. Meanwhile, Frager, who also handled the Tandy 1000, is taking charge of Tandy's entire MS-DOS line: the 1000, 1200, and 2000.

I asked Weinstock if the move put any kind of a shadow on the Model 4's future. His comment was emphatic: "There is no intention to stop producing the Model 4. The product continues to be very successful and will continue for as long as it is selling."

Ed Juge, Radio Shack's director of market planning, adds that the Model 4 is selling especially well to schools. "The 8-bit machines we sell still have a long life ahead of them," said Juge. "We're even considering upgrades to the Model 4." When asked for details, neither Juge nor Weinstock would be specific, but I did learn that some of the 4's most popular add-ons might become standard equipment. Options Tandy's considering include an internal hard disk drive, double-sided disk drives, and the high-resolution graphics board.

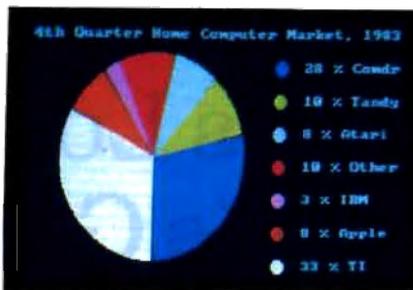


Figure 1. Home computer sales in the last quarter of 1983.



Figure 2. Home computer sales in the last quarter of 1984.

MicroTrends

A report from Future Computing Inc. documents some important changes in the home computer market over the last year or so. The report compares home computer sales in 1984's fourth quarter with sales in the final quarter of 1983.

First, sales were down. In 1983, consumers bought 2.2 million units. In 1984, the total was 1.7 million. Not all vendors felt the crunch equally, though. The big loser was Commodore, whose sales fell 12 percent. Radio Shack lost 8 percent and Texas Instruments, of course, dropped out of the market completely (see Figs. 1 and 2).

Apple's sales, however, jumped 17 percent. IBM gained 13 percent in the home market, attributable to the 200,000 PCjr's sold within the last three months of 1984 (see above).

Prices for home computers in 1984's final quarter ranged from \$325 for an Atari to \$1,750 for an IBM. The dollar total was \$1.8 billion.

Future Computing says, "Consumers are buying computers as tools, not just as toys." Fifty-nine percent of the systems sold in 1984 had disk drives; 36 percent included printers. Other popular peripherals included joysticks, more memory, modems, and mice.

As the report makes apparent, games, graphics, and sound are not necessarily what home computer buyers are looking for anymore. Instead, they're turning to

higher-priced systems and applications software.

The promoters of Softcon, the big microcomputer software convention, can't claim their show is getting bigger every year. Attendance at the second annual Softcon, from March 31-April 3 in Atlanta, was down significantly. Last year's premiere show in New Orleans drew 550 vendors; this time, that number dropped to 250. Yet, the vendors didn't seem too disappointed. They felt the crowds were more interested in the exhibited products than last year.

Most products shown were for the IBM PC, and most of the remainder were for Apples. Only Ontario-based Gridsoft represented the TRS-80 market. And Gridsoft was there to announce versions of its football prediction program—for the PC and the Apple.

To attract people to the show, Softcon paid ABC's Ted Koppel \$25,000 to moderate a panel discussion on the future of software. The panel included John Sculley, president and CEO of Apple Computer, Inc., Mitch Kapor, chairman of Lotus Development Corp., industry analyst Esther Dyson, and Fred Gibbon, president of Software Publishing Corp. Unfortunately, Koppel steered the discussion away from the panel's area of expertise, business, asking instead why anyone would need a home computer when most hardware is rusting, or "whatever discarded computers do," in America's closets.

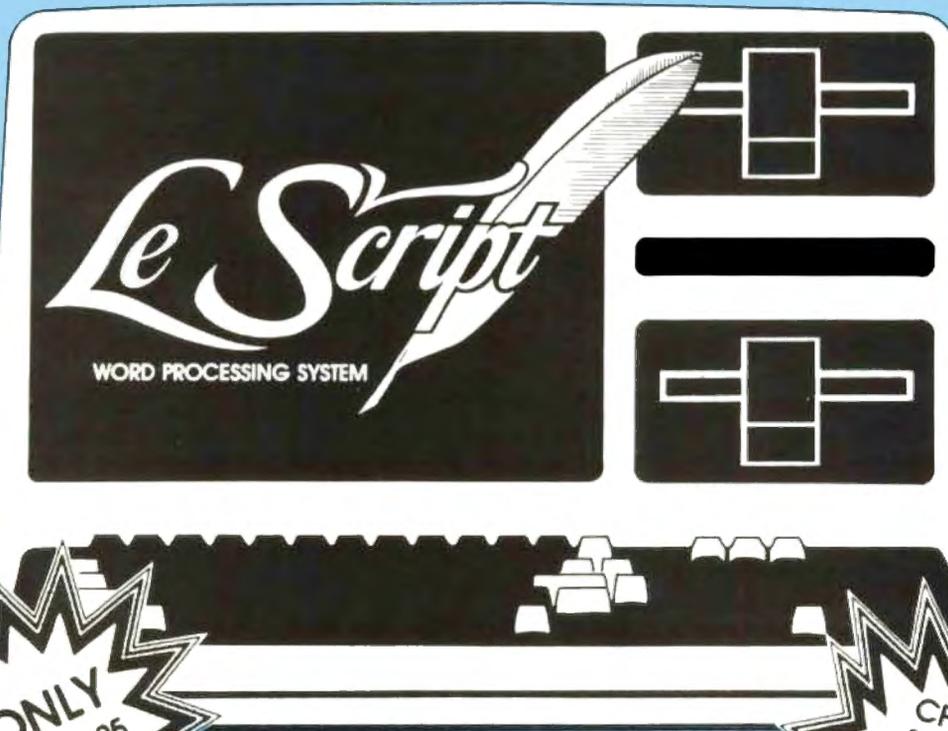
The panelists said telecommunications would eventually make the computer a home necessity, while admitting the need for an easy-to-use interface for nontechnical computer users. None of this is particularly new; it simply underscores the problems the micro industry has had finding a place in the home. Koppel's question will remain unanswered until, as Mitch Kapor put it, "a key inventor, a Henry Ford, comes up with a way to make computers more accessible to everyday people."

The microcomputer industry now has its own daily newspaper. This month, Ziff-Davis Publishing Co. is due to start up *Computer Industry Daily* (CID), an industry newspaper to be electronically distributed via MCI Mail.

According to Esther Dyson, editor of *RELease 1.0*, the industry newsletter bought by Ziff-Davis and converted to CID, "Our charter is to provide the computer industry with comprehensive, coherent coverage of breaking news here and worldwide, especially Japan." The six- to 12-page newspaper will also be printed at 18 U.S. locations for readers without modems or access to MCI mail.

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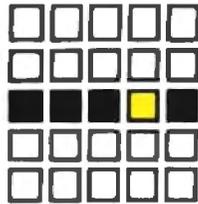
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Graph Fix

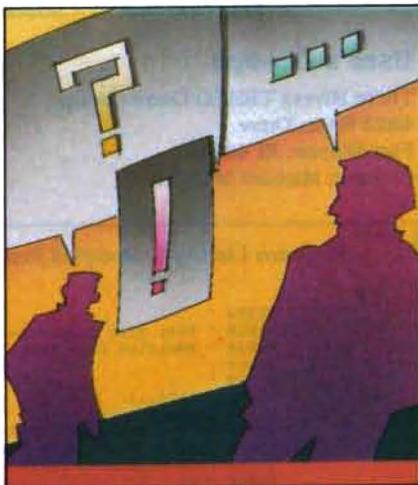
A number of readers have asked me how to get my Graph Master program (February 1985, p. 68) to work with printers other than the Radio Shack DMP-100 (previously called the LP-VII). The problem lies in the differences in printer control codes that create graphics on various printer models. The screen dump routine I used came from the article "LP VII Screen Printout" in the February 1983 *80 Micro* (p. 252). The article explains the workings of the routine and the DMP-100's control codes, so it should be of some help in converting the routine to work on your printer. As an alternative, though not perfect, solution, delete lines 890-1080 (Load 80 users should delete lines 3008-3045) and replace them with Program Listing 1. This screen dump routine uses only regular text characters, so it should work on any type of printer, even a daisy-wheel. The disadvantage is that the printed graphs don't look quite as nice as they do on the screen, and the vertical resolution is reduced.

Arnold E. van Beverhoudt Jr.
P.O. Box 58
St. Thomas, VI 00801

Driver Education

After buying Scripsit for my Model I, I was eager to use it with LDOS to take advantage of double-density format and my double-sided drives. Imagine my disappointment when my system rebooted if I tried to load or save files. Some detective work led me to the following solution, which I've written as a JCL (job control language) file:

Although Scripsit works fine without KI/DVR, you



must set the keyboard driver first if you're going to use other drivers such as RDUBL.

```
Example:
SET *KI KI (T,J)
RDUBL
SYSTEM (DRIVE = 1,CYL = 40,STEP = 0)
```

Albert Schmitt, Jr.
#2 Box 185
Westfield, WI 53964

Set Point

NovaCalc (January 1985, p. 82), is a good spreadsheet program; however, it doesn't align decimal points when line printing numeric values. To fix this, make the changes shown in Program Listing 2.

Howard Potvin
2527 Los Padres Drive
Rowland Heights, CA 91748

Faster, Faster

It's often said that the Tandy 2000's video display is slow when you edit in Basic. Scott Trent's program (December 1984, p. 29) solves the problem on initial entry into Basic. But if you run a pro-

gram that uses graphics or color, the slow scrolling returns. I've modified his program to make it accessible at almost any time (see Program Listing 3). I converted the data statements to hard-coded POKEs and I renumbered the lines to begin at 65000. I saved the program as Fastlist/BAS in ASCII format. These three changes let me merge the routine with any existing program. Now whenever I want to speed up scrolling, I type in GOSUB 65000.

I've also added a Locate..1 statement. This ensures that the cursor is on, since I run compiled Basic programs with the cursor turned off.

Edward R. Sargent
6431 W. 74 Ave.
Arvada, CO 80003

Readers in Need

Does anyone know how to tell if an Epson MX-80/FT printer has the Grafrax + option installed?

Wayne P. Staats
1941 16th St.
Cuyahoga Falls, OH 44223

I'm looking for a communications package for Holmes' VID-80 CP/M on a 64K Model III (in 80-column format). Also, does anyone have a screen dump program for the DMP-200 printer?

Roger Dessal
97 Stratton St. S.
Piscataway, NJ 08854

I have a Model III with a Modem II running under LDOS. I use the computer mostly for data base management with Profile III HD. I'd like to write a Basic program to access my Profile customer file via modem. The Model III cassette Basic

Program Listing 1. Screen dump routine for Graph Master.

```
890 FOR X=8 TO 127:SET (X,47):NEXT X
900 FOR LP=1 TO 16:REM LP = LINE BEING PRINTED
910 FOR PP=1 TO 64:REM PP = PRINT POSITION BEING PRINTED
920 CP=PEEK(15360+(OP-1)*PP):REM CP = CHARACTER ASCII CODE
930 IF CP=128 THEN CP=32:REM MAKE CP = A BLANK SPACE
940 IF CP>128 THEN CP=35:REM MAKE CP = A POUND SIGN (#)
950 LPRINT CHR$(CP);
960 NEXT PP
970 LPRINT
980 OP=OP+64:REM OP = COUNTER FOR SCREEN PEEK ADDRESS
990 NEXT LP
```

End

Program Listing 2. Modifications to NovaCalc for decimal point alignment.

```
1910 E=0:I=N:S1$=STRING$(12,32)
1960 IF I$="D" THEN 1972
1972 I$=L$M$(D$(R,C)) IF ASC MID$(D$(R,C),1)=32
THEN R$SET S1$=D$(R,C):GOTO 1960
1974 L$SET S1$=D$(R,C)
1980 LPRINT S1$;" ";
```

End

READER EXCHANGE

manual has a simple Basic terminal program; Radio Shack says this will run under LDOS if I don't apply any filters or drivers. I disagree. Not only could I not make it work, but Logical Systems says it would be difficult to do. Can anyone help?

Gregory Cannon
876 Broadway
New York, NY 10003

Error Trap

We published Program Listing 12 in "A La CRT" (March 1985, p. 58), but you might have had trouble finding it, since it's hidden inside Program Listing 11. Listing 11 ends with the line 19999 END. Listing 12 starts at line 20100.

—Eds.

The routine published under the heading "Student Special" in the May Reader Exchange (p. 27) contained a typographical error. Line 1030 should read:

```
1030 X2 = (XAND - 256)/256 'HIGH BYTE)
```

—Eds.

The April 1985 Debug section (p. 27) contained corrections to my program.

Finder ("Basic Changes," November 1984, p. 56). The correction is incorrect. An Exclamation point is missing from the seventh line of the Figure. The line should read:

```
DEFM 'HI!':DUMMY MODULE NAME
```

Raymond C. Boggs
4735 Feigley Rd. SW
Port Orchard, WA 98366

Central Coast Computer Club
2840 Halcyon Road
Arroyo Grande, CA 93420
Contact: Wes Porter

Tiger Clube
P.O. Box 23095
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Contact: S. Machado

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Three Rivers TRS-80 Users Group
4923 Blum Drive
Fort Wayne, IN 46815
Contact: Michael Milligan

Compu-80
Kasteelstraat 28
B-1800 Vilvoorde
Belgium
Contact: Bert C. Guffens

Program Listing 3. Modified fast scroll routine for the Tandy 2000.

```
65000 *
65010 * Fast list subroutine by E. R. Sargent
65020 * Modified from Text.BAS copyright 1984 Scott R.
Trent
65030 :
65040 LOCATE,,1
65050 SCROLL=&HFFF0
65060 POKE SCROLL,&HB0:POKE SCROLL+1,&H2 :REM mov al,2
65070 POKE SCROLL+2,&HB4:POKE SCROLL+3,&H0 :REM mov ah,0
65080 POKE SCROLL+4,&HCD:POKE SCROLL+5,&H10 :REM int 10h
65090 POKE SCROLL+6,&HCA:POKE SCROLL+7,&H0:POKE
SCROLL+8,&H0: 'ret 0
65100 CALL SCROLL
65110 COLOR 2
65120 END
```

End

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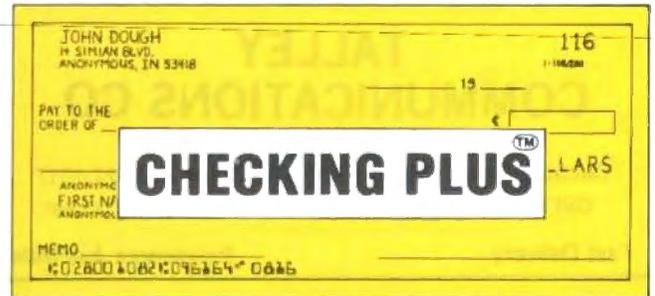
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This Year's Model: Tandy Intros the Model 200

by Terry Kepner

★★★★★

The Tandy Model 200 comes with 24K of RAM, a 40-column by 16-line display, and built-in software for a spreadsheet (Microsoft's Multiplan), calculator, Basic, word processing, telecommunications, scheduling, and address filing. Tandy/Radio Shack, One Tandy Center, Fort Worth, TX 76102. \$999. \$249.95 for each additional 24K RAM module.

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

Tandy's introduction of the Model 200 reminds me of when the Model III replaced the Model I: The Model 200 isn't so much a technological innovation as it is an upgrade of its predecessor, offering the same basic features with some real hardware and software improvements and a much better design.

The Hardware Differences

The Model 200 is almost exactly the same size as the Model 100 (8 1/4 inches deep by 11 5/8 inches wide by 2 1/8 inches high) except that it's slightly thicker. It weighs about the same, too (3 lbs., 13.5 ounces).

The Model 200's most obvious improvement over the 100 is in its liquid-crystal display: It shows a full 16 lines (the Model 100 has an eight-line display) integrated into a flip-up lid that makes viewing easier. When closed, the lid protects both the keyboard and the screen.

The display is still only 40 characters wide, (the same large size as on the Model 100) but this means that all Basic and many machine-language programs can use the same display parameters.

You can adjust the plastic lid to either of two angles with positive lock action. In addition to the same display angle adjustment that the Model 100 uses. The



Photo 1. The Model 200.

combination provides a wide range of viewing angles and also prevents the slamming syndrome.

Because the display no longer takes up space on the computer's main panel, Tandy rearranged the arrow keys into a diamond-shaped cluster and moved the on/off switch to the top left-hand corner of the keyboard. The F1-F8 buttons now sit centered above the keyboard and the four dedicated function keys (Break/Pause, Paste, Label, and Print) are on the far left, just below the power switch.

The repositioned on/off switch can cause a slight problem. As with the Model 100, you can use Basic's Power CONT command to disable the 200's automatic power shutdown. This normally turns off the computer if you don't strike a key within a set period of time (anywhere from six seconds to 25 minutes). If you disable the automatic power-off and close the display with the computer on, it remains on until your batteries wear out. Since you can't see the display with the unit closed, you don't know whether it's on or off.

Tandy has also removed the TELCOM modem switch from the outside of the unit—you now select the modem's orig-

inate/answer mode with your communications software.

Tandy repositioned the connectors for internal and external peripherals. The input/output bus port went from inside the case to the back of the Model 200 as a 40-pin connector (see Photo 3). Also, the two new RAM expansion sockets are conveniently located under a small plastic cover on the underside of the unit, accessible to add or remove RAM memory modules without opening the case. The same compartment contains the socket for adding external ROM.

Tandy also redesigned the battery compartment. It still takes four AA batteries, but they're arranged as two rows of two batteries each instead of four batteries side by side (see Photo 2). And you can now use rechargeable NiCad batteries (the Model 100 wouldn't accept some brands of NiCads because they didn't reach the connectors).

If you want to use NiCads in your 200, Radio Shack can modify it to use them exclusively. They'll set an internal switch that makes the AC power input recharge the NiCads. You can use NiCads until they need recharging and then plug the computer into its AC power supply and continue using it while recharging the batteries.

You have to make two trade-offs with NiCads: NiCads last only about 5 hours before you have to recharge them (which takes 15 hours), while alkaline batteries will last about 25 hours. And if you modify your unit for NiCads, you won't be able to keep regular batteries in the compartment when you plug the unit into an AC power supply.

The recharging could make them explode or split their sides and leak acid. You can still use regular batteries, but not in conjunction with the AC power supply. All the other ports (cassette, modem, RS-232C, bar code, and external

power) are the same as on the Model 100.

Memory

You can add two 24K memory modules to the Model 200. This is perhaps the most important difference between the two computers. The Model 100 had a maximum of 32K of RAM; the Model 200 has a maximum of 72K, organized as three 24K banks (the first is built-in).

The Model 200's (and 100's) central processing unit (CPU), the 80C85, can address a maximum of only 64K of RAM. Memory banking lets you substitute one 24K section of RAM for another, letting you transfer data from one bank to another using the internal registers of the CPU as temporary storage areas.

Unfortunately, you don't get to use the full 24K of each RAM bank, since the 200's ROM uses 5K as system RAM (for the LCD display, Basic variable pointers, keyboard buffer storage, menu map, and so on).

Any Model 100 programs that use ROM code routines won't work on the Model 200. Many machine-language programs for the Model 100 won't work for that reason.

You can expand the Model 200 ROM memory beyond 72K with a 32K ROM in the expansion ROM socket for a total of 104K. The expansion socket, like the ROM socket on the Model 100, does not accept standard 28-pin CMOS EPROMs (erasable programmable ROMs).

The Menu

The Model 200's function keys offer three new options from the main menu: Bank, Copy, and Kill. Bank swaps the different memory banks into position. Copy duplicates a file from one bank to one of the other two. And Kill removes a file from RAM, with a verification prompt so you don't delete a file accidentally. You select which file to copy or kill by positioning the cursor over the file name, just as if you were selecting a file for Text, Basic, or MSPLAN. Also, when you put the cursor over a RAM file name, the bottom of the screen tells you the size of the file in bytes.

Built-In Software

In addition to the five built-in software packages that come with the Model 100 (Basic,



Photo 2. The Model 200's battery slot (left) takes two rows of batteries, and the 24K memory expansion modules are easy to put in place.

The Star Ratings

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

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

The stars mean:

- ★★★★★ Superior;
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- ★★ Fair;
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The ratings terms translate as follows:

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

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

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

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



Photo 3. Relocation of the expansion bus to the rear of the computer makes connecting peripherals easier.

Text, Telecommunications, Schedule, and Address), the 200 provides two new programs, Multiplan and Calculator.

Multiplan

Multiplan is Microsoft's spreadsheet with many of the program's abilities packed into the 200's 32K ROM. Its biggest limitation is its restrictive 99 rows and 63 columns. I can think of several applications where you'd need more columns (such as a yearly sales projection analysis with 104 columns, two per week).

Moving the cursor around in Multiplan is similar to doing so in Text; you use the arrow keys by themselves or in combination with the shift and control keys. You assign

spreadsheet control functions (such as cell width, cell format, cell names, etc.) to function keys F1-F8. Selecting a function key leads to a new subset of functions, also selected with the function keys. You use control-C to exit from the function-selection mode.

You can exchange Model 200 Multiplan files with those you create on desktop computers through the RS-232 port or a modem. This is convenient.

Calculator

Calculator is a simple four-function math calculator you can call up regardless of the program you're currently executing (even when you're on-line with TELCOM or working with Multiplan).

You invoke Calculator by pressing the NUM and GRPH keys. The word "Calculator" replaces the top line of the display on the right. Any number you type in appears on the left-hand side of that line. Pressing the plus, minus, divide, or multiply keys will put that symbol beside the word "Calculator" in front of the number you're currently working with.

The arithmetic symbol defines Calculator's next operation: a plus adds the next number you type in, and a minus subtracts it. To return to your previous program, press the GRPH key.

Invoking the calculator in TELCOM mode could cause problems. While TELCOM won't disconnect, the LCD won't acknowledge or display any incoming data.

Basic

The Model 200's Basic is identical to the Model 100's, except for two additional com-

mands: POWER "hh:mm:ss", "mm/dd/yy", (file name), and VARPTR (file buffer). The Power command is a special alarm function; on the specified date and time, the 200 sounds an alarm and executes the indicated Basic program. You'll find this time-controlled, automatic operation useful for late-night automatic bulletin board system and electronic mail transmissions.

You can also use the alarm feature with the Note.DO file (in SCHEDL) to set up to 255 alarms, each displaying a one-line prompt when the alarm sounds.

The other new command, VARPTR (file buffer), gives you the starting memory address of the file buffer you specify for direct access to input data.

Basic programs that run on the Model 100 will run on the Model 200, except those that use ROM data. However, Model 100 programs can't use the 200's full 16-line display unless you modify them.

Text

While the 200's Text commands are the same as the Model 100's, the 200 offers a new List function and greater printing capabilities.

You can select a document's line length, left margin, page size, lines per page, and top margins. You can also control pagination for single-sheet paper or tractor-feed paper. Text may not be as fancy as Scripsit, but then again it requires no RAM.

One major improvement is the scroll feature on the larger screen. The Model 100 scroll was so slow it was painful; the 200's scroll is so fast you can't even read the file as it goes by.

The F4 key invokes the List function. List displays "records" that match a given character string. (List considers a record any text terminated with a carriage return: a word, a line, or a paragraph.) If you want to see each occurrence of a string, press F4 and type in the string. The 200 displays each occurrence of the string in a record. Press F3 for the next occurrence of the string, F4 to quit, or F8 to go back to the main menu.

Text still presents one major problem for people using non-Tandy printers: It doesn't send a line feed character with every carriage return. Tandy refuses to support their printer competitors. But someone will probably come up with a patch for this.

Telecommunications

TELCOM has some major improvements over its Model 100 brother. It still works through both the RS-232 port or a modem, in both direct and acoustic modes, but it offers four additional commands: You can select automatic line feed insertion with a carriage return,

originate or answer mode, tone or pulse dialing, and filtered ASCII character codes below 32 (except carriage return, line feed, tab, and XON/XOFF characters). TELCOM also has the ability to send a true break to host computers.

Schedule and Address

These two programs are essentially the same as their Model 100 counterparts, except that you can now edit files from within them. If you want to change something in a Note or Address file, you don't have to exit the program and go into Text. Just press the F4 button and you're there. When finished, press F8 to return to the menu, or press F4 to return to your called program (Schedule or Address).

Schedule, Address, and List are actually the same program with three names. The difference is that Schedule and Address can only use the files Note.DO and ADRS.DO, while you can use List with any text file.

Documentation

While the documentation for the Model 200 is better designed than that for the 100, overall it's harder to use and understand. Usually, Radio Shack improves their documentation when they upgrade a computer, but not this time.

The documentation comprises five small booklets: the Basic reference guide, the Multiplan manual, the TELCOM manual, a quick-reference chart, and an owner's manual. Each manual comes in a 5½- by 8¼-inch spiral-bound booklet. The two references are smaller, measuring 6 by 4 inches.

The only good part of the documentation is the Basic reference, which is better organized and provides more detail on Basic operations than the Model 100 manual's section on Basic. While the manual lists commands for input/output with the rest of the Basic commands, it provides a table of device statements and functions organized according to the device used. For example, all the commands relating to input and output of RAM files appear under the RAM heading. Of course, some commands show up under more than one heading, but this one table has all the information on which commands go where. This is much easier to use than the Model 100 quick-reference booklet.

Unfortunately, the rest of the manuals and the other reference guide leave much to be desired. The Multiplan manual is poorly organized, although it does teach a novice how to use a spreadsheet. Its worst problem is that it doesn't have a command tree chart showing the relationship between the various functional commands and their subsets.

Also, the instructions for entering data into Multiplan are given in the owner's manual, while explanations, examples, and tutorials are in the Multiplan book. You can't just use the Multiplan booklet to get started. You must first read the pertinent section of the owner's manual, then switch to the Multiplan booklet.

I found the TELCOM manual especially difficult to use. You would expect to find details on how to set the RS-232 and modem parameters at the beginning. Instead, the first five chapters deal with subscribing and connecting to various public computer services. Before I log-on, I want to make sure the modem parameters are properly set.

The quick-reference guide is actually a reference guide to Multiplan commands and functions, with summaries of the other Model 200 application programs added for good measure. While the booklet comprises only 22 pages, 14 cover Multiplan commands.

The owner's manual gives you the information that doesn't fit into the other booklets: the I/O port information, physical data, how to get started in the different modes and with various peripherals. For beginners it presents just enough information to get you started and not a bit more.

The documentation's saving grace is the size of the manuals. They all fit in the pockets of Radio Shack's Model 100/200 Carry Bag. The only problem with the Carry Bag is that its security strap barely fits over the Model 200. If you don't have the Carry Bag, get it. You'll find it worth the money.

Summary

Like the Model 100, the Model 200 is perfect for the beginner. You don't have to spend hours learning how to use it before beginning any serious work. It's also perfect for field work, since you don't have to have an ac power supply or batteries the size of a small suitcase. The memory may not be as large as a desktop computer, but field notes or rough drafts don't require a lot of room. And the extra memory banks are a big help.

Which is the better buy, the Model 100 or the 200? The Model 100 is inexpensive, and the current availability of 64K RAM memory upgrades and spreadsheets in expansion ROMs give it a lot of capability. The only real advantage with the Model 200 is in its extensive built-in software and the larger screen. If you require a true break capability in TELCOM, an extended alarm feature, or the larger 16-line display, then the Model 200 may just be the machine for you. If the extra features aren't that important, you might do better to upgrade a Model 100. The price will be about the same. ■

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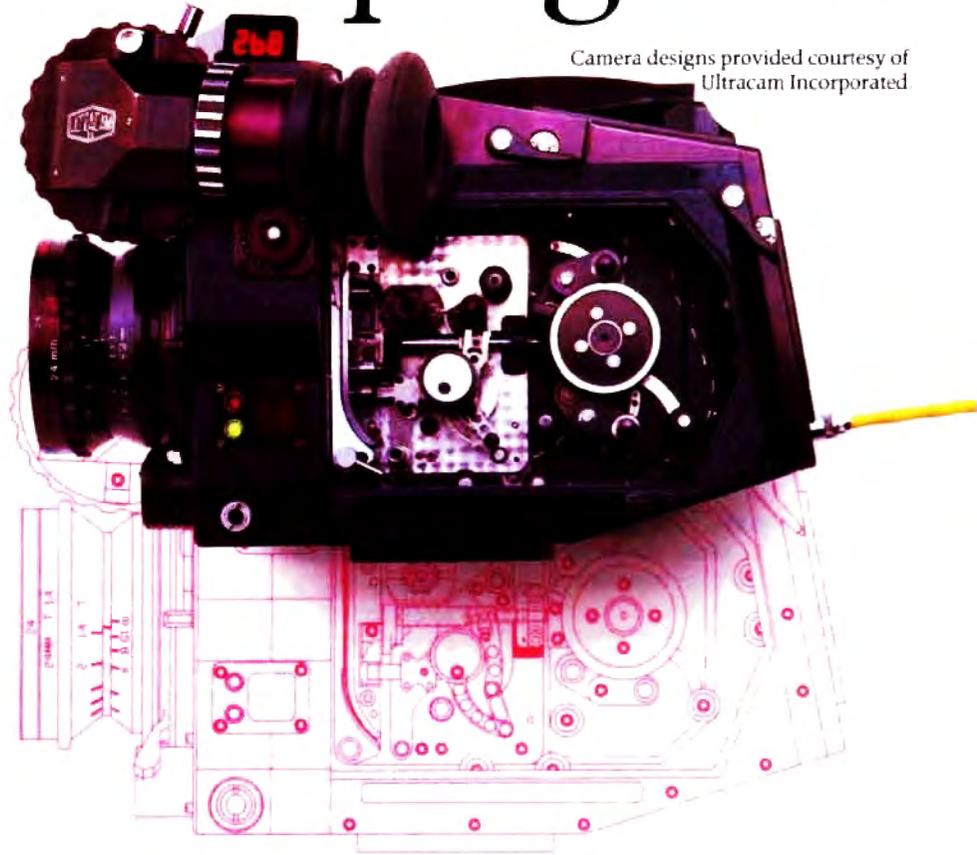
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COUNTERPOINT

How does the Model 200 stack up? Here are my impressions after a month of using one.

Text is still a simple cut-and-paste editor, but it's an improvement over Model 100 Text because you can set right margins and skip paper perforations when you print out. The 200's 16-line by 40-character screen is certainly easier on the eyes, though it's still smaller than a conventional display. Any major writing project will require a formatting program, such as WRITE+, for double-spacing, indenting, and so on.

The built-in TELCOM program, which more than adequately gets me onto MCI Mail and CompuServe, is now smart enough to disconnect when it loses the carrier. I can also exit TELCOM, kill a file or two, and reenter the program, all without having to log out from the remote computer.

Journalists who liked the Model 100 will love the 200. It's a natural for managers who need an occasional spreadsheet but who can't afford room for a desktop. And a student armed with a cassette recorder, WRITE+, and a small printer can bang out term papers more easily than with an Apple or IBM, since the 200 can go to the library.

Most of us wish that Tandy's new computer were IBM compatible with a bigger screen, a sort of half-price Data General One. But batteries to power several hundred kilobytes (at 16 bits each) weigh a lot. And have you ever tried to read one of those large-screen LCDs? I'll stick with the Model 200's 16-line by 40-column display, thank you.

—Carl Oppedahl

I was at first disappointed by the Model 200. The rumors of an 80-column LCD made the announced 40-column by 16-line screen an anticlimax. But now that I've tried it, my impression has changed.

My biggest problem with the Model 100 screen was its lack of continuity when reading text files. The 200's bigger screen does a good job of correcting this by displaying enough text to adequately review documents.

Other welcome features are the changed layout of the function and arrow keys, an on/off button above the keyboard, fully accessible RAM sockets, and the external bus relocated from the bottom of the computer to the back.

The Model 200 display time and scroll speed is almost three times as fast as the 100's because of the 200's much-improved video driver. But Text's select and paste functions are much slower.

Tandy added three additional parameters to the TELECOM STAT command: You can elect to ignore control codes 0-31, you can force line feeds with carriage returns for incoming data, and you can set the modem in originate or answer mode.

Radio Shack will modify the hardware of the 200 to use rechargeable batteries, which decreases the voltage level required to match the lower voltage output of NiCada. I've used NiCads with my Model 100 for over a year now without any kind of a modification. I tried a set of freshly charged NiCads in the 200. While they appear to work, I don't know how long a charge will last.

—Thomas L. Quindry

Since the Model 100 was introduced in the spring of 1983, portable computer users have been waiting for Tandy's upgrade to their popular laptop. After almost 2 years of anticipation, I'm disappointed with the Tandy 200.

True, Tandy heeded the comments of Model 100 users. They added more memory and a larger screen, replaced the line of cursor keys with the cursor diamond, and fixed some of Text's deficiencies. But it still falls short of what I expected. The keyboard has a loose, clacky feel to it that makes it seem cheap. Even the rearranged function keys are more bother than an improvement.

My impressions of the Tandy 200 aren't all bad, though. Multiplan in ROM is a great addition to the 200's firmware. And the additional controls in TELCOM make it much more efficient.

Nonetheless, in a world that offers a wide variety of laptop computers, the Tandy 200 is not a standout in terms of advanced technology or expanded features. It is, however, a machine with a solid background. It offers standard and usable firmware at a price that beats all its competitors. It's just not very exciting when you consider the advances made in portable computers since the Model 100 came out two years ago.

—Bradford N. Dixon

PFS: File and Report Made For Each Other

by Mark Goodwin

★★★★★

PFS:File and Report runs on the Model 4/4P (64K). File requires one disk drive and Report requires two. Tandy/Radio Shack, One Tandy Center, Fort Worth, TX 76102. File is \$124.95. Report is \$99.95.

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

While Tandy markets PFS:File and Report as two separate packages, taken together they make for an impressive data base management system. File and Report support numerous advanced features, including full-screen data entry and editing, hard disk drive data storage, reformatting data base files, and printing complex reports, among others.

Running either File or Report is simple. Both automatically load many of TRSDOS's system overlays into high memory, so neither requires an ancillary system disk. This greatly increases the amount of disk storage available for the data base files, and increases the system's execution speed during disk input/output.

PFS:File

You set up and maintain your data base with File. It presents you with a menu of seven options to design, add, copy, search/update, print, and remove records, and to exit the system.

Your first step is to design a file. As with other data base management programs, File breaks up every data base into individual records. It further splits these records into fields.

Unlike other programs, however, File doesn't require that you specify field length or type. Instead, you design a form for each record just by inserting the fields' headings at whatever position on the screen suits you. That's the advantage of a full-screen editor—you can permanently format a screen using the cursor to set up fields. And since File supports records of up to 32 pages, record length is virtually unlimited.

Once you design the record format, you enter information into the data base. Select the menu's Add option and enter the desired information. Besides entering information within the limits of the data base's form, File lets you dynamically add pages to a record's form without having to redesign it. This is analogous to stapling an extra piece of paper to a data sheet.

Once you add records, you can display

or edit them with the search/update mode. If you want to search or update only a few records (rather than the entire data base), you can select the records by partial string, wildcard string, numeric value, or relational combinations. Once you supply the search specifications, File retrieves each matching record one at a time. When File pulls a record, you can edit or delete it.

In addition to the search/update mode, File provides modes to copy, print, and remove records from the data base. Like search/update, you can perform these operations on either the entire data base or selected records. File's copy mode not only lets you copy records from the data base, but also permits copying the design of the data base's forms. This can be handy if you need to design a new form for another data base similar to one on file.

If necessary, you can completely redesign a data base's record to delete fields that you seldom use or to add new ones that might become necessary in the future. A few restrictions limit redesign options: you may need two disk drives and you can rewrite records only in four-page increments. Also, redesigning a form can be time-consuming.

File's weakest feature is its Print mode, because it allows only printouts within the limits of the data base's form design. You can specify whether or not you want the field headings printed, which fields you want printed, and whether you want the fields printed on their own lines or on the same line as another field. While you can use the print mode for listing the data base's information and for simple tasks like printing mailing labels, it's inadequate for all but the most elementary tasks. The print mode's only good feature is that it can send the output to any TRSDOS device or to a disk file.

PFS:Report

Since File's print mode is so limited, you really need Report to complement it. Report generates complex printouts from records in File's data base. It prints the reports in a horizontal format with each field assigned its own column.

The first step in printing a report is to specify the records of interest. As with many of File's modes, you can print a report for either all the records or a few selected ones. You have to specify the report's title, the output device, the number of lines per page, and the page width.

The printout format Report uses is quite simple. Each report can contain up to 16 columns. Report can do a multilevel sort on the first two columns of each report, and you can sort columns either alphabetically or numerically. If you don't want a sorted report, you can leave the first two columns blank.

While Report sorts fairly fast, you can

The manuals present many clear-cut examples.

print unsorted reports much faster. Also, you must supply other information about the report's format: alphabetic columns, numeric columns, averaged columns, subtotaled columns, totaled columns, and page breaks.

Besides printing the information in a data base, Report allows up to three derived columns per report. A derived column is one that gets its data by performing specified calculation on other columns within the report.

You create a derived column by using a numeric formula on other columns within the report. When constructing a formula, Report allows the four basic math operations: addition, subtraction, multiplication, and division. Formulas are generally evaluated on a strictly left-to-right basis without regard for one operator having precedence over the other. But Report does permit the use of parentheses to manually specify precedence.

If you want to use certain report formats over again, you can save them to disk and later recall them. Normally, Report uses a field's heading as its report column heading. However, you can specify substitute report headings. As with report formats, you can save substitute report column headings on disk for future use.

Documentation

I found the File and Report manuals easy to understand and liberally illustrated. Also, the manuals present many clear-cut examples that quickly instruct you in all phases of operation. In addition to covering the data base management system, both manuals provide various appendixes: error messages, control keys, disk storage capacity, useful TRSDOS commands, and using the programs with a hard disk system. Both manuals are rounded out with adequate tables of contents and very detailed indexes.

Conclusions

File is a superior program for someone needing a data base management program for on-line data referencing. But it needs Report to produce truly useful printouts. As a combined system, File and Report deserve to be ranked as one of the best Model 4 programs available. While these programs were originally written for other computers, the authors used all of the Model 4's advanced capabilities in writing File and Report. ■

BEEP Bolsters Basic by Hardin Brothers

★ ★ ★ ★

BEEP runs on the Model 4/4P (64K) under TRSDOS 6.2 and requires one disk drive. Logical Systems Inc., 8970 N. 55th St., P.O. Box 23956, Milwaukee, WI 53223. 414-355-5454. \$49.

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

The version of Basic that came with the Model 4 was a shock. Many of the features that Model I/III owners had come to think of as a normal part of Basic were no longer available. Abbreviations weren't supported and it was more difficult to move and copy lines. BEEP (Basic Enhancement and Extension Package) adds these features to the Basic distributed with TRSDOS 6.2.

Installation and Use

BEEP adds 13 enhancements and extensions to Basic 01.01.00. First, you can abbreviate the most common Basic programming commands; also, you don't have to include spaces after these abbreviations.

The second set of BEEP enhancements are immediate keys which should feel familiar to Model I/III users. Any of six keys typed in as the first character of a Basic command line will take affect immediately (you don't have to press the enter key). The six immediate keys include the four arrows: the down-arrow lists the next line of a program; the up-arrow lists the previous line; the left arrow lists the first line of a program; and the right arrow lists the last line.

The other two immediate keys, the period and comma, work the same way as they do in Model III TRSDOS. The period lists the current line, and the comma starts editing the current line.

BEEP also includes two commands found in only a few Model I/III Disk Basics. M moves a Basic line from one part of a program to another; C copies a line to another location in a program.

BEEP adds one additional enhancement to Basic that is not immediately obvious. It loads and saves tokenized programs more quickly.

My only complaint is that BEEP does not go far enough. I would have liked to see other abbreviations, labeling features, and Basic and DOS utilities. But, BEEP doesn't take up any extra room on your disk. BEEP is a welcome addition for Model 4 TRSDOS owners. ■

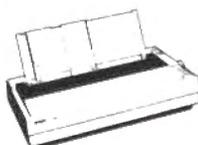
Continued on p. 113

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You can copy BASIC, PASCAL, FORTRAN, C, or other high level language programs, and run them with little modification, unless they make extensive use of graphics, or have machine language calls. CNVBASIC/CMD, available separately, will make most of the syntax and spacing changes required for converting Model I/III BASIC programs for use on other systems. Data files, spreadsheet files, and text files can also be usefully moved between machines. If you use or have the same Visicalc or Multiplan on the TRS-80, you can use the same files on other machines! These spreadsheet files are directly convertible to 123 and other calc-type programs. Of course, the combinations and possibilities are endless, and the flexibility is ALL there with SuperCROSS/XT!

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Wesley

You need to know two things about computer bulletin boards before you pick up your phone and start dialing away:

1. Hundreds of informative and entertaining BBSes are now available.
2. You could very well die before you find them.

The problem with accessing bulletin boards is that most BBS phone lists are outdated before the ink is dry. Many of the numbers listed aren't valid, or have been changed, or are wrong. And many boards are no longer operating.

More important, most lists don't tell you about each board's focus. Calling a BBS is often like going to a movie you've never heard of—you don't know what to expect. It might appeal to your interests, but chances are it won't.

To help you out, we surveyed the thousands of boards currently operating, and came up with a list of those we found most interesting and useful.

How to Pick a Board

The type of board you'll choose to frequent depends on your needs. BBSes fall into three general categories:

- **Local boards.** These are usually for the immediate community and often include want ads, local news, and general messages. Most are for computerists with all types of machines, and serve as an exchange for general computer-related information. Their advantages are that they can put you in touch with people in your area who have similar interests, and you won't get a big long-distance phone bill every month.

- **System-specific boards.** You'll find these mostly in larger urban areas with enough users of a particular microcomputer to support a board dedicated to their interests. These can range from simple message systems (like the Wilmington-80 BBS) to boards with extensive data base files (like the TCUG board in Washington, D.C.). If you don't live near such a board, the data

base files and technical expertise of other users can justify membership and the cost of a weekly call.

- **Special-interest boards.** These are devoted to a particular interest, often not computer-related, such as amateur radio or photography. They can also be for the employees of a particular company or users of a specific product. Many computer and software manufacturers have boards.

Now for Our Choices

After a two-week orgy of calling somewhere around 500 BBSes, we chose to highlight the following systems. We could easily have called another 500, but we had to draw the line somewhere. We therefore recognize that we've most likely missed some good boards. If you have one you particularly recommend, let us know.

Our criteria for choosing a board were simple: Was it useful and did we enjoy it? You'll find a range of BBSes in this list, from one-drive systems with limited data bases to large national boards with registration fees. Some provide highly useful information and programs, others are just for fun. Most have been around for a while, have friendly and cooperative sysops, and are easy to use. (While many of the boards use homebrew software, a number run with commercially available and public-domain programs; the Table provides a list of such software.)

Finally, on p. 41, you'll find a complete list of BBS numbers from around the country. If you don't like our choices, maybe you can find something there that's more to your taste.

by Bradford N. Dixon and Eric Maloney

80 takes a look at some of the more unique bulletin boards around and gives you the penultimate BBS guide, with over 1,850 listings.

On the Boards

| Software | System |
|-------------------------------|---|
| AMIS | Atari. |
| ABBS | Apple. |
| Bullet-80 | TRS-80 Model III. A first generation system. |
| CBBS | Many systems. See CBBS Chicago in main text. |
| Commnet-80 | TRS-80. Another older system. |
| Conference Tree | General interest. Very difficult to use; we avoid them. |
| Connection-80 | Mostly TRS-80, although we ran across some IBM PC Connection-80's. |
| FidoNet | IBM PC. Started out as an experiment in packet-switching; users can send messages to other FidoNet boards. |
| Forum-80 | TRS-80 Model III. Another golden oldie. |
| Greene Machine | TRS-80. Based on the Radio Amateur Telecommunications System (RATS). Original board in Atlanta is still running (404-972-7947). |
| Kandy Shack | Based on Greene Machine system. Headquarters is in Riverside, CA (714-354-8004). |
| TBBS (The Bread Board System) | TRS-80, MS-DOS, CP/M. Second-generation system, much more powerful than Bullet-80 or Forum-80. Originally for TRS-80s, but many TBBS boards are general- or special-interest. |
| Towne Crier | Saturday Software's dirt-cheap TRS-80 system. |
| RBBS | IBM PC. |

Table. Commercial and public-domain software for BBSes.

Astronomer's BBS

Titusville, FL
305-268-8576

Sysop: Not available. **Hardware:** IBM PC. **Software:** RBBS.

If you're serious about astronomy, this is the BBS for you. Its affiliations include the Coalition to Achieve Non-Detrimental Lighting (CANDL), the Central Florida Astronomical Society, the Southeast Region of the Astronomical League, the Independent Space Research Group, and the International Amateur/Professional Photometric Photometry Association.

The board features an extensive data base of astronomy-related programs and text files, as well as data bases for astrophotography; communications; math, science, engineering, and ham radio; finance, stocks, and management; graphics; Pascal; and variable stars and novae. Computer-related material is mostly for MS-DOS machines.

Bullet-80 Headquarters

Anaheim, CA
714-530-4765

Sysop: Joe Simon. **Hardware:** Model I with three drives. **Software:** Bullet-80.

Like Forum-80 (see below), Bullet-80 is a first-generation system that now seems a bit antiquated. Many Bullet-80 boards work on Model I's and IIIs with limited storage, thus restricting the number of files available for downloading. What they lack in sheer power, though, they make up for in simplicity and ease of use. And just as important, they tend to be TRS-80 specific, which is rare in a world dominated by IBM and Apple. This is the original Bullet-80 system, up since 1978, and is run by the software's author, Joe Si-

mon. It includes a classified ads section (it features everything from CP/M cards to Mustangs to bullwhips), a message board, and a modest data base of TRS-80 programs (registration required; see Photo 1).

Bullet-80s have dwindled in number and don't provide the services of more recent systems. But if you're a Model III/4 owner and have one in your area, we recommend you check it out.

CBBS Chicago

Chicago, IL
312-545-8086

Sysops: Ward Christensen and Randy Sues. **Hardware:** North Star Horizon, hard disk. UDS 212A/D modem, Scitronics clock board. **Software:** CBBS.

Many folks call Ward Christensen the father of BBSes. This is his original board, now over seven years old. It's not for the faint-hearted; it's for the "more advanced, technical hobbyist." Suggested topics include C, Assembly language, artificial intelligence, programming techniques, and communications, with a special emphasis on CP/M, MS-DOS, and Unix operating systems. This is a message system, and it has more messages than you could read in a day (see Photo 2). While much of the material doesn't relate directly to TRS-80s, the users of this board possess a wealth of technical expertise, and many of the exchanges should pique the experienced computerist's curiosity. Even if you're a novice, you'll find the Chicago CBBS interesting and informative.

One important note: The possibility exists that the board has changed its phone number by the time you read this. If you can't get through, try calling 312-849-1132.

CBBS/BECS (Boeing Employees' Computing Society)

Bellevue, WA
206-772-3134

Sysop: Bill Hunter. **Hardware:** S.D. Systems system with two 8-inch double-sided, double-density drives, Heath H19 terminal, U.S. Robotics Autodial 212A modem. **Software:** CBBS.

This is a fine example of a BBS set up for company employees. While it's primarily for BECS members, "others are welcome to use the system in moderation as guests." We like the message board—it's casual but has lots of good information. The last time we were on, topics included software quality control, RS-232 technical specs, Ada, Forth, Pascal, and Unix. We also saw lots of equipment for sale. The download section includes mostly MS-DOS software.

Cleveland Forum-80

Cleveland, OH
216-486-4176

Sysop: Ray Furlong. **Hardware:** Model I with one drive, Penrel DCD modem. **Software:** Forum-80.

A Model I with one drive! That was enough to persuade us to include this board.

Forum-80s are a dying breed, perhaps because of their limited capacity, but they're enjoyable and useful. We like this one because of its openness and relaxed atmosphere. It also has a number of useful files in its 57-item data base. These include PPL/BAS, a professional program lister; Terminal/BAS, a Model III Basic terminal program; The Creator, Bruce Tonkin's program generator; MICROHIS/TXT, an essay on the history of the microcomputer; Compress/BAS, a program compressor; Tollfree/TXT, a list of manufacturers' toll-free numbers; and SIXTWO/TXT, an explanation of the differences between TRSDOSes 6.1 and 6.2.

COMMNET-80

Riverside, CA
714-359-3189

Sysop: Stephen A. King. **Hardware:** Model I with three double-sided, double-density drives, Bell AR-212/L1A modem. **Software:** COMMNET-80.

This is one of six COMMNET-80 systems. It's modest, but is one of the friendlier boards we ran across. It requires no registration or fees, and has no time limits, except in the game section. The data base includes 90 programs for downloading, with an emphasis on Orchestra-80/85 files. Some of the programs include Startrek; NOBUGMSG, a pre-log-on text writer by Ray Furlong; NWPROMPT, a NEWDOS/80 prompt customizer; Menu, a menu program; Change, a password changer; and SYSTST, an LDOS utility for checking the integrity of LDOS system files.

The games are mostly commercial interactive fiction, and change monthly.

Other COMMNET-80 systems are in Ak-

ron, OH (216-645-0827), Las Vegas, NV (702-870-9986), North Wales, PA (215-855-3809), Riverside, CA (714-877-2253), and Wichita Falls, TX (817-767-5847).

GASNET (Get-Away Special Net)

Greenbelt, MD
301-344-9156

Sysops: Bob Pincus and Clarke Prouty.
Hardware: North Star Horizon with three drives. **Software:** Highly modified Microstuff program.

GASNET is run by the National Aeronautics and Space Administration (NASA) at the Goddard Space Flight Center to provide "current shuttle, GAS, and space information." It includes a message board; lists of active payloads, current GAS flight assignments, and GAS payload reservations; space shuttle news; and information on the Spartan programs.

This board provides a great deal of information for those interested in what's happening with the space program. We learned, for example, that NASA will be watching Halley's Comet from a free-flying payload to be released from the space shuttle next January. We also found out that GAS payloads are being sponsored by General Electric, Penn State, New Mexico State, St. Mary's Hospital, Datsun, the Los Angeles State Department of Education, and the Booker T. Washington Middle School.

The Good News BBS

Plymouth, MI
313-459-8375

Sysops: Paul and Donna Sockow. **Hardware:** Model I with three drives. **Software:** L.D. Systems.

This board originated "from a sincere desire on our part to use our home TRS-80 computer for the honor and glory of the Lord." A number of such boards exist around the country, some more strident and didactic than others; this one seemed a bit more relaxed than most. If you're born again, you'll appreciate such essays as "Response to Homophobia," "101 Uses for a Dead (or Alive) Baby," "Evolution—Religion or Fact," and "Let Me Live" by Pat Boone. If you're not, you might find some food for thought in such pieces as "Dungeons and Dragons—Concerns for the Christian."

Good News also has a download section of secular TRS-80 utilities and programs.

Computers for Christ in San Jose, CA (408-997-2790) is another Christian board worth checking out.

Ham Radio Net

Newington, CT
203-665-1114

Sysop: Ed Raso. **Hardware:** IBM with 10-megabyte hard disk. **Software:** FidoNet.

Ham Radio Net is devoted to all "aspects of amateur radio." It includes electronic editions, past and current, of the ARRL (American Radio Relay League) Newsletter; Gateway, the ARRL packet radio newsletter; and the W5YI Report. Its data

base sections include GST (GST program files), Packet (packet and RTTY), and Ham (general ham radio), as well as a text file that contains the newsletters, general class rules and regulations, questions for hams taking licensing tests, bibliographies of IBM PC and amateur radio magazines; and a complete list of FidoNet BBSes (nearly 400 of them). If you're an amateur radio enthusiast, you won't get bored on this board.

Other BBSes relating to amateur radio are in Fairfax, VA (703-734-1387), Dallas, TX (214-223-0983), Shreveport, LA (318-688-7078), Billings, MT (406-256-8717), Gaithersburg, MD (301-926-8187), Poughkeepsie, NY (914-485-3393), Upper Marlboro, MD (301-350-1299), Selah, WA (509-697-7298), Duluth, MN (218-525-1788), Seattle, WA (206-285-3040 and 206-367-6053), Anchorage, AK (907-243-0324), and Merrimack, NH (603-424-5497).

Wilmington-80

Wilmington, NC
919-392-5560

Sysop: Mark Samwick. **Hardware:** Model 4 with four drives. **Software:** Modified Greene Machine/RATS.

Noteworthy because it's the only bulletin board we found being run by a Radio Shack Computer Center. It has modest message base and download sections, and seems primarily to be operating as a service for the store's customers.

MEIE (Microcomputer Electronic Information Exchange)

Washington, D.C.
301-948-5718

Sysop: Ted Landberg. **Hardware:** IBM PC XT. **Software:** RBBS.

The MEIE BBS is run by the Institute for Computer Sciences and Technology



Photo 1. Files for downloading on the Bullet-80 board in Anaheim, CA.



Photo 2. A sampling of messages on the CBBS board in Chicago.

(ICST) at the National Bureau of Standards (NBS) to distribute information about microcomputers. Since a government body runs this BBS, you might expect it to be a bit stuffy. Well, it is. But it has a lot of useful material, most notably in the file subsystem, which includes information on ICST programs and activities, user's groups, and federal training programs, as well as a section for the Computer Performance and Evaluation Group. It also has an invaluable list of federal publications relating to computing. And finally, the board has a message section with discussions of various microcomputer systems, questions about software, and tips.

We found three other government BBSes: the General Services Administration board at 202-566-0660, the ICST Data Management BBS at 301-948-2048, and a U.S. Geological Survey BBS at 703-860-7894.

Production World

San Mateo, CA
415-571-6160

Sysop: Wes Dorman. **Hardware:** IBM PC. **Software:** RBBS.

This BBS bills itself as a service for the video, motion picture, photography, and audio industries. It includes a professional services directory, classified section, and on-line discount catalog of computer products. It has a limited data base of programs.

PSINET

Denver, CO
303-722-6210

Sysop: William Tedder. **Hardware:** Model III with four drives. **Software:** TBBS.

Run by the Parapsychology Information Network, PSINET is for those with a serious interest in psychic phenomena. Features include a Premonitions Registry; Dreamnet, which includes an interactive program to help you interpret dreams; on-line ESP and psychokinesis tests; personal accounts of psychic experiences; and extensive lists of literature and organizations.

If you want to get really depressed, leaf through the Premonitions Registry, in which people describe their premonitions and predictions. Most of them start off with something like, "I'm standing in downtown Washington, D.C. An ICBM with an H-bomb lands just on the other side of the building from me." Real uplifting stuff.

SF Writers' Network

Winston-Salem, NC
919-922-3308

Sysop: David Dalton. **Hardware:** Model 4 with two floppies and 10-megabyte hard drive. **Software:** TBBS.

Don't let the name fool you: This is not just another wacked-out SF/fantasy board inhabited by Trekkies and space cowboys. In fact, it's one of the most literate and intelligent boards we ran across, due, no



Photo 3. One of the menus on the SF Writer's board in Winston-Salem, NC.

doubt, to the fact that sysop David Dalton is a newspaper editor (as well as an 80 Micro reviewer). It should interest even those who are not sci-fi buffs (see Photo 3).

The board's most interesting features are an on-line novel called *Strange Particle People*, news commentaries on topics like "Does Electronic Mail Make Us Eloquent? Or Mean?," and technical papers with titles such as "Mysteries of Data Communications: Some Answers to Frequently Asked Questions" and "Schrodinger's Cat: A Bit About the Weirdness of Quantum Mechanics."

We also found an index to 80 Micro articles, a TRS-80 SIG, and a list of important Tandy service numbers.

What struck us the most, though, was the quality of the message board. The folks who come here are witty and have something to say about a broad range of topics.

Soft Horizons

South Dennis, NJ
609-861-2098

Sysops: Dan Keen and Dave Dischert. **Hardware:** Model III with Model 2000 drives. **Software:** TBBS.

This is an expanded electronic version of *Soft Horizons* magazine, a modest, 20-page bimonthly that covers the Model 2000 and Tandy's other MS-DOS machines. It includes all issues of *Soft Horizons*, as well as a message board and classified section. To access the magazine text files, you need to pay a \$10 subscription fee. (The paper version is \$20 a year.)

To give you an idea of what you get: The December/January issue included a site survey program for satellite TV, a Model 2000 orbital simulator graphics program, a Model 2000 clock display program, reviews of IBM PC and Model 2000 Basic compilers, and a column on C programming.

Keen and Dischert will be familiar to some 80 Micro readers: they wrote our Suite 16 column for the Model 16.

Southeastern Software and Message Exchange (SESAME)

Raleigh, NC

919-737-3990

Sysop: Wayne Cornelius. **Hardware:** IBM PC. **Software:** RBBS.

SESAME is a service of the Southeastern Cooperative Wildlife and Fisheries Statistics Project. Its goal is to disseminate "software and computing wisdom of interest to Wildlife and Fisheries professionals." The emphasis is on statistics; a typical message reads something like "I would like to find a program to separate polymodal size frequency distributions into cohorts." The data base includes a number of statistics programs, mostly for MS-DOS machines, although we also found one for the Model 16.

While the board is open to anyone, professionals have higher priority access. A Professional SIG includes sections for the American Fisheries Society, wildlife and forestry management, and fishery management.

TCUG (Tandy Computer Users Group)

Washington, D.C.
703-836-0384

Sysop: Ronnie Bell. **Hardware:** Lobo Systems Max-80, two 8-inch disk drives, three 5¼-inch disk drives. **Software:** CompuCenter written by Roger Fujii and Gary Godfrey under LDOS.

TCUG sponsors an informative and interesting BBS. It makes all callers feel welcome, while encouraging nonmembers to join the group by sending annual dues of \$25.

The board is divided into SIGs, called conferences, for discussions of most Radio Shack computers. When we logged on, TCUG was polling callers on the viability of a Model 4 conference. The message bases are active with discussions of programming tips, bugs in software, and reviews.

Far and away, though, the most impressive feature of the board (and the user's group) is the software library. Membership gives you access to the club's library of about 70 5¼-inch disks of software, primarily for the Models I and III. The club also has Model 100, Coco, and CP/M programs. When we called, the group was building a software library for Tandy's MS-DOS machines. Even if you're not a member, you can find out what programs are available by checking the board's indexes of selected library disks. ■

Bradford N. Dixon and Eric Maloney are on the 80 Micro staff.



Legend

Table with 2 columns: Abbreviation (CN, FN, GM, HC, MN, NW, TC) and Description (Comnet-80, FidoNet, Green Machine, Hostcomm, Mouse-net, NetWorks, Towne Crier). Includes a note: 'Not a 24 hour board'.

Table listing BBS locations in Missouri (417) and Missouri (816). Columns include location name, address, and phone number.

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Table listing BBS locations in New Jersey (609). Columns include location name, address, and phone number.

Table listing BBS locations in New Mexico (505). Columns include location name, address, and phone number.

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Table listing BBS locations in New York (212). Columns include location name, address, and phone number.

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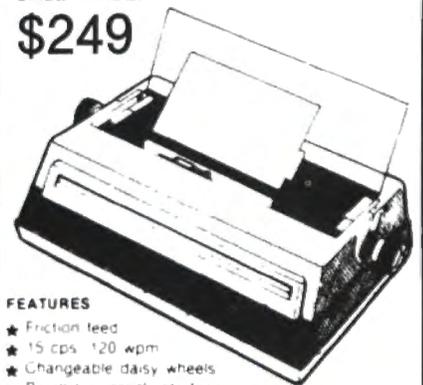
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| Legend | |
|--------|---------------------|
| CN | Comnet-80 |
| FN | FidoNet |
| GM | Greene Machine |
| HC | Hostcomm |
| MN | Mouse-net |
| NW | NetWorks |
| TC | Towne Crier |
| . | Not a 24-hour board |

| | | |
|--------------------------------|--------------|----------|
| Dats Jockey Fido | Seattle | 943-0909 |
| TUG BBS | Seattle | 943-0723 |
| Acadix | Seattle | 944-2528 |
| Health RBBS | Seattle | 982-5215 |
| Seattle (RBBS) | Seattle | 723-2452 |
| Forum-80 | Seattle | 723-3082 |
| CEL-COMM-1 | Seattle | 725-9413 |
| Puget Sound RBBS | Seattle | 743-0182 |
| The Mystic Plains | Seattle | 743-0293 |
| NWPCUG Edmonds | Seattle | 743-0021 |
| Inform * | Seattle | 745-8960 |
| Final Frontier | Seattle | 747-4735 |
| Minibit S.J. IMS | Seattle | 752-5141 |
| Seacom-80 | Seattle | 763-8879 |
| Kingdom of Seven | Seattle | 767-7777 |
| Nipple | Seattle | 771-9319 |
| CBBS/BECS | Seattle | 772-3134 |
| PC Board | Seattle | 778-1940 |
| Pratas of Puget Sound | Seattle | 783-9798 |
| Invisible Seattle * | Seattle | 784-7895 |
| Second System PPS | Seattle | 784-9776 |
| Lost City of Astoria | Seattle | 821-2802 |
| The Classifieds | Seattle | 821-3168 |
| Tele-Travel | Seattle | 823-8001 |
| Nocturnal Night | Seattle | 824-5215 |
| Wayne's Mail | Seattle | 824-7277 |
| Unnamed BBS | Seattle | 824-8598 |
| System 80 | Seattle | 827-0346 |
| Adam's Ribbe | Seattle | 828-3197 |
| Arise Super 8 | Seattle | 838-3532 |
| Nightmare | Seattle | 839-3415 |
| Dis-Your-Match | Seattle | 839-4759 |
| Space | Seattle | 839-9323 |
| Terminal Connection * | Seattle | 852-8598 |
| Bongoland | Seattle | 852-9375 |
| Underground | Seattle | 856-9043 |
| Access | Seattle | 874-3792 |
| Lost Citadel | Seattle | 874-4115 |
| Tiger's Lair | Seattle | 874-5551 |
| Amarron | Seattle | 878-2885 |
| Exocult | Seattle | 881-0749 |
| Bandit's Harbor | Seattle | 881-1215 |
| Sundance I | Seattle | 883-0403 |
| JCTS | Racmond | 983-2709 |
| Eagles Nest | Seattle | 983-4463 |
| Expert Systems | Seattle | 885-4536 |
| Shuttle Express | Seattle | 935-6416 |
| PC Match | Seattle | 935-7530 |
| Pratas Northwest | Tacoma | 937-0444 |
| ABBS | Seattle | 941-0740 |
| The Intrap | Seattle | |
| Washington (509) | | |
| ABBS | Spokane | 456-8900 |
| ABBS | Spokane | 534-2419 |
| ABBS | Yakima | 278-7724 |
| Magazine Bibliography (RBBS) * | Seas | 857-7298 |
| PMS | Richland | 943-8502 |
| West Virginia (304) | | |
| UserBoard (RBBS) | Charleston | 344-8086 |
| RBBS | Charleston | 345-1436 |
| Bullet-80 | Flemingwood | 372-9654 |
| Color-80 #99 | Morgan Towne | 589-0780 |

| | | |
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| Wisconsin (414) | | |
| CBBS | Milwaukee | 241-8264 |
| Big-Top Games System | NA | 259-9475 |
| Connection-80 | Milwaukee | 271-7580 |
| Connection-80 | Milwaukee | 281-0545 |
| Beer City TBBS | NA | 395-8839 |
| BBS Systems | Milwaukee | 483-4579 |
| PET BBS | Racine | 554-8520 |
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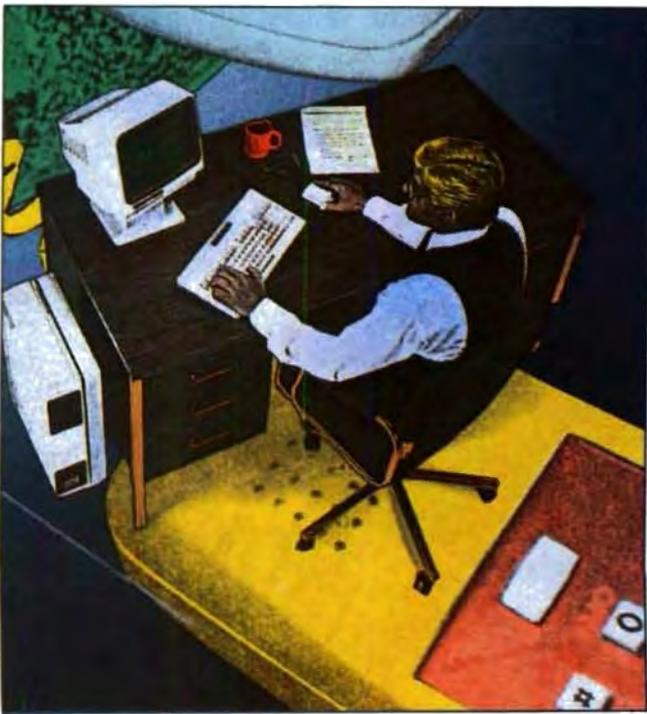
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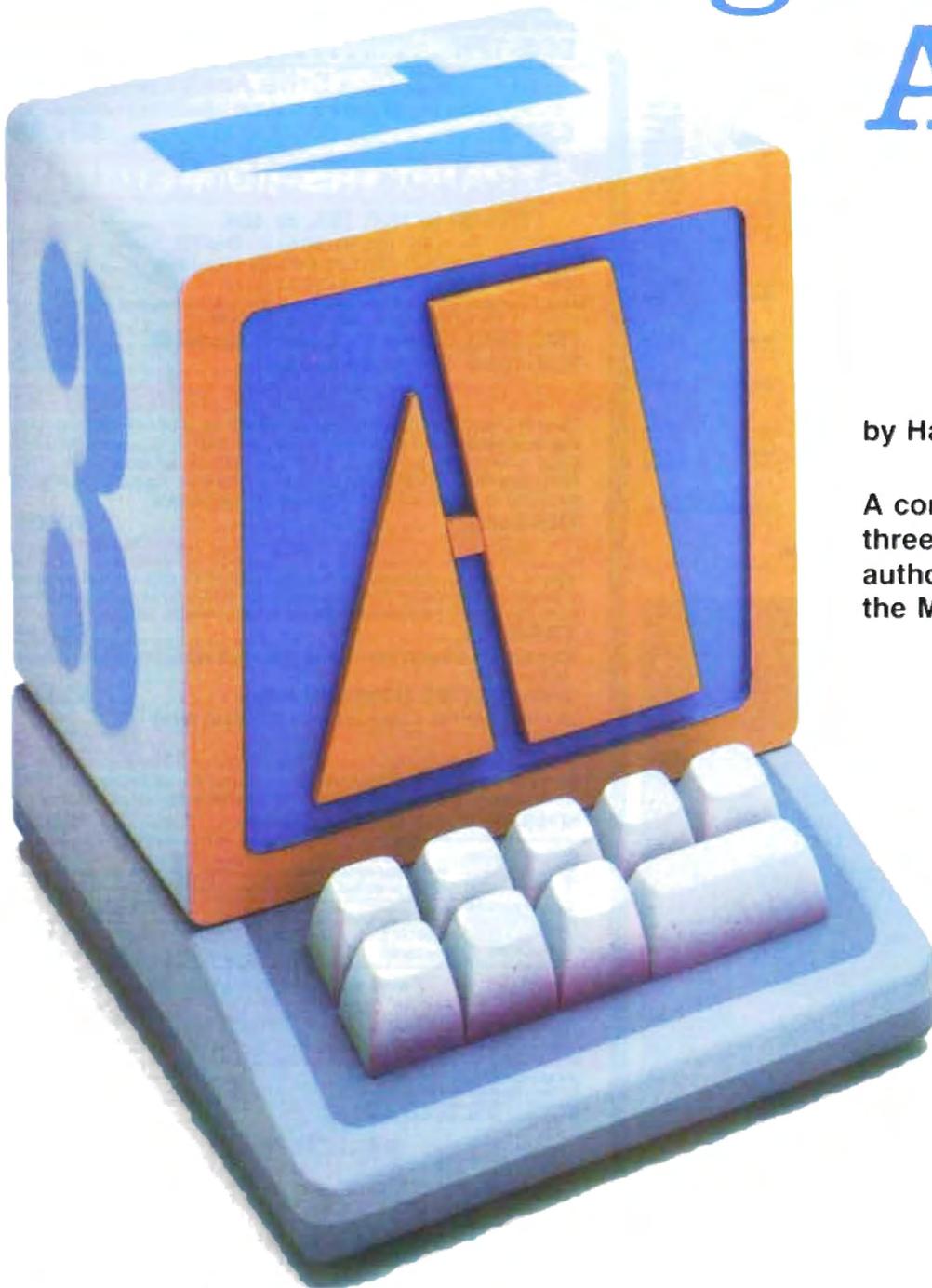
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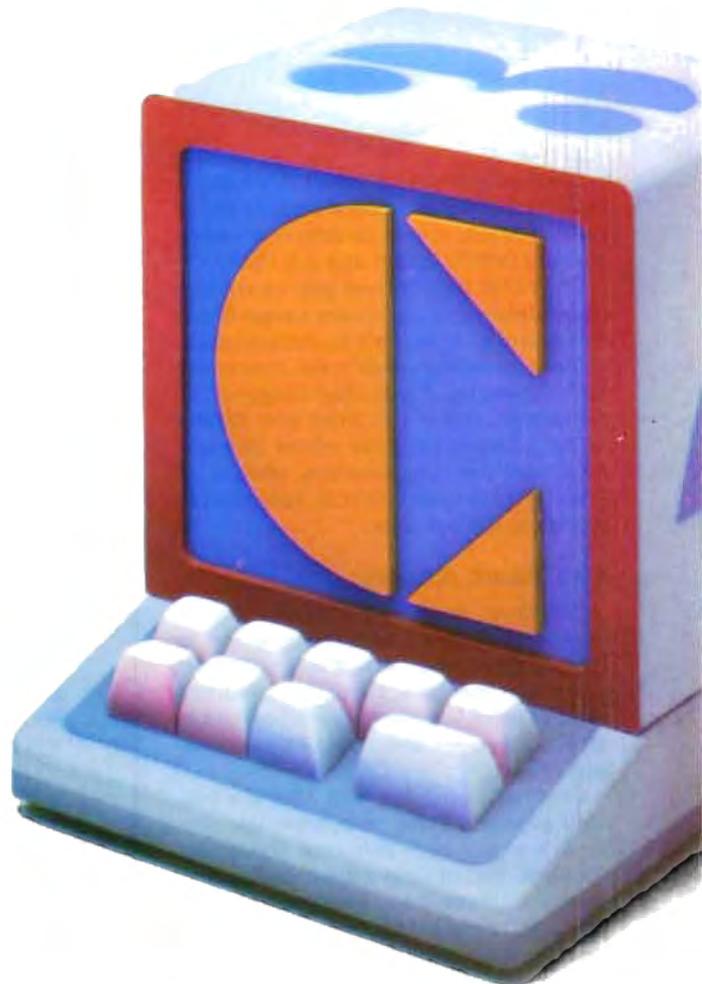


Language Arts

by Hardin Brothers

A comparison of three commercial Basic authoring systems for the Model I/III/4 programmer.





Ask any three programmers what they think of Microsoft Basic and you're likely to get three different answers, ranging from happy acceptance to complete revulsion. Some programmers like Basic's interactive nature. Some complain about its reliance on line numbers, lack of local variables, and poor control structures, all of which make structured Basic programming harder than it should be.

If you're a Model I/III/4 owner who wants more out of Basic, you can choose from several products designed to overcome some of the language's inherent flaws and simplify structured Basic programming. In this article, I'll examine three of those products, known as Basic authoring systems, and describe what I see as their strengths and weaknesses.

The DOSPLUS System

Every independent Model I/III DOS manufacturer added extensions to Disk

Basic to make it more powerful than the Radio Shack and Microsoft standards. However, the only independent company to provide an alternative DOS and Basic for the Model 4/4P is Micro-Systems Software Inc., the manufacturer of DOSPLUS.

Micro-Systems' enhanced version of Basic is available in three forms: as part of DOSPLUS 3.5 for the Model I/III, as part of DOSPLUS IVA for the Model 4, or as a product called 6.2 PLUS for Model 4 TRSDOS users (which I'll refer to as 6.X PLUS, since the 6.2 version was not yet available when I prepared this article). For product information, see the Table.

Micro-Systems' Basic is unique in recognizing that line numbers more often hinder than help programmers. It lets you define routines by name, as in NAME HELP, so you don't have to remember specific line numbers. Then, elsewhere in your program, you can refer to the routine's name, as in GOTO HELP and GOSUB HELP.

In short programs, this feature may not

be too important, but it's valuable when you're writing long programs. You no longer have to keep a list of routines' line numbers, or scroll through a program to find the beginning of a special routine. Also, your programs become much easier to read and debug when you can use a command like GOSUB CREATE.KEYS instead of GOSUB 12550.

Programs containing named subroutines work only under DOSPLUS Basic, however. If you're developing software for users of other versions, you have to remove the names and change the references before distributing the program. All DOSPLUS Basics include a command called Resolve that does just that.

DOSPLUS and 6.X PLUS Basic have other Basic enhancements that aid program development, including shorthand commands, an excellent sort routine, a cross-reference utility, and a global search-and-replace function for programs in memory. Also, 6.X PLUS includes sev-



eral enhancements for TRSDOS 6.X at the DOS level. (See the Related Articles box at the end of this article for references to reviews of DOSPLUS 3.5 and 6.X PLUS.)

DOSPLUS Basic is one step closer to a more structured and easier-to-use Basic. Its advantage is that it's an enhancement to Basic, retaining Basic's full interactive flavor. However, this is also its biggest disadvantage: You're still faced with Basic's rather clumsy program editor and you must still use line numbers, even if all your GOTO and GOSUB commands branch to labeled lines.

The Basic Answer

The Basic Answer (TBA) from Logical Systems brings a totally different feel to writing Basic programs. It lets you forget about line numbers, supports global and pseudo-local variable names, and adds several processor directives to Basic's normal syntax.

Creating a program with TBA is a two-step process. First, you write the program's source code following TBA's conventions. You can use a word processor or text editor if you want, giving you the luxury of full-screen editing, or you can use Basic's editor. In either case, you save the program in ASCII format and then run TBA to convert the source code into a functioning Basic program. Finally, you run the resulting program.

If you've never written in a compiled language such as C, Pascal, or Assembly-language, the two-step process might sound awkward. But in my opinion, the advantages of using a word processor's editing facilities far outweigh forsaking Basic's interactive environment.

TBA forces you to use reference labels instead of line numbers, while the DOSPLUS Basics give you the option of doing so. In general, labeling will probably make your programs more structured and easier to read, debug, and maintain. Using labels will also accustom you to thinking of program sections as independent procedures.

TBA has several other interesting features. It requires that you make all variable names between two and 13 characters long, and you must follow them with a type flag (% , ! , # , or \$). Variable names may in-

clude Basic reserved words such as OR and may also include periods or underline characters to improve readability. This means you can use variable names like "Record.Number%" and "Last__Name\$", forbidden under most other TRS-80-compatible Basics.

Particularly interesting and helpful is TBA's use of global and pseudo-local variables. TBA demands that you define all variables as either global or local before you use them. You can use global variables throughout a program; local variables are confined to a specific procedure or subroutine. You can also use the same variable name as a local variable in several different subroutines without the possible conflicts or side effects you'd normally get in Basic.

TBA has two other important features. First, it lets you embed compiler directives in your source code. For example, you can

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The Basic Answer
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Milwaukee, WI 53223
800-248-3535
\$29.00

The Alternate Basic
704 N. Pennsylvania
Lansing, MI 48906
517-482-8270
\$69.95

Table. Basic authoring systems' product information.

tell TBA how many lines of source code to print per page, how to title each page, when to skip to the next page, and when to turn the source code listing on or off.

The last of these directives is important if you write program modules and save them separately to disk. Say you've written a section of code that flashes a message on the screen until the user responds by pressing a key. You can insert this routine any time you write a program simply by loading it from disk. However, you probably don't want or need a printout of that procedure every time you list your program.

Once you've finished writing a program, you save it to disk from your word processor and return to DOS. Then you run TBA, telling it the names of your source code file and finished program, and sit back to watch the action. TBA scans all your program's variables and substitutes for each

a unique two-character variable name that satisfies Basic's requirements. TBA generates Basic code, deleting all label names, all comments that begin with an apostrophe, and all directives.

If you want, TBA sends the source code to your screen or to a printer. You can also display each line as TBA translates it into Basic. At the end of the listing, TBA displays a cross-reference list of label names and variables.

The label list shows the line in which you defined each label along with a list of all line numbers that refer to that label. The variables list does the same, and also displays the two-character variable name TBA created for that label. You'll find both lists useful for debugging the final program.

The Alternate Basic

TBA excels at handling variables, but it doesn't add any new control structures to Basic. The Alternate Basic does just the opposite: It adds a number of new and powerful control structures, but leaves control of variables up to the programmer.

The Alternate Source distributes The Alternate Basic (ABasic) in versions for the Models I, III, 4, 1000, 1200, and 2000, most CP/M computers, and all PC-DOS/MS-DOS machines. I used the Model 4 version while researching this article.

As with TBA, you write source code with a word processor and ABasic converts that code to a Basic program. You can display a list of labels and their corresponding line numbers during conversion but, unlike TBA, ABasic doesn't create a list of variables at the same time. However, ABasic comes with several utility programs you can use to create many types of cross-reference listings.

ABasic requires label variables instead of absolute line numbers for GOTO and GOSUB commands. ABasic also can search libraries of subroutines and pull the appropriate routines out of a file without copying the entire library file into the new program.

ABasic's greatest strength is the control structures it adds to standard Basic. With them, I find I can write complex programs much more quickly and with very few logical bugs. Programmers who've used structured languages will find most of the same major control structures in ABasic.



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One ABasic extension is an enhanced form of If...Then...Else. The expression If evaluates must fit on one line, but you can include as many lines of code as you want in your Then and Else structures. Because you don't have to squeeze an If...Then...Else construction into a single line, you can often avoid GOTO jumps out of the Then or Else section of code.

ABasic also adds a Do Until loop that lets you write a section of code (as long as you want) that executes at least once. At the end of the loop, the program tests an expression, similar to an If expression, and repeats the loop unless the expression is false. For example, if you want to pause a program until the user presses a key, you could code it this way:

```
PRINT "Press any key"
DO UNTIL A$ < > " "
A$ = INKEY$
END DO
```

Here's an even more efficient way:

```
PRINT "Press any key"
DO UNTIL INKEY$ < > " "
END DO
```

Similar to the Do Until loop is ABasic's Do While loop. This is of little use to Model 4 or MS-DOS users, whose Basics already include While...Wend, but it can be a great help to Model I/III owners.

A Do While loop checks for a condition at the beginning of the loop. If that condition is true, the loop executes and then the program checks the condition again. When the condition is false, control passes to the next command after the end of the loop. You could write the routine above using a Do While loop:

```
A$ = ""
PRINT "Press any key"
DO WHILE A$ = ""
A$ = INKEY$
END DO
```

ABasic's final extension to standard Basic is a complete case structure, which bases program action on a given variable's value. For example, you might prompt the user to select a menu option by pressing the 1, 2, or 3 key. If you collect the key's value in A\$ using an INPUT\$ command (on the Model 4), the program can branch to the appropriate routine depending on A\$'s value.

Unlike standard Basic's On...GOSUB

command, the Case command lets you direct execution to an unlimited number of lines of code for each choice. Case also offers an optional Else statement to trap unwanted user input.

ABasic's conversion process is similar to TBA's. After you write a program with your word processor, you save it in ASCII format and run ABasic from DOS Ready. You type in the names of your input and output files and set a number of optional compiling parameters.

As ABasic works on your input file, it collects a list of the errors it finds and indicates the output file's line number for each error. Possible errors include invalid label references, a Do statement without an End Do, multiple Else statements, and so on.

ABasic has several utilities designed to make some kinds of debugging and program documentation easier. One is CREF, which creates and displays (or prints) a complete alphabetical list of a program's variables, with the line numbers of every occurrence of each variable.

Another utility, LVAR, produces a list of all procedures in an ABasic source file and the variables in each procedure. This utility assumes that a procedure starts with a label name and ends on the line before the next label name. If you have several labels inside a single procedure or subroutine, you'll find the variables list slightly less useful than it would otherwise be. However, the LVAR display can be extremely helpful in finding conflicts between variables.

A third ABasic utility is XVAR, which translates variables names in an ABasic or standard Basic file. To use XVAR, you specify your input and output files and type in the original and new names of each variable you want to change. I found XVAR a little clumsy; I wish you could refer XVAR to a disk file for the translation table. In many cases, XVAR is no more convenient than a word processor's search-and-replace function.

ABasic's XLATE utility translates characters in an ASCII file to any other set of characters. You can also use it to add or strip line numbers; when adding line numbers to a file, you can specify any values you want for the beginning number and the increment.

The last ABasic utility is a help program; its source code comes on the ABasic disk, so you can add it to your programs. The manual tells you how to construct text files to work with the help program.

The Bottom Line

How to choose among these three Basic authoring systems? All support labels for routines, so you can forget about line numbers. All can help you write clearer, more structured programs that are easier to debug and maintain, and more likely to run correctly the first time, than standard Basic programs.

The DOSPLUS Basics are the easiest to

use, especially for shorter programs, since you never have to leave the Basic interpreter. Unlike the other two programs, the DOSPLUS Basics don't require that you write a source code file and translate it into standard TRS-80 Basic.

The Basic Answer has by far the strongest variable-handling capabilities. It frees you from worry about possible variable conflicts. Model I/III users should enjoy being able to use variables longer than two characters regardless of embedded reserved words.

The Alternate Basic's added control structures are its strongest feature, and I also like its ability to pick a specific routine out of a library file. However, ABasic doesn't check for variable conflicts, so you must keep careful records of the variable names you use in library routines.

Because I find that I write fastest in a structured language, I prefer using ABasic for major programming projects. I also enjoy using 6.X PLUS to write "quick and dirty" programs directly in Basic. I'd like to have TBA's support of local and global variables, but I haven't found a practical way to run the same source file through ABasic and TBA.

A combination of TBA and ABasic would be ideal, but unfortunately, such a program doesn't exist, at least not for TRS-80 users. ■

Hardin Brothers, an 80 Micro associate editor, writes about programming; his column on Assembly language, The Next Step, appears every month. You can contact him at 280 N. Campus Ave., Upland, CA 91786. Please enclose a stamped, addressed envelope for a reply.

Related Articles

Harrell, John B. III, "DOSPLUS 3.5," October 1983, p. 160. A review of Micro-Systems' Model III DOS.

Harrell, John B. III, "More Model 4: 6.0 PLUS," February 1984, p. 44. A review of Micro-Systems' TRSDOS 6.X/Basic enhancements package.

Vose, G. Michael, "The Basic Answer," February 1983, p. 48. A review of Logical Systems' Basic authoring program.



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TOTAL RECALL

by John D. Wolfskill

Get help any time you need it with pop-up screens that display program commands, instructions, or hints.

If you're like me, you probably wade through an applications manual every time you run a program, looking for a particular command sequence—the one you always seem to forget. With Helper, you can display frequently needed commands, instructions, or tips on your Model 4 any time you need them—even in the middle of an applications program (including Basic). Helper superimposes its six-line help screens over your program display; you can view a series of help screens without losing your active display.

Helper lets you create, edit, and manipulate up to 16 of these text or graphics screens (see Photo 1). Its machine-language control routine becomes a transparent part of your TRSDOS 6.X operating system, giving you universal access to the help screens.

Preliminary Screening

To build a file of help screens, type in

the Program Listing and save it to disk. Then run the program: after a title screen, you'll see the prompt "Create new file?" Type in Y. At the file name prompt, type in HELP1/BAS:0. Helper will create a file of 16 blank records on drive zero and display its main menu (see Table 1 for a description of the options).

Press the E key to invoke the Edit option (Table 2 describes the edit menu's options). You'll see a blinking cursor in the screen's upper left-hand corner. Now type in your help screen text, using any or all of screen rows 0–5. Helper accepts all text, graphics, or special characters available from the keyboard, except reverse video characters (see Photo 2).

When you finish, press control-T for the Title option. Type in a descriptive title of up to 29 characters. Now press the enter key. Helper writes record 1 to a temporary storage area and returns control to the main menu.

Press E again to reenter the Edit mode. You're still on record 1. To page forward, press the shift and up-arrow keys simultaneously. The screen tells you you're on record 2; you can now type in your second help screen. To page backward through the file, press the shift and down-arrow keys. If you edit a record, you must update it by pressing control-U before you move to the next record. Updating isn't necessary if you're just browsing through the file.

Add a few more help screens to the file and you're ready to install your records.



System Requirements

Model 4
64K RAM
Disk Basic

Record Selection

From the main menu, press S to select the records you want Helper to install and have ready for immediate display. You may select any or all of the 16 available records. A fast-blinking cursor appears next to record 1. If you want to install this record, press the enter key. A solid graphics block marks the records you select.

To bypass a record, press the down-arrow key. As you mark each record, the bottom right of the screen displays the amount of random-access memory available (in a 64K machine) after you install the Helper records. Continue until you've selected or bypassed all records.

At this point make sure you've saved Listing 1 to disk. If so, type in Y at the prompt "Install selected records?". Helper saves the resident file to disk and begins installing the selected records in high memory. Each record appears on the video screen as it's written. When you've got the last record in place, a short tone and message inform you that you've installed Helper. Helper then invokes a New command in Basic and returns control to TRSDOS.

Help for the Asking

Move the cursor to the center of the screen. Now press control-A. Your first help record opens as a window from the top of the display. Each time you press the control-A combination, Helper displays the next record in sequence. After it displays the last record, Helper rewinds its buffer to the beginning. You can't reverse this action, but the buffer cycles so rapidly you don't really need to.

Now put Helper through its paces. Call up a directory, or invoke any other DOS library command that fills the screen with text. Note that Helper's text area is scroll-protected. In most cases, screen output works around Helper's display.

To remove the scroll protection, press

control-B. Now call up a directory again. This time, Helper scrolls off the display. Fill the screen with text once more and press control-A. Helper overwrites part of your text. Press control-B and Helper restores the screen to its original condition. By alternating between control-A and control-B, you can cycle through Helper's buffer without destroying your active screen display.

Instant Pictures

Helper can also take a "snapshot" of the display's top six lines to temporarily save part of any screen in which you're interested. To see how, call a directory again. From TRSDOS Ready, press the enter key until the information you want to capture is on the screen's top six rows. Press control-C. A short tone tells you Helper has snapped its camera shutter.

Now get into Basic and run any program you want. Press control-B and your snapshot will appear. To save the snapshot for future use, press control-C again. Alternating between control-C and control-B retains the information in the snapshot buffer.

Reruns

The Helper menu's CONFIG option is a short-cut way to install a file with records you selected in a previous session. To use CONFIG, reload and run Listing 1. At the "Create new file?" prompt, you may opt to look at your current disk directories by typing in DIR. Now reload HELP1/BAS:0. When the main menu appears, press the C key. CONFIG immediately installs the file's previously selected records and returns control to TRSDOS Ready.

Some Basic Pointers

You can deactivate Helper from Basic without resetting your computer. Make sure you turn off scroll protection by pressing control-B. Then, in the immedi-

ate mode, type in POKE &H0089,201. Helper remains in memory but won't function. You can reactivate it whenever you want by typing in POKE &H0089,195. However, to remove Helper and reclaim its memory area you must reboot the computer.

To assign Helper commands to the Model 4's unused function keys, type in:

```
POKE &HFE28,129:POKE &HFE38,130:POKE &HFE42,131
```

in the immediate mode. This assigns the control-A command to function key F1, control-B to F2, and control-C to F3.

Key reassignments remain in effect at all operating levels until you change them or turn off the computer. To assign the function keys different values, change the character codes that follow the commas in the Listing's POKE statements.

Auto Assembly

You can easily prepare your disks so that a specific Helper file automatically loads each time you boot up. Your options are to build a job control language (JCL) file or to configure (SYSGEN) the disk itself.

JCL files, often used for automatic execution of DOS commands, can also supply prerecorded input to a Basic program such as Helper. To set Helper for JCL installation, make the changes shown in the Figure. Save the updated listing to disk as Helper/BAS and return to TRSDOS Ready.

Now build a simple JCL file using the command BUILD HELP/JCL. Type in the following, using the name of your help record file where HELP1/BAS occurs. Press the enter key after each command line, leaving no extra spaces:

```
BASIC
LOAD"HELPER/BAS:0",R
N
HELP1/BAS:0*
//STOP
```

Press control/shift-@ to write Help/JCL to drive zero. Type in AUTO DO HELP/



Photo 1. A help screen display.

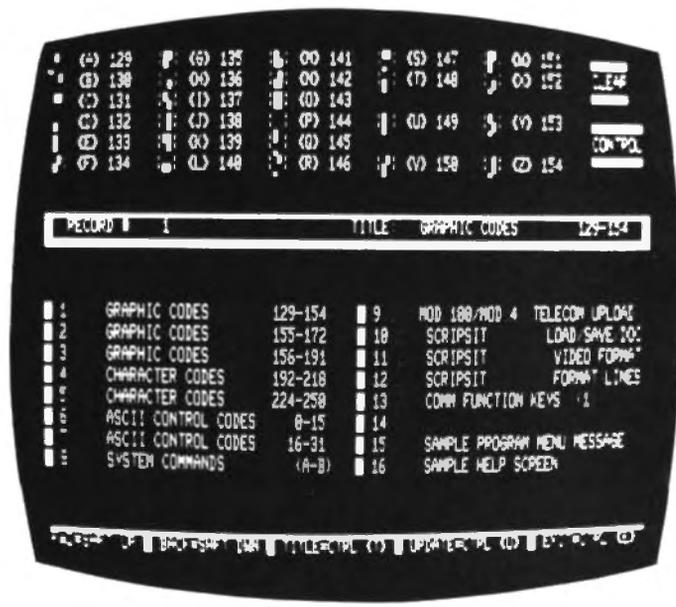


Photo 2. Creating a help screen.

| Command | Key | Description |
|---------|-----|---|
| Edit | E | Creates or edits a record file. |
| File | F | Updates resident Helper disk file. Lets you write or edit text records without installing them in memory. |
| Select | S | Selects records for installation. |
| CONFIG | C | Installs selected record configuration. Loads all previously marked records. |

Table 1. Helper's main menu.

| Command | Key(s) | Description |
|---------|------------|--|
| Forward | Shift-Up | Displays next higher record. |
| Back | Shift-Down | Displays next lower record. |
| Title | Control-T | Normal exit from the Edit option; automatically updates record. |
| Update | Control-U | Updates current record; saves additions or editing changes. |
| Exit | Control-E | Alternate exit from the Edit option; doesn't save editing changes. |

Table 2. Helper's edit menu.

| Variable | Description |
|------------|--|
| HP\$(2,16) | Text records. Each record consists of two strings of 240 characters each. |
| RN\$(16) | Directory records titles. Each title is 29 characters in length. |
| HPIS, RNIS | Pre-allocates Helper file space in memory and on disk. Used to create a help file. |
| SR(16) | Selected record status. 1 = selected; 0 = not selected. |
| AD.WP.BC | General purpose counter variables. |
| B.C.H.L.AA | Register values returned from supervisor calls. |
| MS | Memory available after Helper and records are installed. |

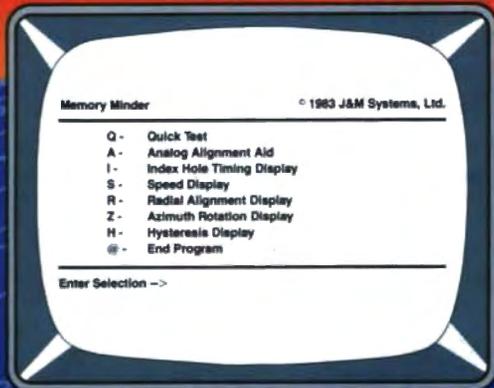
Table 4. Key variables.

| Line | Description |
|-----------|---|
| 80 | Reserves memory for use by the video control routine (SCRN). |
| 100-120 | Variable initialization area. |
| 120 | Sets code 21 toggle for special characters; after a break, issue PRINT CHR\$(21) before restarting the program. |
| 140-160 | POKEs video control handling routine (SCRN) into high memory. |
| 170-220 | Prints title. |
| 230-290 | File initialization area; creates new file by writing HPIS, RNIS arrays to disk. |
| 300 | Displays disk directory using SVC #34. |
| 310-340 | Reads Helper file from disk to memory. |
| 350-430 | Main menu. |
| 440-450 | Edit menu. |
| 460-610 | Text entry routine. Line 480 uses SVC # 15 to get the current cursor position following each keystroke. Variable E holds result. |
| 620-680 | Directory title entry routine. |
| 690-720 | Displays requested record. The last screen print position in the text area can't be written. Line 1410 uses this byte to add a carriage return (ASCII 13) that serves as a record delimiter for the control routine. |
| 730-800 | Record update routine. Line 750 transfers the screen to a 2K buffer area using SVC #15. Text/title information extracted by first PEEKing the buffer, then POKEing the values into string array variables HP\$ and RN\$. |
| 810-880 | Directory title display routine. Line 840 flags previously selected records with a graphics block character. |
| 890-990 | Record select routine. Line 910 removes marker blocks from previously selected records. |
| 1000-1100 | CONFIG record check. Used by the CONFIG option to determine if any records have been previously selected for installation. If no records have been selected, CONFIG returns control to the main menu, otherwise it asks for verification to install selected records. |
| 1100-1140 | Updates resident file to disk. Saves all editing changes. |
| 1150-1200 | Record installation routine. Line 1180 checks for selected records. |
| 1210 | Clear test line. |
| 1220-1290 | Pre-allocates memory space for Helper records. |
| 1300-1360 | Determines number of selected records for installation via the CONFIG option. |
| 1370-1420 | Main record installation routine. Text buffer size is allocated according to the number of selected records. |
| 1380 | Assigns buffer starting and ending addresses. |
| 1390 | Transfers records to the video screen. |
| 1400 | Uses SVC #15 to read the screen contents into a temporary buffer area. |
| 1410 | Transfers the records to their execution location in high memory. |
| 1430-1570 | Record control routine. |
| 1520 | Preloads text buffer start address to control routine. HST = most significant byte; LST = least significant byte. |
| 1530 | Preloads text buffer end address to control routine. HED = most significant byte. |
| 1540 | Preloads record counter address to control routine. HCTR = most significant byte; LCTR = least significant byte. |
| 1550 | Adjusts system HIGH\$ marker to protect control routine and text records from being overwritten. |
| 1560 | Sets @KITSK jump vector to start address of control routine. |

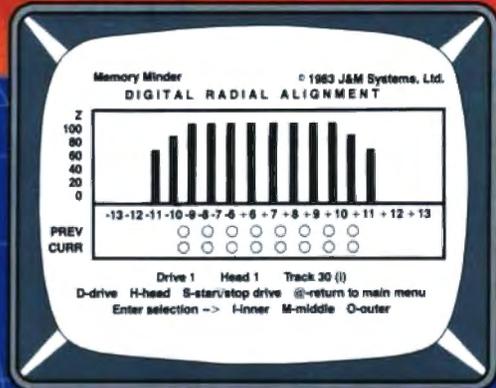
Table 3. Key program lines.

MEMORY MINDER T.M.

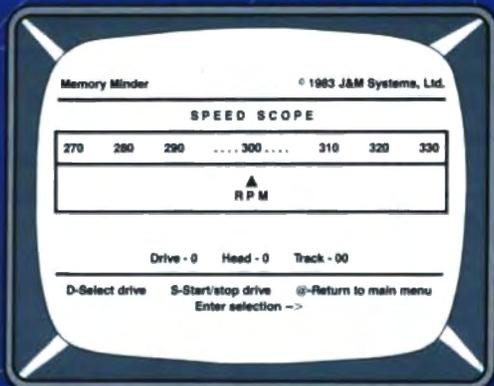
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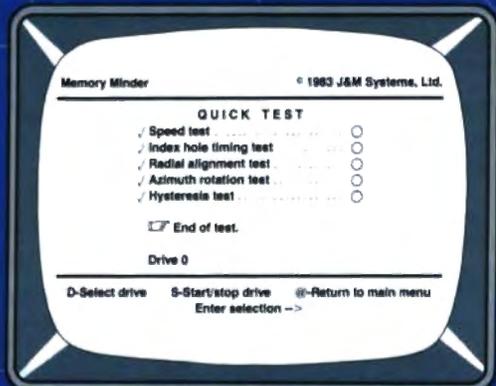
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JCL for automatic execution of Help/JCL on boot-up.

Now press the orange reset button. TRSDOS loads Basic, loads and runs Helper/BAS, answers the prompt "Create new file?" with N, loads the file HELP1/BAS and leaves control with the Basic program.

Helper takes over from there by installing selected records with the CONFIG option. When it stops processing, the screen goes blank except for a blinking cursor. Press the enter key. TRSDOS will make a short housekeeping disk access to get the proper system overlay on board before releasing control to TRSDOS Ready.

Note that an asterisk follows HELP1/BAS in the JCL file. A JCL command to load a Helper text file must have an asterisk as the file name's last character. Line 305 in the modified Listing checks for the asterisk indicating that a JCL file is loading the text file. Helper strips the asterisk before looking for the text file on drive zero.

JCL files won't deliver information directly to an INKEY\$ loop. To surmount this problem, I used AM\$ = "C" in line 382 as a flag to answer the INKEY\$ loop's request for the CONFIG option. Use the asterisk only in the JCL file itself.

If JCL files aren't your cup of tea, you can load Helper files automatically a second and much faster way. You can SYS-GEN the system configuration in which a Helper file is currently installed. At TRSDOS Ready type in SYSGEN (YES).

```

260 IF F$="Y" OR P$="y" THEN GOSUB 1230:GOSUB 1110:GOTO 310
ELSE 305
305 IF RIGHT$(F$,1)="*" THEN AM$="C":
FL$=LEFT$(F$,LEN(F$)-1)
382 IF AM$="C" THEN GOSUB 1300:GOTO 370
    
```

Figure. Modifications to the Program Listing for JCL loading.

Program Listing. Helper/BAS.

```

10 REM *****
20 REM *      HELPER SERVICE      *
30 REM *           BY             *
40 REM *     JOHN D. WOLFSKILL    *
50 REM *      201 PURITAN DRIVE   *
60 REM *    MIDDLETOWN, RI 02840 *
70 REM *****
80 CLEAR, 54767!
90 ON ERROR GOTO 1500
100 DEFINT A-Z:DIM SR(16),AD,WP,BC,B,C,H,L,AA,HPS(2,16),RNS(16)
110 UL$=STRING$(79,176):HPIS=STRING$(240,32):RNI$=STRING$(29,95):LWS="":COS=CHR
R$(14):CF$=CHR$(15):W$=CHR$(143):MS=28886:A=1:PRINT CHR$(21);
120 PR$=W$+" EDIT "+W$+SPACE$(14)+W$+" FILE "+W$+SPACE$(14)+W$+" SELECT "+W$+SPA
CE$(15)+W$+" CONFIG "+W$+H$="HELPER"+STRING$(2,144)+"SERVICE":GR$=STRING$(33,179
)
130 REM **** VIDEO CONTROL ROUTINE : SCR# ****
140 B=6HFF2C:C=6HFF2E:H=6HFF30:L=6HFF32:AA=6HFF34:SCR#=6HFF11:ZZ=6HFF07
150 FOR AD=6HFF11 TO 6HFF37:READ JB:POKE AD,JB:NEXT
160 DATA 58,44,255,71,58,46,255,79,58,48,255,103,58,50,255,111,58,52,255,239,34,
54,255,50,52,255,201,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
170 PRINT CP$:CLS:PRINT@804,CHR$(191):PRINT@870,STRING$(4,191):CHR$(23):PRINT
@724,CHR$(191):GR$:CHR$(191):PRINT@884,CHR$(191):GR$:CHR$(191);
180 N=810:PRINT@N-4,STRING$(2,191);
190 FOR DP=1 TO 15
200 FOR RD=1 TO 250:NEXT
210 PRINT@N,MID$(H$,DP,1)+CHR$(171);
220 N=N+4:NEXT
230 GOSUB 270:PRINT@1606,"CREATE NEW FILE ";:INPUT P$
240 IF P$="DIR" OR P$="di:" THEN 280
250 GOSUB 270:PRINT@1604," FILESPEC ";:INPUT PL$
260 IF P$="Y" OR P$="y" THEN GOSUB 1230:GOSUB 1110:GOTO 310 ELSE 310
270 PRINT @1684,SPACE$(40);:RETURN
    
```

Listing continued

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Listing continued

```

280 GOSUB 270:PRINT@1684,"WHICH DRIVE";:INPUT DD
290 IF DD<0 OR DD>1 THEN GOSUB 270:GOTO 280
300 CLS:POKE AA,34:POKE B,0:POKE C,DD:CALL SCRIN:PRINT:GOTO 230
310 OPEN "I",1,FL$
320 FOR AD=1 TO 16
330 INPUT #1,HP$(1,AD),HP$(2,AD),RNF(AD),SR(AD)
340 NEXT:CLOSE 1
350 REM **** TEXT EDITOR ****
360 CLS:PRINT CFS;:PRINT@0,"";:PRINT@560,UL$;:PRINT@640,CHR$(191);" RECORD # ";
SPACES(27);"TITLE:";SPACES(33);CHR$(191);:PRINT@700,STRINGS(79,131);
370 GOSUB 820:PRINT@1760,UL$;PR$;
380 X$=INKEY$:IF X$="" THEN 380
390 IF X$="E" OR X$="e" THEN GOSUB 440
400 IF X$="C" OR X$="c" THEN GOSUB 1300:GOTO 370
410 IF X$="S" OR X$="s" THEN GOSUB 900
420 IF X$="P" OR X$="p" THEN GOSUB 1100:GOTO 370
430 GOTO 380
440 GOSUB 1210:PRINT@1840,"FWD-SHFT UP ";W$;" BACK-SHFT DWN ";W$;" TITLE=CTRL <T
> ";W$;" UPDATE=CTRL <U> ";W$;" EXIT=CTRL <E> ";:PRINT@0,CO$;
450 GOSUB 710
460 REM **** TEXT INPUT ROUTINE ****
470 X$=INKEY$
480 POKE AA,15:POKE B,4:CALL SCRIN
490 AE=PEEK(&HFF37)*80+PEEK(&HFF36)
500 IF AE>478 OR PEEK(&HFF37)>6 THEN PRINT CFS;:PRINT@0,CO$;
510 IF X$=CHR$(5) THEN GOSUB 710:GOTO 370
520 IF X$=CHR$(27) THEN A=A+1:GOSUB 700
530 IF X$=CHR$(26) THEN A=A-1:GOSUB 700
540 IF X$=CHR$(8) THEN PRINT CHR$(24);
550 IF X$=CHR$(9) THEN PRINT CHR$(25);
560 IF X$=CHR$(10) THEN PRINT CHR$(26);
570 IF X$=CHR$(11) THEN PRINT CHR$(27);
580 IF X$=CHR$(20) THEN PRINT CFS;:PRINT@600,CO$;:GOTO 610
590 IF X$=CHR$(21) THEN GOSUB 740:GOTO 370
600 IF X$="" OR X$< CHR$(32) THEN 470 ELSE PRINT X$;:GOTO 470
610 GOSUB 1210:PRINT W$;" ENTER ";W$;" when complete..";
620 REM **** TITLE INPUT ROUTINE ****
630 X$=INKEY$
640 IF POS(0)<47 OR POS(0)>77 THEN PRINT CFS;:PRINT@680,CO$;
650 IF X$=CHR$(13) THEN GOSUB 740:GOTO 370
660 IF X$=CHR$(8) THEN PRINT CHR$(24);
670 IF X$=CHR$(9) THEN PRINT CHR$(25);
680 IF X$="" OR X$=CHR$(32) THEN 630 ELSE PRINT X$;:GOTO 630
690 REM **** RECORD DISPLAY ROUTINE ****
700 IF A=17 THEN A=1 ELSE IF A<1 THEN A=16
710 PRINT@0,CFS; HP$(1,A);MID$(HP$(2,A),1,239)+CHR$(32);:PRINT@680,RNF(A);
720 PRINT CHR$(28);:PRINT@654,USING LM$;A;:RETURN
730 REM **** RECORD UPDATE ROUTINE ****

```

Listing continued

This command writes your system's current configuration to a file called CONFIG/SYS. It saves all background tasks (Helper is one) as well as all code above the HIGH\$ marker (where Helper records reside). Each time you cold start or reboot your computer, CONFIG/SYS restores the file exactly as it was the last time you used it. You don't have to reload the Basic program or install Helper records.

You should make sure the disk you SYSGEN has enough free space to hold the entire Helper file. CONFIG/SYS is an invisible system file and won't appear in your disk directory.

Using SYSGEN does have a drawback. Should you decide to load or change Helper files on a disk you've SYSGENed, press the reset button while holding down the clear key. This bypasses CONFIG/SYS so the configured Helper file (along with your system configuration) won't load. Trying to load Helper manually into a system in which it's already SYSGENed will cause a hang accompanied by a head-on system disk crash.

Routine Matters

Tables 3 and 4 describe Helper's key variables and program lines. Helper uses a machine-language background task to control display of its text records. TRSDOS 6.X's keyboard driver invokes the routine.

Address 2338, 0922 hex (hexadecimal), within the driver provides a call to a 3-byte

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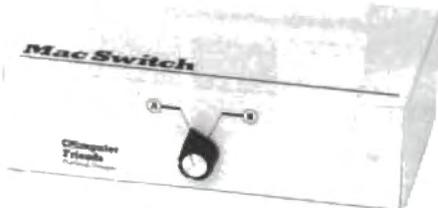
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Listing continued

```

740 PRINT CFS;:GOSUB 1210:PRINT"Updating Record .. ";A;
750 POKE B,6:POKE H,213:POKE L,240:POKE AA,15:CALL SCRNI
760 FOR WP=0 TO 239:MIDS(HPS(1,A),WP+1,1)=CHR$(PEEK($HD5F0+WP)):NEXT:WL=1
770 FOR WP=240 TO 478:MIDS(HPS(2,A),WL,1)=CHR$(PEEK($HD5F0+WP)):WL=WL+1:NEXT
780 WL=1
790 FOR AD=688 TO 716:MIDS(RN$(A),WL,1)=CHR$(PEEK($HD5F0+AD)):WL=WL+1:NEXT
800 RETURN
810 REM **** TITLE DISPLAY ROUTINE ****
820 PRINT CFS;:AL=960
830 FOR AD=1 TO 16
840 IF SR(AD)=1 THEN PRINT @AL,CHR$(143);AD;". "; ELSE PRINT@AL," ";AD;". ";

850 PRINT RN$(AD);:AL=AL+80
860 IF AD=8 THEN AL=1000
870 NEXT
880 IF FL=1 THEN FL=0:GOTO 920 ELSE RETURN
890 REM **** RECORD SELECTION ROUTINE ****
900 AD=1:GOSUB 1210:PRINT W$;" ENTER ";W$ TO Select";SPACES(5);W$;" DOWN ARROW
";W$;" TO PASS";SPACES(3);" Memory Available = ";MS;
910 FOR AD=1 TO 16:SR(AD)=0:NEXT:FL=1:GOTO 820
920 AD=1:AL=960
930 X$=INKEY$
940 IF AD=9 THEN AL=1000
950 IF AD=16 THEN X$="":GOSUB 1210:GOSUB 1010:GOTO 370
960 IF X$=CHR$(13) THEN M=M+1:PRINT@AL, CHR$(143);:SR(AD)=1:PRINT@1909,MS-(M*400);:AD=AD+1:AL=AL+80
970 IF X$=" " THEN PRINT@AL, CHR$(32);:FOR TD=1 TO 30:NEXT:PRINT@AL, CHR$(143);
980 IF X$=CHR$(10) THEN PRINT@AL,CHR$(32);:AD=AD+1:AL=AL+80:GOTO 930
990 GOTO 930
1000 REM **** <C>ONFIG RECORD CHECK ****
1010 FOR AD=1 TO 16
1020 IF SR(AD)=1 THEN 1060
1030 NEXT
1040 GOSUB 1050:RETURN
1050 GOSUB 1210:PRINT"No Records Selected..";:SOUND 5,5:CF=1:GOSUB 1210:RETURN
1060 GOSUB 1210:PRINT"INSTALL SELECTED RECORDS (Y/N) ?";
1070 X$=INKEY$:IF X$=" " THEN 1070
1080 IF X$="Y" OR X$="y" THEN GOSUB 1210:PRINT PR$;M=0:AD=0:GOSUB 820:GOTO 370
1090 IF X$="Y" OR X$="y" THEN GOSUB 1100:GOTO 1160 ELSE 1070
1100 GOSUB 1210:PRINT"SAVING : ";FL$;
1110 OPEN "O",1,FL$
1120 FOR AD=1 TO 16
1130 WRITE #1, HPS(1,AD),HPS(2,AD),RN$(AD),SR(AD)
1140 NEXT:CLOSE 1:RETURN
1150 REM **** RECORD INSTALLATION ROUTINE ****
1160 GOSUB 1210:PRINT"INSTALLING RECORDS..";
1170 WP=0:FOR AD=1 TO 16
1180 IF SR(AD)=1 THEN GOSUB 1300
1190 NEXT
1200 CS=0:CST=0:GOTO 1440
1210 PRINT@1840,SPACES(79);:PRINT@1839," ";:RETURN
1220 REM **** NEW FILE CREATOR ****
1230 FOR W=1 TO 2
1240 FOR Y=1 TO 16
1250 HPS(W,Y)=HPI$
1260 NEXT:Y=1
1270 FOR Y=1 TO 16
1280 RN$(Y)=RNI$
1290 NEXT:RETURN
1300 M=0
1310 REM **** <C>ONFIG RECORD CHECKER ****
1320 FOR AD=1 TO 16
1330 IF SR(AD)=1 THEN M=M+1
1340 NEXT
1350 IF M=0 THEN GOSUB 1050:RETURN
1360 GOTO 1160
1370 REM **** RECORD INSTALLATION ROUTINE ****
1380 START=$HPEF2-(400*M):ED=START+(M*400):CTR=START
1390 PRINT@0,HPS(1,AD),HPS(2,AD);:PRINT@654,USING LWS;AD;:PRINT@608,RN$(AD);
1400 POKE B,6:POKE AA,15:POKE H,213:POKE L,240:CALL SCRNI
1410 FOR BC=0 TO 478:POKE START+WP,PEEK($HD5F0+BC)WP=WP+1:NEXT:POKE START+WP,13
:WP=WP+1
1420 RETURN
1430 REM **** RECORD CONTROL ROUTINE ****
1440 FOR AD=$HPE24 TO $HPE10
1450 READ JB:CS=CS+JB:CST=CST+1:POKE AD,JB:NEXT
1460 DATA 50,249,0,14,1,185,194,55,254,205,78,254,205,130,254,205,120,254,201,14
,2,185,194,65,254,205,203,254,201,14,3,185,192,0,0,205,78,254,205,0,255,201
1470 DATA 17,243,251,46,0,38,0,6,1,213,62,15,239,209,18,19,44,62,80,109,194,85,2
54,46,0,62,6,180,200,36,195,85,254,0,0,0,0,0,0,0,0
1480 DATA 50,249,254,42,253,254,180,202,131,254,201,42,245,254,34,253,254,201
1490 DATA 62,15,6,7,14,7,239,62,15,6,4,239,229,6,3,33,0,0,62,15,239,62,10,42,253
,254,239,225,62,15,6,3,239,17,224,1,42,253,254,25,34,253,254,6,2,30,6,46,0,14,95
,85,62,80,186,200,62,15,239,44,6,2,195,109,254
1500 DATA 62,15,6,7,14,0,239,1,243,251,38,0,46,0,197,10,79,6,2,62,15,239,193,3,4
4,62,80,189,194,217,254,46,0,62,6,180,200,36,195,217,254,0,0,0,0,0,0,0,0,0,0,0
,0,62,104,6,31,239,201,62,100,6,0,42,245,254,43,239,201
1510 IF CS<24490 OR CST <>237 THEN GOSUB 1210:PRINT W$;"CHECKSUM ERROR.. Check
DATA Statements";:SOUND 5,2:GOSUB 1210: GOTO 370
1520 HST=INT((START+655361)/256):LST=(START+655361)-(HST*256):POKE $HPEF5,LST:PO
KE $HPEF6,HST
1530 HED=INT((ED+655361)/256):LED=(ED+655361)-(HED*256):POKE $HPEF9,HED:POKE $HF
EFA,LED
1540 HCTR=INT((CTR+655361)/256):LCTR=(CTR+655361)-(HCTR*256):POKE $HPEFD,LCTR:PO
KE $HPEFE,HCTR
1550 Z=PEEK(100):POKE 100,0:CALL IS:POKE 100,2 :REM ** ADJUST HIGH MARKER **
1560 POKE 138,36:POKE 139,254:POKE 137,195 :REM ** SETUP EKI TASK VECTOR **
1570 GOSUB 1210:PRINT"HELPER SERVICE .. Installed";:SOUND 7,2:CLS:PRINT C0$;:SYS
TEM
1580 REM **** ERROR HANDLER ****
1581 IF ERR=61 THEN GOSUB 270:PRINT@ 1684, "DISK SPACE FULL, INSERT NEW DISK":SO
UND 5,2:INPUT X$:RESUME 250
1590 IF ERR=64 OR ERR=53 THEN GOSUB 270:PRINT@1684,"File not Found..";:SOUND 5,2
:RESUME 250
1600 GOSUB 1210:PRINT W$;"Program Error ";ERR;" in line ";ERL;W$;:SOUND 5,2:RESU
ME 370

```

jump vector (@KITSK) starting at address 137, 0089 hex. @KITSK is a design feature of the TRSDOS operating system that lets you chain an independent task with the keyboard driver.

At start-up, TRSDOS puts a Z80 return code in the first @KITSK address. Calls to @KITSK send execution right back to the driver. Helper modifies @KITSK to provide a jump to its own control routine whenever the keyboard driver is active. Helper monitors key closures as the driver monitors them. For an explanation of keyboard background task interfacing and the use of TRSDOS supervisor calls, see the *Model 4 Technical Reference Manual*.

Hints and Cautions

Model 4 Scripsit 1.0.1 doesn't particularly like Helper's encroaching on its territory and tries to overwrite the message as it appears. You can fool Scripsit by pressing the break key to move the cursor to the command line. While Scripsit waits for input, Helper has free access to the display.

Applications that use double-width characters also make the Helper record double-width. The record jumps outside its normal area on a double-width screen. It's a good idea to load Helper before activating driver/filter modules that the DOS puts in high memory. This ensures that Helper or its text records won't overwrite them. Also, you can't install Helper if you have Mem-disk resident in a 64K machine. ■

John D. Wolfskill, an engineering instructor at the Naval Education and Training Center in Newport, RI, has been a TRS-80 hobbyist since the early Model I days. You can write to him at 201 Putnam Drive, Middletown, RI 02840.

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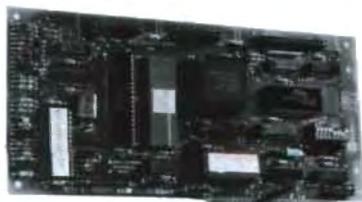
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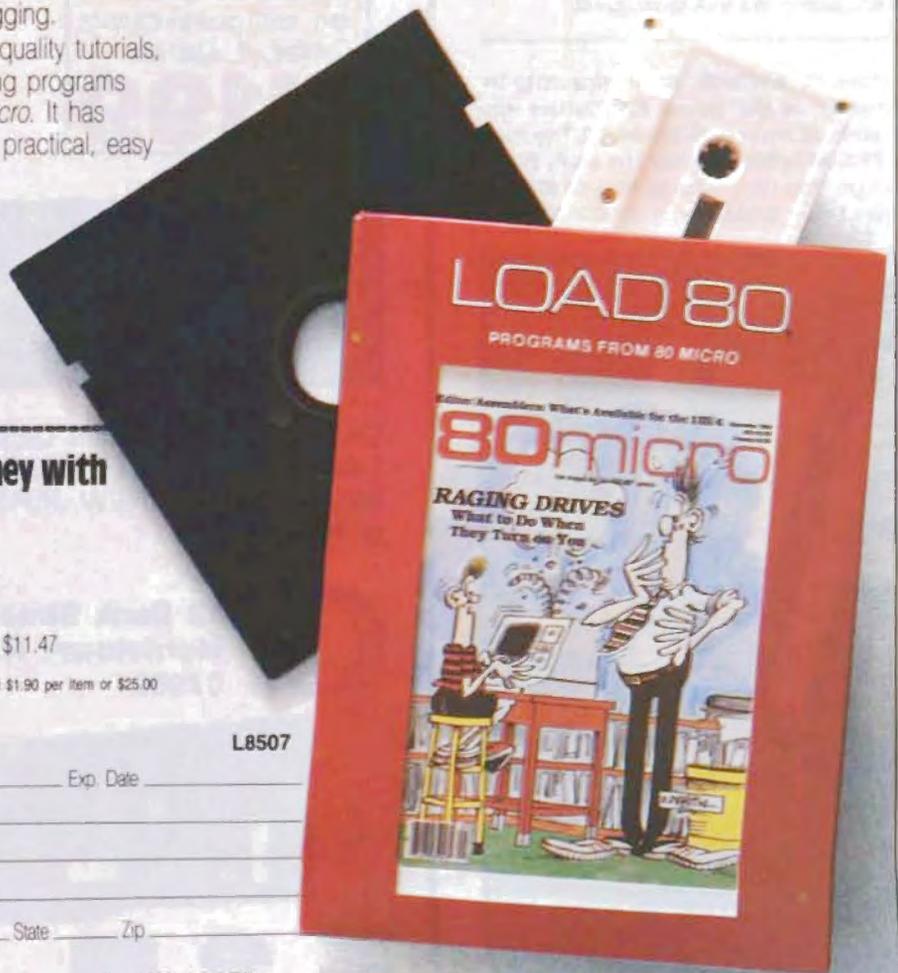
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Getting Ahead

Speed up prompt-driven Model III programs by answering queries ahead of time.

Keyboard type-ahead is one of TRSDOS 6.X's features I like best. Once I've memorized a program's menus, prompts, and required responses, I can type them in ahead of time to speed up program execution. I find this much more satisfying than waiting for each prompt to appear on-screen.

I wish the Model III provided this feature, but it comes only with LDOS 5.1. I wrote a program, TypeAhead, that gives me type-ahead on my TRSDOS 1.3 disks (see the Program Listing). With a few changes, you can make the program run on a Model III cassette system as well (see below).

The Benefits of TypeAhead

A type-ahead feature is great because it lets you "store" data in the computer in anticipation of questions and prompts. Say, for example, you have a menu-driven data base management program. The first screen prompt looks like this:

- 1) Add entries
- 2) Search
- 3) Sort
- 4) Print

You select option 3. The second screen asks you if you want to sort by:

- 1) Name
- 2) Address
- 3) City

You choose option 1. Next, the program asks at what letter you want the sort to begin. You need only the last half of the alphabet, so you type in N and press the enter key. Then the program asks if you want the sort to include a second field. You do, so you type in 3. Finally, the sort begins.



System Requirements

Model III
TRSDOS 1.3 or Cassette Basic
Assembly language
Editor/Assembler

Program Listing, TypeAhead.

```

00100 ;
00110 ; Model III Type Ahead Utility 01.00.00
00120 ; Copyright (c) 1984 By Mark D. Goodwin
00130 ;
00140 ; Disk EQUates ; Cassette EQUates
00150 ;
41FF 00160 DELAY EQU 41FFH ;DELAY EQU 41FFH
021B 00170 DSPLY EQU 021BH ;DSPLY EQU 021BH
402D 00180 EXIT EQU 402DH ;EXIT EQU 1A19H
4411 00190 HIGH EQU 4411H ;HIGH EQU 40B1H
4016 00200 KEYV EQU 4016H ;KEYV EQU 4016H
4201 00210 REPEAT EQU 4201H ;REPEAT EQU 4201H
4047 00220 RTCV EQU 4047H ;RTCV EQU 4047H
5200 00230 START EQU 5200H ;START EQU 43E9H
00240 ;CLEAR EQU 1E83H
00250 ;RSTPTR EQU 1B4DH
5200 00260 ORG START
00270 ;
00280 ; Initialization and Relocation Routine
00290 ;
5200 F3 00300 INIT DI ;Disable the interrupts
5201 2A1144 00310 LD HL,(HIGH) ;HL=High memory pointer
5204 11F453 00320 LD DE,PEND ;DE=End of program pointer
5207 B7 00330 OR A ;Figure the
5208 ED52 00340 SBC HL,DE ; relocation offset
520A EB 00350 EX DE,HL ;DE=Relocation offset
520B 215152 00360 LD HL,RTAB ;HL=Relocation address pointer
520E 4E 00370 INIT9 LD C,(HL) ;Get the
520F 23 00380 INC HL ; relocation
5210 46 00390 LD B,(HL) ; address
5211 23 00400 INC HL ; into HL
5212 78 00410 LD A,B ;Jump if
5213 81 00420 OR C ; it's the end
5214 2809 00430 JR Z,INIT1 ; of the table
5216 0A 00440 LD A,(BC) ;A=LSB of relocation address
5217 03 00450 ADD A,E ;Add in the offset
5218 02 00460 LD (BC),A ;Save the new LSB
5219 03 00470 INC BC ;Bump the address pointer
521A 0A 00480 LD A,(BC) ;A=MSB of relocation address
521B 0A 00490 ADC A,D ;Add in the offset
521C 02 00500 LD (BC),A ;Save the new MSB
521D 18EF 00510 JR INIT0 ;Loop
521F 2A4740 00520 INIT1 LD HL,(RTCV) ;Save the old
5222 222953 00530 LD (ORTC),HL ; RTC routine's address
5225 21CA52 00540 LD HL,RTC ;Set the new
5226 00550 RL00 EQU $-2
5228 224740 00560 LD (RTCV),HL ; RTC routine's address
522B 2A1640 00570 LD HL,(KEYV) ;Save the old
522E 22D152 00580 LD (OKEY),HL ; keyboard driver address
5231 212B53 00590 LD HL,KEY ;Set the new
5232 00600 RL01 EQU $-2
5234 221640 00610 LD (KEYV),HL ; keyboard driver address
5237 21F453 00620 LD HL,PEND ;HL=Current end of program
523A ED5B1144 00630 LD DE,(HIGH) ;DE=New end of program
523E 012B01 00640 LD BC,PLEN ;BC=Program length
5241 EDB8 00650 LDDR ;Move it to high memory
5243 ED531144 00660 LD (HIGH),DE ;Save new high memory pointer
00670 ;
00680 ; Insert the following three lines for non-disk only:
00690 ;
00700 ; LD DE,50 ;Set string
00710 ; CALL CLEAR ; string space pointers
00720 ; CALL RSTPTR ;Reset Basic pointers
00730 ;
5247 FB 00740 EI ;Enable the interrupts
5248 C17852 00750 LD HL,MESS ;Display
524B CD1B02 00760 CALL DSPLY ; a message
524E C32D40 00770 JP EXIT ;Return to TRSDOS/Basic
00780 ;
00790 ; Relocation Address Pointers Table
00800 ;
5251 2652 00810 RTAB DEFW RL00
5253 3252 00820 DEFW RL01
5255 FP52 00830 DEFW RL02
    
```

Listing continued

Listing continued

```

5257 0253 00040 DEFW RL03
5259 0553 00050 DEFW RL04
525B 0853 00060 DEFW RL05
525D 1253 00070 DEFW RL06
525F 1C53 00080 DEFW RL07
5261 1F53 00090 DEFW RL08
5263 2253 00900 DEFW RL09
5265 2653 00910 DEFW RL10
5267 4053 00920 DEFW RL11
5269 4653 00930 DEFW RL12
526B 5553 00940 DEFW RL13
526D 5C53 00950 DEFW RL14
526F 6453 00960 DEFW RL15
5271 6E53 00970 DEFW RL16
5273 7153 00980 DEFW RL17
5275 0D53 00990 DEFW EPTR
5277 5F53 01000 DEFW CPTR
5279 0000 01010 DEFW 0
01020 ;
01030 ; Sign On Message
01040 ;
527B 1C 01050 MESS DEFB ICB
527C 1F 01060 DEFB LPH
527D 4D 01070 DEFB 'Model III Type Ahead Utility $1.00.00'
6F 64 65 6C 20 49 49 49
20 54 79 70 65 20 41 68
65 61 64 20 55 74 69 6C
69 74 79 20 30 31 2E 30
30 2E 30 30
52A2 0A 01080 DEFB 10
52A3 43 01090 DEFB 'Copyright (c) 1984 By Mark D. Goodwin'
6F 70 79 72 69 67 68 74
20 28 63 29 20 31 39 38
34 20 42 79 20 4D 61 72
6B 20 44 2E 20 47 6F 6F
64 77 69 6E
52C0 0A 01100 DEFB 10
52C9 0D 01110 DEFB 13
01120 ;
01130 ; New Real-Time Clock Routine
01140 ;
52CA 3E00 01150 RTC LD A,0 ;A=Buffer length
52CB 01160 KLEN EQU 9-1
52CC PE00 01170 CP 128 ;Jump if
52CE 2050 01180 JR 2,RTC4 ; it's full
52D0 CD0000 01190 CALL 0 ;Scan the keyboard
52D1 01200 OKEY EQU 9-2
52D3 F5 01210 PUSH AF ;Save the key
52D4 2A0142 01220 LD HL,(REPEAT) ;HL=Number of repeats
52D7 7C 01230 LD A,H ;Jump if
52D8 B5 01240 OR L ; it isn't
52D9 201A 01250 JR NZ,RTC1 ; a new delay
52DB 2AFF41 01260 LD HL,(DELAY) ;HL=Delay count
52DE 111F00 01270 LD DE,31 ;Jump if
52E1 ED52 01280 SBC HL,DE ; it's already
52E3 3810 01290 JR C,RTC1 ; been set
52E5 119700 01300 LD DE,97H ;Is it a
52E8 ED52 01310 SBC HL,DE ; new key?
52EA 210300 01320 LD HL,3 ;HL=Same key delay count
52ED 3803 01330 JR C,RTC0 ;Jump if same key
52EF 211400 01340 LD HL,20 ;HL=New key delay count
52F2 22FF41 01350 RTC0 LD (DELAY),HL ;Save the delay count
52F5 F1 01360 RTC1 POP AF ;Restore the key
52F6 B7 01370 OR A ;Jump if
52F7 282F 01380 JR 1,RTC4 ; no key pressed
52F9 FE01 01390 CP 1 ;Jump if it
52FB 200F 01400 JR NZ,RTC2 ; isn't BREAK
52FD AF 01410 XOR A ;zero the
52FE 32CB52 01420 LD (KLEN),A ; buffer length
52FF 01430 RL02 EQU 9-2
5301 217553 01440 LD HL,KBUF ;Reset
5302 01450 RL03 EQU 9-2
5304 225F53 01460 LD (CPTR),HL ; the buffer
5305 01470 RL04 EQU 9-2
5307 220D53 01480 LD (EPTR),HL ; pointers
5308 01490 RL05 EQU 9-2
530A 3E01 01500 LD A,1 ;A=BREAK value
530C 217553 01510 RTC2 LD HL,KBUF ;HL=Next location pointer
530D 01520 EPTR EQU 9-2
530F 77 01530 LD (HL),A ;Save the key
5310 23 01540 INC HL ;Bump the pointer
5311 11F553 01550 LD DE,KBUF+128 ;DE=End of buffer pointer
5312 01560 RL06 EQU 9-2
5314 EB 01570 EX DE,HL ;Swap the pointers
5315 B7 01580 OR A ;Wrap around
5316 ED52 01590 SBC HL,DE ; the buffer?
5318 EB 01600 EX DE,HL ;Swap the pointers
5319 2003 01610 JR NZ,RTC3 ;Jump if no wrap around
531B 217553 01620 LD HL,KBUF ;HL=New pointer
531C 01630 RL07 EQU 9-2
531E 220D53 01640 RTC3 LD (EPTR),HL ;Save the pointer
531F 01650 RL08 EQU 9-2
5321 3ACB52 01660 LD A,(KLEN) ;A=Buffer length
5322 01670 RL09 EQU 9-2
5324 3C 01680 INC A ;Bump it
5325 32CB52 01690 LD (KLEN),A ;Save it
5326 01700 RL10 EQU 9-2
5328 C30000 01710 RTC4 JP 0 ;Go to old RTC routine
5329 01720 ORTC EQU 9-2
01730 ;
01740 ; New Keyboard Driver Routine
01750 ;
532B F3 01760 KEY DI ;Disable the interrupts
532C 210E00 01770 LD HL,14 ;Figure the

```

Listing continued

If your system had a type-ahead buffer, you could load the data base manager and type in 3. 1. N, press the enter key, and type in 3. As the program encountered each question, it would automatically find the answers waiting for it. You could perform another task or sit back and wait for the finished sort, which is a lot less frustrating than waiting for the computer to ask questions you know by heart.

Assembling and Using TypeAhead

You can easily assemble TypeAhead with any EDTASM-compatible editor/assembler. Disk system owners should type in the Listing. Cassette owners must make the following changes: In lines 130-250 use cassette equates instead of disk equates, and enter lines 700-730 as standard source code, not as comments.

Because TypeAhead initializes and relocates itself automatically, running the program is easy. Disk system owners can execute TypeAhead like any other /CMD file. Cassette users can execute TypeAhead using the Basic System command.

Once you load TypeAhead in memory, it becomes a resident system program. Everything you do after that gives you the type-ahead feature, even if you enter Basic. You can only break out of it by resetting the computer.

How TypeAhead Works

I've fully commented TypeAhead's source code, so you don't really need a line-by-line description. However, I'll mention some of TypeAhead's highlights.

After you load TypeAhead, it executes its initialization and relocation routine. It relocates itself by adjusting any memory-dependent addresses and moving the program to protected high memory. Before moving to high memory, TypeAhead links with the Basic ROM's real-time clock and keyboard driver vectors, thereby gaining full control over the real-time clock interrupt and keyboard routines.

Once TypeAhead sets itself up, all real-time clock interrupts pass control to TypeAhead's real-time clock routine. This routine handles all keyboard scanning. Whenever a real-time clock interrupt occurs, the clock routine scans the keyboard to see if you're pressing a key. If you are, the routine puts the key's value in a high memory buffer.

Because real-time clock interrupts occur 30 times a second, you're limited to a maximum typing speed of 30 characters a second. Also, TypeAhead provides only 128 characters of buffer space. Whenever the buffer becomes full, TypeAhead stops scanning the keyboard. When buffer space again becomes available, TypeAhead resumes the keyboard scan.

TypeAhead's keyboard driver extracts buffered keys and returns them to the

Listing continued

```

532F 39      #1780      ADD      HL,SP      ; return address pointer
5330 7E      #1790      LD        A,(HL) ;A=LSB of return address
5331 FE9E    #1800      CP        9EH   ;Jump if called
5333 2804    #1810      JR        Z,KEY0 ; from 1D9EH possible
5335 FE21    #1820      CP        21H   ;Jump if not
5337 281B    #1830      JR        NZ,KEY1 ; called from 1D21H
5339 23      #1840      INC      HL     ;Bump the pointer
533A 7E      #1850      LD        A,(HL) ;A=MSB of return address
533B FE1D    #1860      CP        1DH   ;Jump if not called
533D 2815    #1870      JR        NZ,KEY1 ; from 1D21H or 1D9EH
533F 3ACB52  #1880      LD        A,(KLEN) ;A=Buffer length
5340         #1890      EQU      $-2
5342 B7      #1900      OR        A     ;Jump if
5343 282E    #1910      JR        Z,KEY3 ; buffer empty
5345 2A5F53  #1920      LD        HL,(CFTR) ;HL=Character pointer
5346         #1930      EQU      $-2
5348 7E      #1940      LD        A,(HL) ;A=Key value
5349 FE01    #1950      CP        1     ;Jump if
534B 2807    #1960      JR        Z,KEY1 ; it's a BREAK
534D FE60    #1970      CP        60H   ;Jump if
534F 2803    #1980      JR        Z,KEY1 ; it's a SHIFT @
5351 AF      #1990      XOR      A     ;Flag no key
5352 181F    #2000      JR        KEY3 ;Jump
5354 3ACB52  #2010      LD        A,(KLEN) ;A=Buffer length
5355         #2020      EQU      $-2
5357 B7      #2030      OR        A     ;Jump if
5359 2819    #2040      JR        Z,KEY3 ; buffer empty
535A 3D      #2050      DEC      A     ;Dec the length
535B 32CB52  #2060      LD        (KLEN),A ;Save it
535C         #2070      EQU      $-2
535E 217553  #2080      LD        HL,KBUF ;HL=Character pointer
535F         #2090      EQU      $-2
5361 7E      #2100      LD        A,(HL) ;A=Key value
5362 23      #2110      INC      HL     ;Bump pointer
5363 1AF553  #2120      LD        DE,KBUF+128 ;DE=End of buffer pointer
5364         #2130      EQU      $-2
5366 EB      #2140      EX      DE,HL ;Swap the pointers
5367 B7      #2150      OR        A     ;Wrap around
5368 ED52    #2160      SBC      HL,DE ; the buffer?
536A EB      #2170      EX      DE,HL ;Swap the pointers
536B 2803    #2180      JR        NZ,KEY2 ;Jump if no wrap around
536D 217553  #2190      LD        HL,KBUF ;HL=New pointer
536E         #2200      EQU      $-2
5370 225F53  #2210      LD        (CFTR),HL ;Save the pointer
5371         #2220      EQU      $-2
5373 FB      #2230      EI         ;Enable the interrupts
5374 C9      #2240      RET        ;Return
          #2250 ;
          #2260 ; Type Ahead Buffer
          #2270 ;
0080         #2280      KBUF      DEFS      128
53F4         #2290      PEND      EQU      $-1
012B         #2300      PLEN      EQU      PEND-RTC+1
5280         #2310      END
    
```

End

ROM. Whenever the program calls the keyboard driver, it checks the calling routine's return address. If the routine is the Basic interpreter loop, TypeAhead only returns buffered break and SHIFT@ values. Whenever the Basic interpreter loop isn't the calling routine, TypeAhead releases any buffered key value.

An Additional Feature

Besides providing the type-ahead feature, my program adds an auto-repeat function to the Basic INKEY string. It enables this feature by releasing only buffered break and SHIFT@ values. One application for this utility is in games where you use the arrow keys to move an object across the screen. With normal INKEY\$, you have to tap the key repeatedly to move the object. My program eliminates the tapping. You just press the key, and the character moves until you lift your finger.

However, if you run a program that has an INKEY\$ command that requires an alphanumeric response, be sure you don't press the key too long. You could end up storing responses in the buffer, and the next INKEY\$ in the program reads the buffer for its response. Thus, you could accidentally answer future prompts incor-

rectly. But, as long as you don't have lead fingers, this shouldn't be a problem.

TypeAhead's Limitations

Because I designed TypeAhead around the Model III ROM, it works fine with Basic. Regrettably, it might not work with all machine-language programs. TypeAhead should work with any machine-language program that recognizes high memory and performs keyboard input through Model III ROM routines. The only way to find out if TypeAhead works with a particular program is to try it. Simply put, it will either work or crash the system.

Also, TypeAhead scans the keyboard only during real-time clock interrupts, so you'll probably lose characters any time you disable interrupts or make disk or cassette input/output. Instructing the computer to RUN APROGRAM/BAS while you're still loading Basic, for example, results in lost characters and a syntax error.

If you keep TypeAhead's limitations in mind, I think you'll find the program a welcome addition to TRSDOS 1.3 or Model III Cassette Basic. ■

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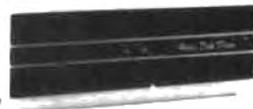


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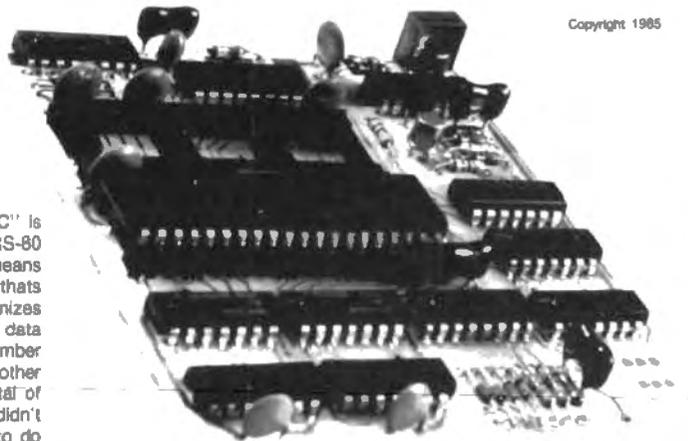
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When it comes to writing sorts, once is not enough. You can easily write a quick Basic sort when you need one in a specific instance, but that takes care of only one case. Alternatively, you could write a general sort and store it on disk, but the conditions of a sort change: One day you might want records sorted from highest to lowest; the next day, from lowest to highest. Sometimes your records have three fields, sometimes six. While re-writing a sort program isn't hard, it's mindless busywork, and it often takes you longer to debug a sort than to write it.

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Ordering Up Your Sort

To generate a sort, type in Sorter (see Program Listing 1), save it to disk, and run it. Your responses to 10 prompts determine the resulting sort's nature. The Photo shows a sample run; I'll explain each prompt briefly:

Enter A for alpha seq. N for numeric sequence?

If you type in A, Sorter sorts according to each piece of data's leftmost character. For example, Sorter would order the machine parts widgit, screw, and bolt this way:

```
bolt
screw
widgit
```

If you type in N, Sorter right-justifies data before sorting it. This is necessary to produce a proper sort on numeric data. For instance, say you want to sort two pieces of data, 33 and 325. If the sort pro-

GENERATE SORT

```
ENTER A FOR ALPHA SEQ, N FOR NUMERIC SEQ ? A
FOR DESCENDING SEQUENCE ENTER D ?
ENTER NUMBER OF FIELDS ? 5
ENTER MAXIMUM NUMBER OF RECORDS IN FILE ? 1000
DIN CND REQUIRES 15069 BYTES LEAVING 19068 FOR SORT CLEAR ON
IF GARBAGE COLLECTION ELIMINATOR REQUIRED ENTER Y ? N
ENTER KEY FIELD POSITION ? 3
ENTER MAX CHAR IN KEY ? 10
ENTER INPUT FILE NAME ? INFILE
ENTER OUTPUT FILE NAME ? OUTFILE
ENTER SORT NAME ? SORT1/DMS
PRESS ENTER TO WRITE SORT ON DISK
```

Photo. A sample run of Program Listing 1.

gram left-justified the data, the final sort would appear as:

```
325
33
```

which is incorrect. By right-justifying the data in a numeric sort, the program gives you the proper numeric sequence:

```
33
325
```

For descending sequence enter D?

If you type in D, the program sorts a file from Z to A and from highest to lowest number. Otherwise, Sorter produces output in ascending order, from lowest to highest number and from A to Z.

Enter number of fields?

Type in the number of fields that make up a single data base record. For example,

a data base comprising a date, a part number, quantity on hand, and quantity on order has four fields. Date is field 1, Part Number is field 2, and so on.

Enter maximum number of records in file?

This number need not be an accurate count as long as it's equal to or greater than the number of records in the file. The program uses this number to dimension the sort program's arrays and allocate memory. After you answer this prompt, the sort generator calculates and displays the amount of memory available for storing input data.

If garbage collection eliminator required enter Y?

Answering Y invokes a routine that circumvents the computer's garbage collection process, which Thomas Eggarter explained in "Quit Stalling" (November 1984, p. 86). I usually try to run a sort without the routine, as it increases input time slightly. However, if you're low on available memory or your computer stalls during the input phase, you'll want to rebuild your sort with the garbage collection eliminator invoked.

Enter key field position?

Your response to this prompt determines the field by which you want to sort. In the sample record above, you'd type in 2 if you wanted to sort by part number, since Part Number is the second field.

Enter maximum characters in key (field)?

The sort treats all key fields as strings, and it fixes the field's length at the number of characters you specify here. The number must be equal to or greater than the maximum number of characters in the key field.

Enter input file name?

Type in the name of the file you want to sort.

LOAD
80

System Requirements

Models I, III, 4, 1000, and 1200
Disk Basic
32K RAM

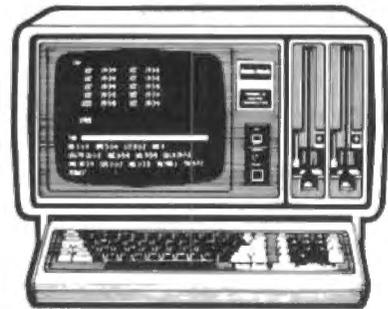
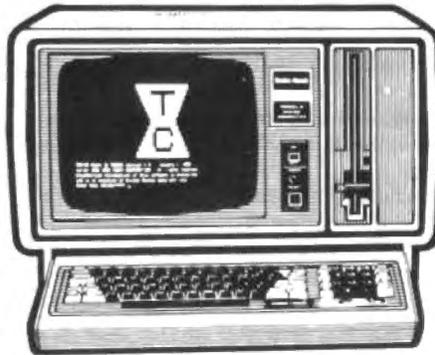
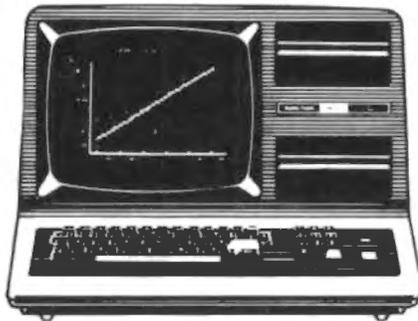
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| Line | Description |
|---------|--|
| 20 | Sets M to available memory limit. |
| 30 | Dimensions array and goes to subroutine to fill array with sort program lines. |
| 60 | Strips trailing comma or semicolon from input and print commands in generated sort. |
| 70 | Modifies L\$(7) from right- to left-justify for alpha sequence. |
| 80 | Changes S\$(4) from > to < for descending sequence. |
| 90 | Sets the number of fields within a record (F), the maximum number of records in the file (N), and calculates the amount of memory the resulting DIM instructions will require (A). |
| 100 | Sets M to a maximum of 32000 which the sort's Clear command uses. |
| 120 | Modifies L\$(7) by removing GOSUB30 and GOSUB40 to bypass garbage-collector elimination instructions. |
| 130 | Sets up L\$(1) with the Clear command using M as the number of bytes available to clear, and sets DL with the maximum number of records to read using F from line 80. |
| 140-170 | Sets up files and fields. |
| 180 | TS\$ is a temporary storage area that the sort program uses. The length is set to the maximum length of the sort key plus four characters for the tag. |
| 190 | Sets up the sort program's DIM command line for record fields to the maximum record count specified. |
| 200 | If the key field (KF) is the first field, the generated sort doesn't use L\$(6) and L\$(13) and the program skips to line 220. |
| 210-230 | Makes the generated sort input and print fields that fall before and after the key. |
| 240 | Sets the sort program's name (OL\$). |
| 270-330 | Writes the generated sort to disk. |
| 350-680 | The lines of the generated sort in Basic. The generator modifies them according to prompted input. |
| 360-370 | Part of the garbage collection eliminator. Protects location of the next free memory byte from Basic and sets a temporary new top of memory and a new next free memory location. |
| 380-390 | Restores the Basic values changed in line 360. |
| 400-430 | Sets up locations for the temporary new bottom of memory and temporary next free memory bytes used in line 360. |
| 440-510 | Sort subroutine. |
| 520 | Becomes the generated sort's DIM command line. |
| 530 | Prints "Reading" and opens the input file. |
| 540 | Sets the maximum number of records that the sort reads. |
| 550 | Inputs all fields that occur prior to the key field. |
| 560 | Reads the key, fixes the length, and assigns the sort's tag. |
| 570 | Reads any fields that occur after the key. |
| 580 | Checks if data remains in the input file after the maximum number of records are read; if so, jumps to an error message. |
| 590 | Opens the output file. |
| 600 | Sets the maximum number of records the sort writes. |
| 610 | Sets (T) equal to the tag number assigned during input. |
| 620 | Writes any fields occurring before the key. |
| 630 | Pulls the tag off of the key field and writes the key field to disk. |
| 640 | Writes any fields occurring after the key. |
| 670-680 | Error message fields. |

Table. Line definitions for Program Listing 1.

```

310 FOR Z=0 TO 4:PRINT#1, S$(Z):NEXT Z
460 S$(2)="30010 N%=N
470 S$(3)="30040 CMD"+CHR$(34)+"O"+CHR$(34)+"", N%, A$(1)"
480 S$(4)="30050 RETURN"
Delete lines 80 and 490-510

```

Figure 1. Changes to use CMD"O" in sort. (Model III only.)

Enter output file name?

Specify the sorted file's name. If you type in the input file's name, the program warns you that the sorted file will overwrite the input file, and asks if this is acceptable. If not, you can type in a different output file name.

Enter sort name?

This is the name of the sort program you're generating.

Ready to Sort

After you've answered the 10th prompt, the sort generator prompts you to press the enter key to write your custom sort to disk.

Merging Sorter

Program Listing 2 shows a sample sort, called Sort1/BAS, that corresponds to the sample run shown in the Photo. The generator saves the sort program in ASCII format, so you can easily merge it with another program.

To merge a sort, first make sure its line numbers don't conflict with your main program's. Then, with the main program in memory, type in MERGE "SORTER". If you use the sort as a separate program, resave it in standard, compressed format for better speed. To do so, type in SAVE "SORTER".

When Things Go Wrong

The sort generator and the finished sort program display error messages when they encounter inconsistent or incorrect input. If the number of records combined with the number of fields reduces available memory to fewer than 1,000 bytes, the sort generator informs you "Too many messages for memory size" and prompts you to start over.

If your response to the prompt for the number of sort fields (prompt 6) falls outside the number of fields you indicated, (prompt 3), Sorter displays the error message "Key (field) not within field, try again."

In the sort program itself, you'll encounter the message "Reached max record count before EOF" if the input file contains more records than you specified. If the sort finds a key field with more characters than you specified at prompt 7, it displays the field along with the message, "Key field longer than expected."

You'll see the error message, "Data entered work area, output will be garbled" only if you use the garbage collection eliminator. The error occurs when the eliminator, which requires 500 bytes, plus the input data, exceed the program's allotted string space. A possible solution is to change line 50 from WA=500 to WA=nnn, where nnn is a number less than 500 (see Listing 2). However, using a number less than 100 increases the input time dramatically.

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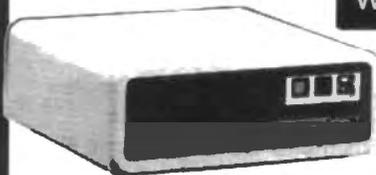
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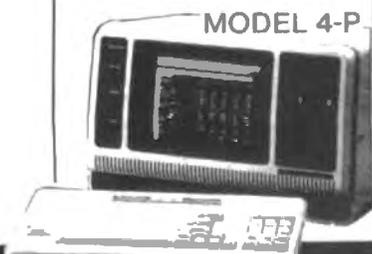
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MODEL 4-P



One Sort or Another

The Table explains key lines in Listing 1. The sort routine, lines 440-510, uses an algorithm known as the Shell-Metzner sort. You can replace the routine with another sort if you want; Model III owners can substitute the CMD"O" function (see Figure 1 for instructions).

If you use a different sort, be sure to change line 310, which writes the routine to disk. Also, delete line 80, which arranges the output in descending order; this would foul up a different sort routine.

Figure 2 lists modifications to Listing 1 for the Models 4, 1000, and 1200. ■

Robert G. Wilson started programming in 1957 on the UNIVAC Model I, and he has worked on a number of systems since then. He's currently an independent management consultant. You can write to him at 143 Elm St., Georgetown, MA 01833.

Related Articles

Gorney, Len, "All About Sorts," Parts I and II, August 1981, p. 308 and September 1981, p. 148. A tutorial covering a variety of sort algorithms (but not Shell-Metzner).

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```

20 CLEAR: M=MEM 'for Model 1000/1200, M=PRE(1)
30 DIM L$(20):GOSUB 440
70 Change 56 to 47.
130 L$(1)="10 CLEAR:CLS:DL="+STR$(N)+" :TS$="
560 eliminate GOSUB 30; and GOSUB 40;
Delete the following lines: 120, 290, 350-430.
    
```

Figure 2. Modifications for the Models 4, 1000, and 1200.

Program Listing 1. Sort generator program.

```

10 ' SORT GENERATOR BY R.G. WILSON
20 CLEAR 2000:M=MEM+2000
30 DIM L$(20):GOSUB 350
40 CLS:PRINT "GENERATE SORT":PRINT
50 GOTO 70
60 L$(CL)=LEFT$(L$(CL),LEN(L$(CL))-1):RETURN
70 INPUT "ENTER A FOR ALPHA SEQ, N FOR NUMERIC SEQ ";Z$:IF Z$="A"
THEN MID$(L$(7),56,13)=" LEFT$(A$+TS$"
80 INPUT "FOR DESCENDING SEQUENCE ENTER D ";Z$:IF Z$="D" THEN MID$(
S$(4),21,1)="< "
90 INPUT "ENTER NUMBER OF FIELDS ";F:FC=F-1:INPUT "ENTER MAXIMUM N
UMBER OF RECORDS IN FILE ";N:A=(26+((F-1)*11))+((N*3)*F-1):IF M-A<
1000 THEN INPUT "TOO MANY RECORDS FOR MEMORY SIZE, <ENTER> TO REST
ART";A:GOTO 20
100 M=M-A:IF M>32000 THEN M=32000
110 PRINT"DIM CMD REQUIRES"A"BYTES LEAVING"M"FOR SORT CLEAR CMD"
120 INPUT"IF GARBAGE COLLECTION ELIMINATOR REQUIRED ENTER Y ";W$:I
F W$<"Y" THEN MID$(L$(7),5,8)=STRING$(8,32):MID$(L$(7),98,8)=STRI
NG$(8,32)
130 L$(1)="10 CLEAR"+STR$(M)+" :CLS:DL="+STR$(N)+" :TS$="
140 INPUT "ENTER KEY FIELD POSITION ";KF:IF KF>FC+1 OR KF=0 THEN P
RINT "KEY NOT WITHIN FIELD, TRY AGAIN":GOTO 90
150 INPUT "ENTER MAX CHAR IN KEY ";KL
160 INPUT "ENTER INPUT FILE NAME ";IL$
170 INPUT "ENTER OUTPUT FILE NAME ";OL$:IF IL$=OL$ THEN INPUT "OUT
PUT FILE WILL DESTROY INPUT FILE, ENTER Y IF ACCEPTABLE";Z$:IF Z$<
">"Y" THEN GOTO 160
180 TS$=TS$+STRING$(KL+4,32):L$(1)=L$(1)+CHR$(34)+TS$+CHR$(34)+" :K
L="+STR$(KL)+" :IL$="+CHR$(34)+IL$+CHR$(34)+" :OL$="+CHR$(34)+OL$+CH
R$(34)
190 IF FC<1 THEN CL=3:GOSUB 60:GOTO 200:ELSE FOR Z=1 TO FC:L$(3)=L
$(3)+CHR$(65+Z)+"$(DL)," :NEXT Z:CL=3:GOSUB 60
200 IF KF=1 THEN L$(6)=CHR$(0):L$(13)=L$(6):GOTO 220
210 FOR Z=1 TO KF-1:L$(6)=L$(6)+CHR$(65+Z)+"$(Z)," :L$(13)=L$(13)+C
HR$(65+Z)+"$(T);" +CHR$(34)+" ,"+CHR$(34)+" ;":NEXT Z:CL=6:GOSUB 60
220 IF KF=FC+1 THEN L$(8)=CHR$(0):L$(15)=L$(8):L$(14)=LEFT$(L$(14)
,LEN(L$(14))-5):GOTO 240
230 FOR Z=KF TO FC:L$(8)=L$(8)+CHR$(65+Z)+"$(Z)," :L$(15)=L$(15)+CH
R$(65+Z)+"$(T);" +CHR$(34)+" ,"+CHR$(34)+" ;":NEXT Z:CL=8:GOSUB 60
:L$(15)=LEFT$(L$(15),LEN(L$(15))-5)
240 INPUT "ENTER SORT NAME ";OL$
250 L$(8)="1 " +OL$+" SORT - KEY IS FIELD "+STR$(KF)+" OF"+STR$(F
C+1)+" FIELDS. MAX LENGTH OF KEY IS"+STR$(KL)+" CHAR"
260 L$(2)="20 PRINT"+CHR$(34)+"RUNNING"+OL$+CHR$(34)
270 LINE INPUT "PRESS ENTER TO WRITE SORT ON DISK";Z$:OPEN "O",1,0
L$
280 FOR Z=0 TO 2:PRINT#1,L$(Z):NEXT Z
290 FOR Z=0 TO 6:PRINT#1,G$(Z):NEXT Z
300 FOR Z=3 TO 19:PRINT #1,L$(Z):NEXT Z
310 FOR Z=0 TO 7:PRINT #1,S$(Z):NEXT Z
320 CLOSE
330 PRINT OL$ " NOW ON DISK"
340 END
350 G$(0)="20 GOTO 50"
360 G$(1)="30 F1=PEEK(16598):F2=PEEK(16599):POKE16598,C1:POKE16599
,C2:POKE16561,C1:POKE16562,C2:IFBM>F1+(F2*256)THENPRINT"+CHR$(34)+
"DATA ENTERED WORK AREA, OUTPUT WILL BE GARBLED, SORT
TERMINATED"+CHR$(34)+" :GOSUB40:END:ELSERETURN"
370 'ABOVE SETS TEMP NEW BOTTOM & SAVES ORIGINAL VALUES
380 G$(2)="40 POKE16598,F1:POKE16599,F2:POKE16561,B1:POKE16562,B2:
RETURN"
390 ' ABOVE RESTORES THE STRING WORKING AREAS
400 G$(3)="50 WA=500"
410 G$(4)="60 B1=PEEK(16561):B2=PEEK(16562):'SAVE TOP OF MEMORY LS
B=B1 MSB=B2"
420 G$(5)="70 BM=PEEK(16544)+256*PEEK(16545):BM=BM+WA:'ESTABLISH B
OTTOM FOR WORK AREA
430 G$(6)="80 C2=INT(BM/256):C1=BM-(C2*256):'C1=NEW LSB C2=NEW MSB
OF POINTER"
440 S$(0)="29999 'SORT ROUTINE"
450 S$(1)="30000 PRINT"+CHR$(34)+"SORTING"+CHR$(34)+" :M=N"
460 S$(2)="30010 M=INT(M/2):IF M=0 THEN RETURN ELSE K=N-M:J=1"
470 S$(3)="30040 I=J"
480 S$(4)="30050 L=I+M:IF A$(I)>A$(L) THEN 30100"
    
```

Listing 1 continued

Listing 1 continued.

```

490 S$(5)="30070 J=J+1:IF J>K THEN 30010 ELSE 30040 "
500 S$(6)="30100 LSET TS$=A$(I):LSET A$(I)=A$(L):LSET A$(L)=TS$"
510 S$(7)="30120 I=I-N:IF I<1 THEN 30070 ELSE 30050"
520 L$(3)="100 DIM A$(DL),"
530 L$(4)="110 PRINT"+CHR$(34)+"READING"+CHR$(34)+" :OPEN"+CHR$(34)
+"I"+CHR$(34)+" ,L,IL$"
540 L$(5)="120 FOR Z=1 TO DL:IF EOF(1) THEN CLOSE:N=Z-1:GOSUB 3000
0:GOTO 200"
550 L$(6)="130 INPUT#1,"
560 L$(7)="140 GOSUB 30:INPUT#1,A$:IF LEN(A$)>KL THEN 320 ELSE A$=
RIGHT$(TS$+A$,KL)+RIGHT$(STR$(10000+Z),4):GOSUB 40:A$(Z)=A$"
570 L$(8)="150 INPUT#1,"
580 L$(9)="160 NEXT Z:IF EOF(1) THEN CLOSE:N=Z-1:GOSUB 30000:GOTO
200:ELSE GOTO 310"
590 L$(10)="200 PRINT"+CHR$(34)+"WRITING"+CHR$(34)+" :OPEN"+CHR$(34)
)+"O"+CHR$(34)+" ,L,OL$"
600 L$(11)="210 FOR Z=1 TO N"
610 L$(12)="220 T=VAL(RIGHT$(A$(Z),4))"
620 L$(13)="230 PRINT#1,"
630 L$(14)="240 PRINT#1,LEFT$(A$(Z),KL);"+CHR$(34)+" ,"+CHR$(34)+" ;"
"
640 L$(15)="250 PRINT#1,"
650 L$(16)="260 NEXT Z"
660 L$(17)="300 CLOSE:PRINT"+CHR$(34)+"END SORT"+CHR$(34)+" :END"
670 L$(18)="310 PRINT"+CHR$(34)+"REACHED MAX RECORD COUNT BEFORE E
OF"+CHR$(34)+" :END"
680 L$(19)="320 PRINT"+CHR$(34)+"KEY FIELD LONGER THAN EXPECTED. P
IELD IS:"+CHR$(34)+"A$:END"
690 RETURN
    
```

End

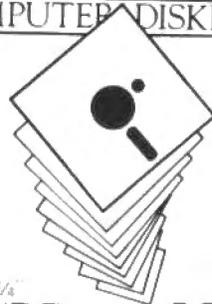
Program Listing 2. Sort1/BAS, a sample sort program.

```

1 ' SORT1/BAS SORT - KEY IS FIELD 3 OF 5 FIELDS. MAX LENGTH OF KEY
IS 10 CHAR
10 CLEAR 19064:CLS:DL= 1000:TS$=" " " :KL= 10:IL$="INFI
L" :OL$="OUTFILE"
    
```

Listing 2 continued

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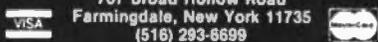
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Listing 2 continued

```

20 GOTO 50
30 F1=PEEK(16598):F2=PEEK(16599):POKE16598,C1:POKE16599,C2:POKE165
61,C1:POKE16562,C2:IFBM>F1+(F2*256) THENPRINT"DATA ENTERED WORK ARE
A, OUTPUT WILL BE GARBLED, SORT TERMINATED":END:ELSERETURN
40 POKE16598,F1:POKE16599,F2:POKE16561,B1:POKE16562,B2:RETURN
50 WA=500
60 B1=PEEK(16561):B2=PEEK(16562):'SAVE TOP OF MEMORY LSB=B1 MSB=B2
70 BM=PEEK(16544)+256*PEEK(16545):BM=BM+WA:'ESTABLISH BOTTOM FOR W
ORK AREA
80 C2=INT(BM/256):C1=BM-(C2*256):'C1=NEW LSB C2=NEW MSB OF POINTER
100 DIM A$(DL),B$(DL),C$(DL),D$(DL),E$(DL)
110 PRINT"READING":OPEN"1",1,IL$
120 FOR Z=1 TO DL:IF EOF(1) THEN CLOSE:N=Z-1:GOSUB 30000:GOTO 200
130 INPUT#1,B$(Z),C$(Z)
140 :INPUT#1,A$:IF LEN(A$)>KL THEN 320 ELSE A$= LEFT$(A$+T
S$,KL)+RIGHT$(STR$(10000+Z),4): :A$(Z)=A$
150 INPUT#1,D$(Z),E$(Z)
160 NEXT Z:IF EOF(1) THEN CLOSE:N=Z-1:GOSUB 30000:GOTO 200:ELSE GO
TO 310
200 PRINT"WRITING":OPEN"0",1,OL$
210 FOR Z=1 TO N
220 T=VAL(RIGHT$(A$(Z),4))
230 PRINT#1,B$(T);",":C$(T);",":
240 PRINT#1,LEFT$(A$(Z),KL);",":
250 PRINT#1,D$(T);",":E$(T)
260 NEXT Z
300 CLOSE:PRINT"END SORT":END
310 PRINT"REACHED MAX MESSAGE COUNT BEFORE EOF":END
320 PRINT"KEY FIELD LONGER THAN EXPECTED. FIELD IS:"A$:END
29999 'SORT ROUTINE
30000 PRINT"SORTING":M=N
30010 M=INT(M/2):IF M=0 THEN RETURN ELSE K=N-M:J=1
30040 I=J
30050 L=I+M:IF A$(I)>A$(L) THEN 30100
30070 J=J+1:IF J>K THEN 30010 ELSE 30040
30100 LSET TS$=A$(I):LSET A$(I)=A$(L):LSET A$(L)=TS$
30120 I=I-M:IF I<1 THEN 30070 ELSE 30050
    
```

End

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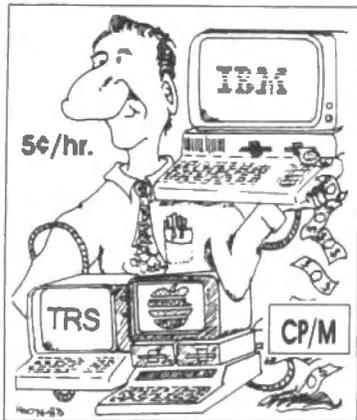
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Once you install Autorun on your system disk, it automatically runs when you boot up TRSDOS 6.X. The program prompts you for a drive number, then displays a selective directory of the programs on that drive. You load a program or job control language (JCL) file by positioning the cursor over that file and pressing the enter key.

Installing Autorun

Installing Autorun under TRSDOS 6.X is a two-step process. First key in the Basic code in Program Listing 1 and save it to disk as Autorun/BAS.

Then set up an auto-boot command on your DOS disk by entering the following line at TRSDOS Ready: AUTO BASIC AUTORUN/BAS (M=55295). This command ensures that when you boot TRSDOS 6.X, Basic automatically loads with an upper memory limit of 55295 (D7FF hexadecimal) before running Autorun. The program requires some reserved space in high memory to read in the disk directory, as you'll see.

Autorun makes assumptions about the way you name files on disk. It assumes JCL file names end with the extension /JCL, that command files end in /CMD, and that Basic program names carry the /BAS extension or have no extension. I recommend that you give Basic files the /BAS extension, however.

Up and Running

Autorun operates with a minimum of effort. At the first prompt, you enter a drive number between zero and 7 or press the E



Photo. Sample Autorun display.

key to exit. (Note that you don't need to press the enter key to execute a command.)

Autorun then reads the disk directory for the specified drive. If it can't read the drive (e.g., if you specify a nonexistent drive or have an unreadable disk), Autorun displays a "Drive not available" message and asks you to try again.

Then Autorun displays a list of Basic, command, and JCL files on the disk at six files per line. If the disk contains no such programs, Autorun displays the message "No suitable files found."

Autorun highlights the first program in the directory in reverse video. Use the arrow keys to move the highlighting cursor to select a specific file, and then press the enter key. Press the R key to restart Autorun (see the Photo).

Program Mechanics

The Table provides a line-by-line description of Autorun. When you select a



System Requirements

Model 4 Basic
TRSDOS 6.X

Basic program, Autorun returns to TRSDOS, reloads Basic without setting any high memory limit, then runs the program (e.g. BASIC MYPROG/BAS:1). For command files, Autorun returns to TRSDOS and invokes the program by issuing its name as a command (e.g., PINBALL/CMD:0).

For JCL files, Autorun returns to TRSDOS and issues a Do command with the equals sign control character (e.g., DO = STARTUP/JCL). It assumes that you've already compiled the JCL file or that it doesn't require compilation.

Customizing

Autorun makes assumptions about your programs that might not be true in all cases. For example, some Basic programs (including Autorun) require that you set a high memory limit, and some command files need specified parameters (COMM /CMD on your TRSDOS 6.X disk, for instance).

Autorun can't cater to all of those, so you might want to ensure they're excluded from Autorun's directory list. Here's how to tailor Autorun to your system.

You can exclude nonstandard programs two ways. The simplest is to make each file invisible, since Autorun displays only visible nonsystem files. To do this, use the ATTRIB command at the TRSDOS level. For example, to make PROGA/BAS invisible, type in ATTRIB PROGA/BAS (INV). PROGA/BAS won't appear in a normal Directory command unless you use the invisible option (e.g., DIR ;1 (INV)).

If this is undesirable, you can exclude programs by modifying Autorun. Look at line 190 in Listing 1, and you'll see one such example: This line ensures that Autorun/BAS doesn't appear in the selective directory list.

To exclude PROGA/BAS, add line 191 to read: IF PROG\$(PROG) = "PROGA/BAS" THEN 250. Add as many lines as necessary

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Program Listing 1. Autorun main program.

```

1 REM "AUTORUN/BAS" A.D. Smith, P.O. Box 119, Mortdale, NSW 2223, AUSTRALIA
  Requires memory protect above &HD7FF i.e. BASIC AUTORUN/BAS (M=55295)
10 GOSUB 430: REM Perform initialisation
20 CLS: PRINT@ (11,13), "Enter drive # (0 - 7) for run select, or 'e' to exit."
30 DRIVES = INKEY$
40 IF DRIVES = "e" OR
   DRIVES = "E" THEN CLS: SYSTEM
50 IF DRIVES < "0" OR
   DRIVES > "7" THEN 30
60 DRIVE = VAL(DRIVES): RETCODE = USR1(DRIVE): REM Attempt dir read into RAM
70 CLS: IF RETCODE = 255 THEN PRINT@ (11, 26), "**** Drive not available ****":
   FOR X = 1 TO 8000: NEXT: GOTO 20
80 PRINT@ (0,23), "Selecting files from drive"; DRIVE; "....."
90 PRINT@ (1,0), DASHES$: PRINT@ (22,0), DASHES$:
100 DIRADDR = &HD818: PROG = 0
110 IF PROG > 125 OR
   PEEK(DIRADDR) = 255 THEN 260: REM Check for table full / end of RAM dir
120 IF PEEK(DIRADDR) AND &H48 THEN 250: REM Ignore System & Invisible files
130 PROGS(PROG) = ""
140 FOR SPECPTR = DIRADDR+5 TO DIRADDR+15: REM Get name/ext from dir entry
150 IF PEEK(SPECPTR) = 32 THEN 180: REM Skip spaces
160 IF SPECPTR = DIRADDR+13 THEN PROGS(PROG) = PROGS(PROG) + "/"
170 PROGS(PROG) = PROGS(PROG) + CHR$(PEEK(SPECPTR)): REM Build filespec
180 NEXT SPECPTR
190 IF PROGS(PROG) = "AUTORUN/BAS" THEN 250: REM Example of specific exclusion
200 IF INSTR(PROGS(PROG),"/") = 0 THEN 240: REM Include specs with no extension
210 IF INSTR(PROGS(PROG),"/BAS") > 0 THEN 240
220 IF INSTR(PROGS(PROG),"/CMD") > 0 THEN 240
230 IF INSTR(PROGS(PROG),"/JCL") = 0 THEN 250
240 PRINT@ FNSCREENPOS(PROG), PROGS(PROG):; PROG = PROG + 1
250 DIRADDR = DIRADDR + 18: GOTO 110: REM Step to next dir entry
260 IF PROG = 0 THEN PRINT@ (11,24), "**** No suitable files found ****":
   FOR X = 1 TO 8000: NEXT: GOTO 20
270 LAST = PROG-1: PROG = 0
280 PRINT@ (23,12), "Use arrows to select, <ENTER> to run, or 'r' to restart."
290 PRINT@ FNSCREENPOS(PROG), REVVID$:; PROGS(PROG):
300 KEY$ = INKEY$
310 IF KEY$ = ENTER$ THEN 390
320 IF KEY$ <> "" THEN PRINT@ FNSCREENPOS(PROG), NORMVID$:; PROGS(PROG):
330 IF KEY$ = RT$ AND
   PROG < LAST THEN PROG = PROG+1: GOTO 290
340 IF KEY$ = DOWN$ AND
   PROG <= LAST-6 THEN PROG = PROG+6: GOTO 290
350 IF KEY$ = LEFT$ AND
   PROG > 0 THEN PROG = PROG-1: GOTO 290
360 IF KEY$ = UP$ AND
   PROG > 3 THEN PROG = PROG-6: GOTO 290
370 IF KEY$ = "r" OR
   KEY$ = "R" THEN 20
380 GOTO 290: REM Ignore key if invalid
390 CLS: PRINT CURSOR$: REM <ENTER> was pressed, so perform run
400 IF INSTR(PROGS(PROG),"/CMD") > 0 THEN 420
410 IF INSTR(PROGS(PROG),"/JCL") > 0 THEN COMMS$ = "DO - "
   ELSE COMMS$ = "BASIC "
420 COMMS$ = COMMS$ + PROGS(PROG) + ": " + DRIVES$ + ENTER$:
   PRINT COMMS$: COMMS$ = USR2(COMMS$): REM Issue command
430 REM **** Initialisation subroutine ****
440 DEFINT A-Z: DIM PROGS(125): REM Max non-system files on Mod 4 floppy = 126
450 CURSORP$ = CHR$(15): CURSOR$ = CHR$(14): PRINT CURSORP$: ENTER$ = CHR$(13):
   DASHES$ = STRING$(80,"-"): REVVID$ = CHR$(16): NORMVID$ = CHR$(17):
   UP$ = CHR$(11): DOWN$ = CHR$(10): LEFT$ = CHR$(8): RT$ = CHR$(9)
460 DEF FN SCREENPOS(X) = 160 + PIX(X/6)*80 + (X-PIX(X/6)*6)*13
470 DATA 229,78,6,1,33,24,216,62,34,239,225,200,54,255,201: REM @DODIR m/l code
480 DATA 19,26,111,19,26,103,62,24,239: REM @CMNDI m/l code
490 FOR MLADDR = &HD800 TO &HD817
500 READ MLBYTE: POKE MLADDR,MLBYTE: REM Set up @DODIR/@CMNDI routines
510 NEXT MLADDR: DEF USR 1 = &HD800: DEF USR 2 = &HD80F
520 RETURN

```

End

| Line | Description |
|---------|--|
| 10 | Initialization (see lines 430-520). |
| 20-50 | Obtains drive or exit option. |
| 60-70 | Reads directory, checks success. |
| 80-100 | Formats screen, initializes pointers. |
| 110 | Begins processing directory entries, stops if it already has 126 or if it has reached the end of the directory in RAM (marked by an X'FF' byte). |
| 120 | Eliminates system and invisible files. |
| 130-180 | Builds a file specification from RAM directory entry. |
| 190-230 | Selects candidates for screen display. |
| 240 | Displays file specification. |
| 250 | Steps to next directory entry in RAM. |
| 260 | Returns to beginning if no files found. |
| 270-290 | Completes list, creates highlight cursor. |
| 300-380 | Moves highlight cursor as required by arrow keys. |
| 390-420 | Builds and issues required command. |
| 430-520 | Initializes variables, sets up machine-language code in high RAM, defines USE entry points. |

Table. Line description of Autorun/BAS.

to exclude special-requirement programs.

I noted earlier that Autorun assumes that file names without an extension are Basic programs. If that's not the case and you'd like to exclude such files from Autorun's directory list, delete line 200.

The Subroutines

Although Autorun primarily comprises Basic code, it uses two small machine-language routines built into Data statements in lines 470 and 480. See Program Listing 2 for these Assembly-language routines.

The first routine (stored between X'D800' and X'D80E') reads the disk directory into a RAM buffer that Autorun uses to select the files it displays on-screen. Autorun does this with the @DODIR SVC call to TRSDOS 6.X (see the *Model 4 Technical Reference Manual* for more details).

The manual also details the layout of the directory. Each directory entry is 18 bytes long. The file name appears in bytes 5-12 of each entry, with the extension in bytes 13-15 (note lines 140-180 in Listing 1).

Byte zero of an entry indicates certain file attributes: Bit 6 is on for system files, and bit 3 is on for invisible files (note line 120 of Autorun/BAS).

Program Listing 2. Autorun's machine-language subroutines.

```

D800      @B100      ORG      @D8000
@B22      @B110      EQU      34      ;@DODIR SVC (Mod 4 Tech Ref p. 255)
@B18      @B120      EQU      24      ;@CMNDI SVC (Mod 4 Tech Ref p. 241)
          @B130      ;
          @B140      ; Code to read disk dir into RAM buffer (USR1 entry) ....
D800      @B150      PUSH     HL      ;Save drive # pointer
D801      @B160      LD       C,(HL)  ;Drive # to C
D802      @B170      LD       B,1    ;Specify directory to RAM buffer
D804      @B180      LD       HL,BUFFER ;Load RAM buffer address
D807      @B190      LD       A,DODIR ;Execute @DODIR
D809      @B200      RST      28H
D80A      @B210      POP      HL      ;Restore drive # pointer
D80B      @B220      RET      2      ;Return to BASIC if successful
D80C      @B230      LD       (HL),255 ;Set return code if failure
D80E      @B240      RET
          @B250      ;
          @B260      ; Code to exec command and return to DOS (USR2 entry) ....
D80F      @B270      INC      DE      ;Step ASA ptr to LSB of command
          @B280      ; string addr (DOS Manual p.2-171)
D810      @B290      LD       A,(DE)  ;Transfer LSB to L (via A)
D811      @B300      LD       L,A
D812      @B310      INC      DE      ;Step to MSB of command string addr
D813      @B320      LD       A,(DE)  ;Transfer MSB to H (via A)
D814      @B330      LD       H,A
          @B340      ; HL now points to supplied command string)
D815      @B350      LD       A,CMNDI ;Execute @CMNDI

```

Listing 2 continued

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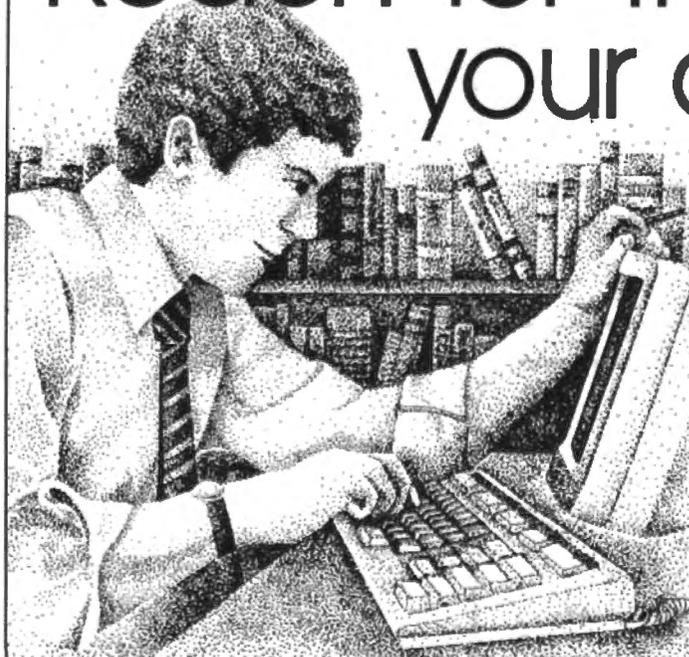
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When setting up the RAM buffer, you must allow for a maximum of 126 files on a standard Model 4 nonsystem disk, excluding the special files Boot/SYS and DIR/SYS. In practice, you won't normally reach this limit unless some files are null.

The protection of X'D800' and above for running Autorun is arbitrary; Listing 2 shows that there's free RAM above the directory buffer. I did this to avoid clashes with TRSDOS memory allocation for KSM files, SYSRES modules and so on.

The second machine-language routine, located between X'D80F' and X'D817', uses the @CMNDI SVC to pass commands to TRSDOS. Autorun invokes it at the end of the program (line 420) to execute the required program run. Although you could

use the Basic System command, it would require an immediate return to Basic that's not suitable for Autorun.

Note that @CMNDI requires that you terminate the supplied command with a X'OD' byte, equivalent to the enter key. ■

You can reach Alan D. Smith at P.O. Box 119, Mortdale, N.S.W. 2223, Australia.

Related Article

Kornfeld, Barry. "You Can Call It...Ray," November 1980, p. 226. A Model V/III disk menu program that runs under NEWDOS/80.

Listing 2 continued.

```

D817 EF      00360      RST      28H      ;(Does not return)
0901      00370  BUFFER  DEFB      23W5      ;DIR buffer (16-byte* 128 entries
                                ;incl BOOT,DIR/SYS) + terminator)
E110      00380      ;
0000      00390  BUPEND  EQU      $-1
0000      00400      END
00000 Total Errors

BUPEND  E110
BUFFER  D818
CMNDI   0018
DODIR   0022
    
```

End

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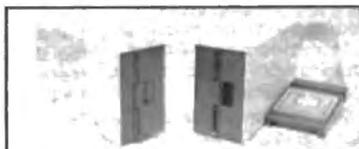
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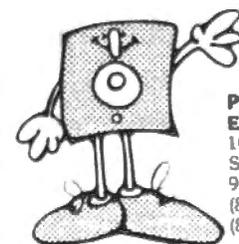
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Signs Of the Times

A sign blaring "FREE SOFTWARE" would certainly attract attention at a trade show. This month, I'll describe how to build and operate such a remote display. It displays 16 alphanumeric characters and works with a standard RS-232C port so you can use it with virtually any microcomputer. And since you can control the display through a modem, you're not distance-limited by a tangled control wire.

The board (see the Photo) uses an 8250 UART (universal asynchronous receiver/transmitter) as the serial interface controller and an 8748 single-chip microcomputer as the display controller. The 8748 also sets up the 8250 for operation and processes the characters the 8250 receives. A description of the RS-232C interface and the operation of the UART appears in the January 1984 Project 80 (p. 197).

The board also requires two Hewlett-Packard HDSP-6300 eight-character, 18-segment LED (light-emitting diode) alphanumeric displays and the Texas Instruments AC5947 ASCII-to-18-segment decoder/driver chip. Figure 1 shows a block diagram of the remote display board.

The 8250 UART

The 8250 UART has a few features that make it an appropriate choice for this project, namely its internal register address latching (using its ADS/ signal), an internal software-controlled baud rate generator, and a CSOUT signal that indicates when the device is selected.

The 8250 has 10 internal registers, though some are read- or write-only. These registers handle the serial data format (i.e., number of data bits, odd, even, or no parity, number of stop bits, and so on), the modem control lines (RTS/, DTR/, and so on), and the baud rate generator frequency. They also let you monitor various status conditions, send and receive data, and enable certain interrupt conditions, if desired.

The 8748 sets up the board's UART parameters for 7 data bits, 1 stop bit, and no parity. You should use these parameters when sending characters to the 8250 (although you could send more than 1 stop

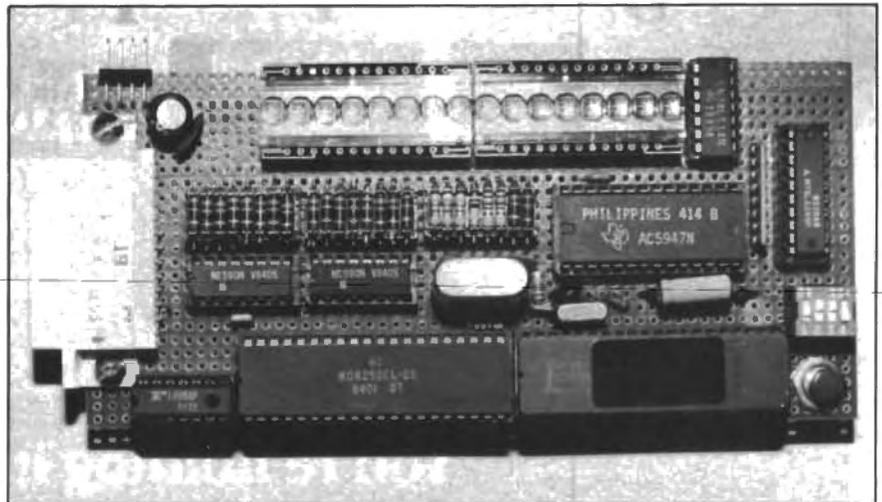


Photo. Remote display board.

bit if you wanted). The 8748 also sets the baud rate by reading the configuration of the external DIP (dual in-line package) switch, which indicates the desired baud rate. The 8748 looks up the appropriate divider value in a ROM table and sends it to the 8250 to generate the appropriate baud rate frequency (X16).

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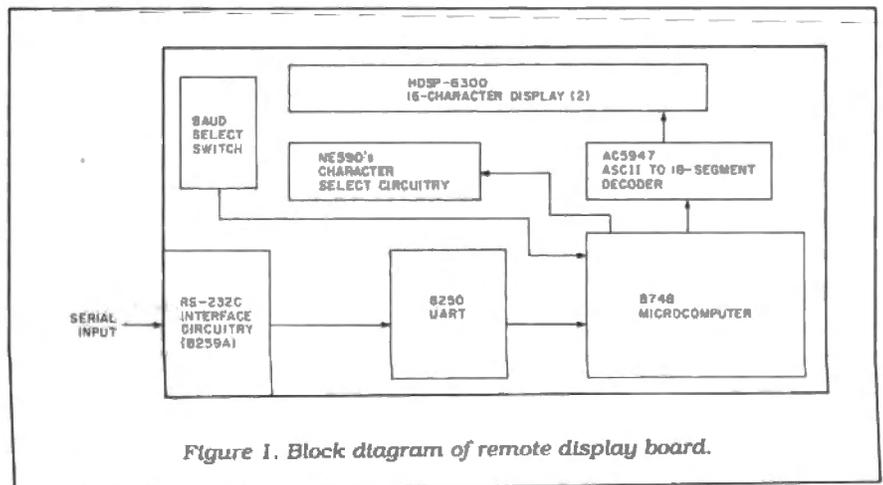


Figure 1. Block diagram of remote display board.

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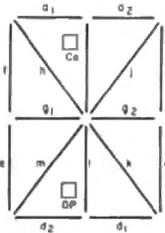


Figure 2. HDSP-6300 18-segment character display.

amount of time, turned off, and the next one is turned on. This happens so quickly you can't detect it. This is the same display method calculators use.

The T.I. AC5947 ASCII Decoder/Driver

The Texas Instruments AC5947 is a key chip in the remote display board. It turns on the correct segments of the currently selected 18-segment digit, based on the 6-bit ASCII character latched into the device (see Fig. 5). Since it only supports 6-bit ASCII characters, you can't get lowercase; the 8748 software converts all incoming lowercase characters to uppercase.

I could have eliminated the AC5947 and replaced it with simple latches, but I would have had to control the segment combinations for each character through software. Since this function was already available in an inexpensive device (under \$5), I chose the least-work approach.

The 8748 Single-Chip Microcomputer

The block diagram for the 8748 is shown in Fig. 3. The 8748 is a version of the 8048 microcomputer which has on-chip EPROM instead of mask-programmable ROM. While the microprocessor portion of the 8748 is primitive by today's standards (even in comparison to the Z80 or 6502), it is sufficient for many simple control applications.

The 8748 has 1,024 bytes of EPROM, 64 bytes of RAM, one counter/timer, 24 general-purpose input/output (I/O) lines, three additional special input lines, an on-chip crystal oscillator (requiring an external crystal), interrupt control for a timer interrupt and one external interrupt, and a limited ability to access additional external program memory, data memory, and I/O.

Unlike traditional microprocessors (e.g., the Z80), which use the popular von Neumann architecture, the 8748 uses the less-common Harvard architecture. Von Neumann architecture involves having both program and data

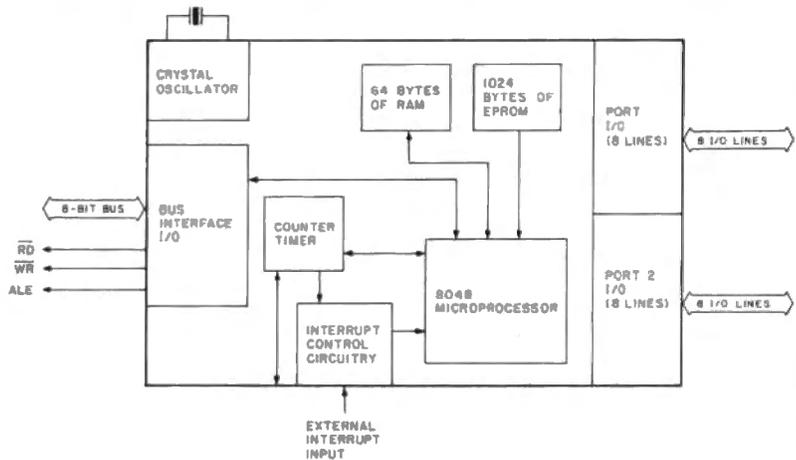


Figure 3. 8748 block diagram.

| Qty. | Description | Dist. | Part Number | Price Each |
|------|---|-------|-------------|------------|
| 1 | 8748 single-chip microcomputer | JDR | 8748 | 24.95 |
| 1 | AC5947* T.I. 18-segment decoder/driver | AE | AC5947 | 5.00 |
| 2 | HDSP-6300* HP 8-character, 18-segment display | HA | HDSP-6300 | 40.00 |
| 2 | NE590 8-channel device driver I.C. | JDR | NE590 | 2.50 |
| 1 | 8250 UART w/on-chip baud rate generator | JDR | 8250 | 10.95 |
| 1 | LM1489A quad RS-232C receiver IC | JDR | LM1489 | 0.69 |
| 1 | 74LS14 hex inverter/Schmitt trigger (LS TTL) IC | JDR | 74LS14 | 0.59 |
| 1 | 74LS245 bidirectional bus buffer (LS TTL) IC | JDR | 74LS245 | 1.49 |
| 1 | DB-25S/RA right angle D-subminiature connector | JDR | DB25SR | 4.42 |
| 1 | 6.0 MHz crystal | JDR | | 2.95 |
| 1 | 1.8432 MHz crystal | JDR | | 3.95 |
| 1 | 4-pos. dip switch (SPST) | RS | 275-1304 | 1.49 |
| 1 | 47 µF/35 V electrolytic capacitor (pc mount) | RS | 272-1027 | 0.69 |
| 4 | .1 µF/50 V disc capacitor | RS | 272-135 | 0.25 |
| 1 | 4.7 µF/50 V electrolytic capacitor | JDR | | 0.15 |
| 1 | 10 pF/500 V disc capacitor | DK | P4000 | 0.08 |
| 2 | 22 pF/500 V disc capacitor | DK | P4004 | 0.08 |
| 1 | 47 pF/50 V disc capacitor | RS | 272-121 | 0.20 |
| 1 | 1.5k ohm resistor (¼ watt, 5%) | DK | | 0.05 |
| 1 | 1m ohm resistor (¼ watt) | DK | | 0.05 |
| 2 | 1k ohm resistor (¼ watt) | RS | 271-1321 | 0.08 |
| 1 | 100k ohm resistor (¼ watt) | RS | 271-1347 | 0.08 |
| 9 | 4.7k ohm resistor (¼ watt) | RS | 271-1330 | 0.08 |
| 18 | 36 ohm resistor (¼ watt, 5%) | DK | | 0.05 |
| 1 | Momentary contact push button SPST-switch | RS | 275-1571 | 0.80 |

*Price is approximate. Call or write for current pricing and availability.

Parts Distributors

Arrow Electronics, (AE), 3810 Varsity Drive, Ann Arbor, MI 48104. 313-971-8220.

Digit-Key Corporation, (DK), Highway 32 S., P.O. Box 677, Thief River Falls, MN 56701. 800-346-5144, 218-681-6674.

Hamilton/Avnet Electronics, (HA), 32487 Schoolcraft Road, Livonia, MI 48150. 313-522-4700.

JDR Microdevices, (JDR) 1224 S. Bascom Avenue, San Jose, CA 95128. Outside CA: 800-538-5000, 408-995-5430. In CA: 800-662-8279.

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

Table. Remote display board parts list.

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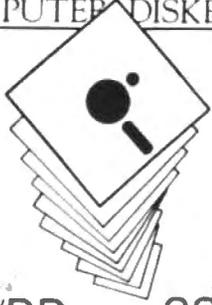
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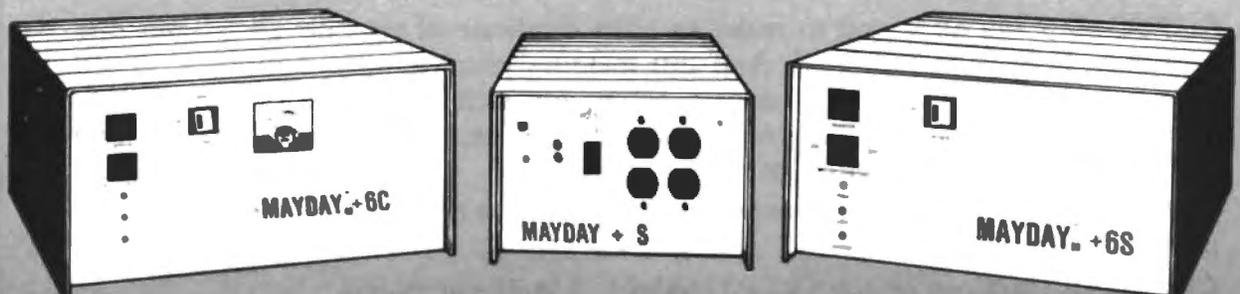
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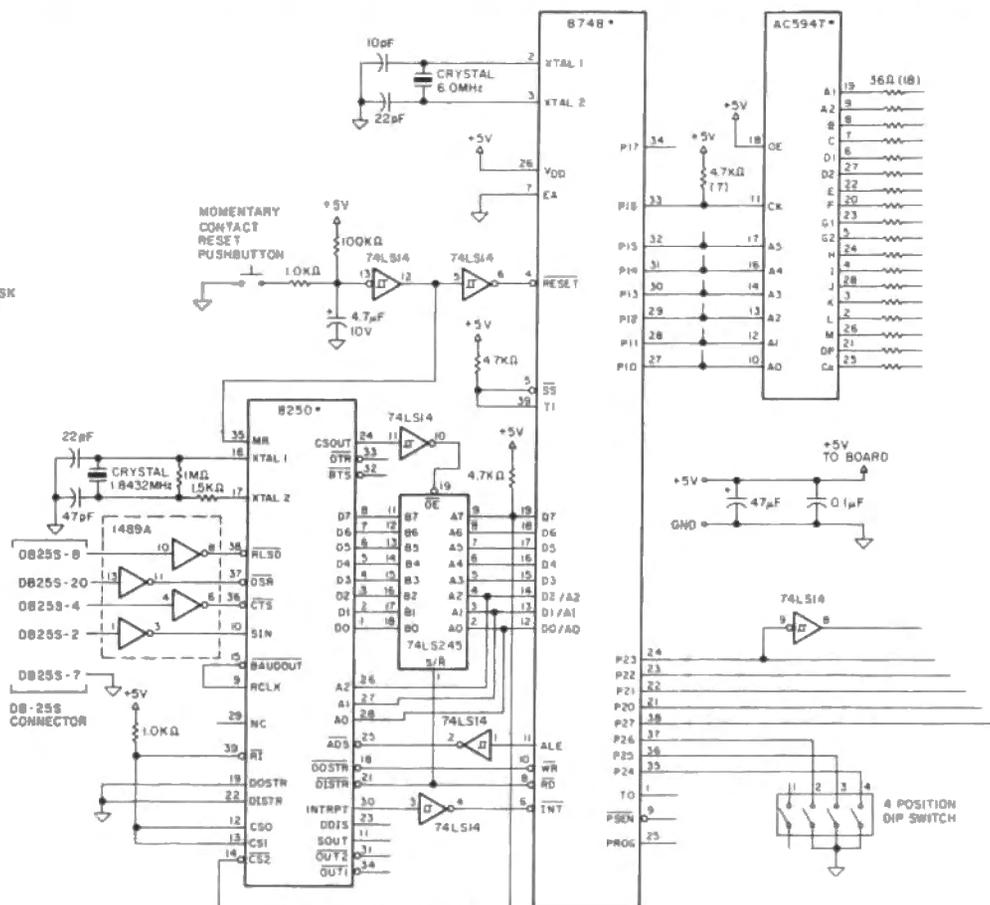
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 - ALL RESISTORS ARE 1/4 WATT, 5%, UNLESS OTHERWISE INDICATED.

POWER/GND PINOUT TABLE

| DEVICE | GND | +5V |
|---------|-----|-----|
| 8250 | 20 | 40 |
| 8748 | 20 | 40 |
| AC5947 | 15 | 1 |
| NE590 | 8 | 16 |
| 74LS14 | 7 | 14 |
| 1489A | 7 | 14 |
| 74LS245 | 10 | 20 |

BAUD RATE TABLE

| BAUD | S2 | S3 | S4 |
|--------|-----|-----|-----|
| 110 | OFF | OFF | OFF |
| 300 | OFF | OFF | ON |
| 600 | OFF | ON | OFF |
| 1200 | OFF | ON | ON |
| 2400 | ON | OFF | OFF |
| 4800 | ON | OFF | ON |
| 9600 | ON | ON | OFF |
| 19,200 | ON | ON | ON |



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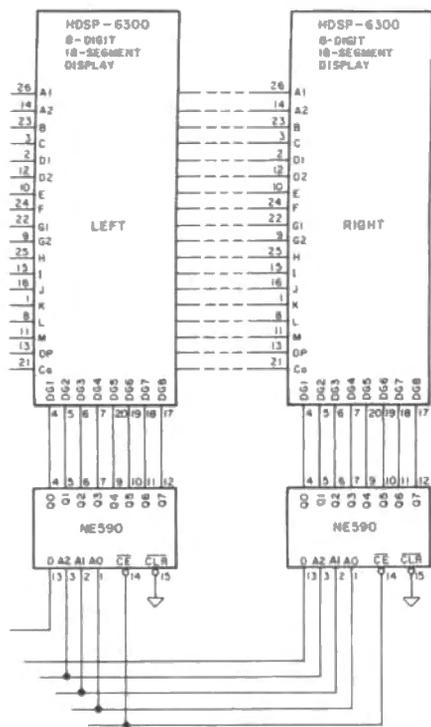


Figure 4. Schematic for 16-character remote alphanumeric display.

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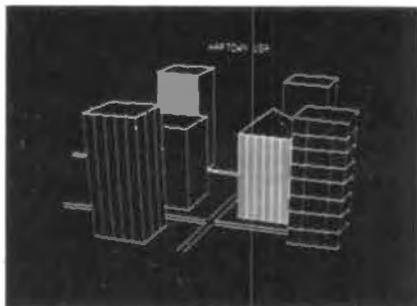
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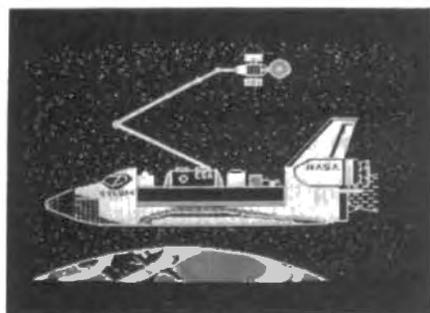
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It's apparent why today's processors use the von Neumann approach.

memories uniform, where the processor can access them with the same instructions. Indeed, a program running on a von Neumann-type processor could even modify itself.

In contrast, the Harvard architecture separates program memory and data memory. It uses different instructions to access the different memories and it's designed so that programs can't modify themselves. While the Harvard approach is probably the better choice for a simple microcomputer with limited resources, it quickly becomes apparent why today's processors use the von Neumann approach more widely.

(The 8748 will likely appear in future Project 80 projects. For those of you who are interested, see the references section at the end of this column for more information.)

I needed an assembler to write the software for the computer. I found one: an 8748 assembler from Mumford Micro Systems (Box 400, Summerland, CA 93067, 805-969-4557). It works well, and I recommend it. Although the assembler normally sells for \$125, Mumford Micro Systems agreed to make it available to Project 80 readers for \$50 during the month this column appears.

Building the Display Board

Figure 4 shows the schematic for the remote alphanumeric display board; the parts list appears in the Table. The HDSP-6300 displays' 26 pins fit nicely into a 28-pin socket. They're designed to fit together edge to edge to create a longer display. Together with the two 28-pin sockets for the displays, you'll need two 40-pin sockets, three 28-pin sockets, one 20-pin socket, two 16-pin sockets, and two 14-pin sockets for the integrated circuits (ICs). If you put your resistors on component carriers as I did, you'll also need three additional 16-pin sockets.

The interconnection between the 8748 and the AC5947 and 8250 devices is straightforward. All four buffers of the 1489A RS-232C receiver chip are shown connected, since the 8250 has input support for the various modem control signals. As currently designed, however, the 8748 software uses only the receive

| | | | | | | | | | | | | | | | | | | | |
|----------------|----------------|---|---|----------------|----------------|----------------|----------------|---|---|---|---|---|---|---|---|---|---|---|--|
| | | | | A ₃ | A ₂ | A ₁ | A ₀ | | | | | | | | | | | | |
| A ₅ | A ₄ | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | A | B | C | D | E | F | | |
| 0 | 0 | Q | R | S | T | U | V | W | X | Y | Z | [| \ |] | ^ | _ | ~ | | |
| 0 | 1 | P | Q | R | S | T | U | V | W | X | Y | Z | [| \ |] | ^ | _ | ~ | |
| 1 | 0 | ! | " | # | \$ | % | & | ' | < | > | * | + | , | - | . | / | | | |
| 1 | 1 | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | : | ; | < | = | > | ? | | |

Figure 5. AC5947 6-bit ASCII character set.

Program Listing. Program that controls the remote display.

```

;*****
; THIS PROGRAM CONTROLS THE PROJECT 80 REMOTE RS-232C
; ACCESSED 16-CHARACTER ALPHANUMERIC DISPLAY. IT IS WRITTEN
; TO FOR USE BY AN 8748 MICROCOMPUTER, WHICH IS USED AS THE
; SYSTEM CONTROLLER. THE 16 CHARACTERS ARE MULTIPLEXED, WITH
; EACH CHARACTER DISPLAYED FOR APPROXIMATELY 640 NS BEFORE
; THE NEXT CHARACTER IS DISPLAYED.
;
; ***** WRITTEN BY ROGER C. ALFORD *****
;*****
; SYSTEM EQUATES:
000C   CTRL: EQU   0CH   ;ASCII CTRL-L (CLEAR DISPLAY)
0010   NUMCHR: EQU 16   ;NUMBER OF DISPLAY CHARACTERS
0003   LCR: EQU   03H   ;8250 UART "LINE CONTROL REGISTER"
0001   DLM: EQU   01H   ;8250 UART "DIVISOR LATCH MSB" REG.
0005   LSR: EQU   05H   ;8250 UART "LINE STATUS REGISTER"
0000   RBR: EQU   00H   ;8250 UART "RECEIVER BUFFER REGISTER"
0020   STDSP: EQU 20H   ;START OF CHAR. BUFFER IN RAM
0030   CHRPTR: EQU STDSP+NUMCHR ;CURRENT CHAR. IN BUFFER POINTER
0031   MPXVLU: EQU CHRPTR+1 ;DISPLAY CHAR. MULTIPLEX COUNTER
;
;*****
; THIS SECTION OF CODE CONTAINS THE RESET AND INTERRUPT
; VECTORS AND THE RESET INITIALIZATION CODE.
;
0000   ORG   000H
0000   JMP   INIT           ;SYSTEM RESET -- INIT. BELOW
0007   ORG   007H
0007   JMP   PRCTMR        ;TIMER INTERRUPT -- PROCESS IT
0009   ORG   009H
0009   ORL   P2,00FFH     ;MAKE SURE NO CHARACTERS ARE
0009   ; TURNED ON.
000B   CALL CLRDSF        ;CLEAR THE DISPLAY RAM AREA
000D   INC   R6           ;POINT AT THE MULTIPLEX CNTR,
000D   ; "MPXVLU".
000E   MOV   @R0,000H     ;CLEAR THE MULTIPLEX COUNTER
0010   CALL SETURT        ;SET-UP THE UART
0010   ANL   P1,07FH     ;CLEAR P1 BIT 7 TO PERMIT
0012   ; CHARACTERS TO BE DISPLAYED.
0014   MOV   A,00FFH     ;GET THE INITIAL TIMER START
0014   ; COUNT VALUE.
0016   MOV   T,A         ;WRITE THE COUNT VALUE TO THE
0016   ; TIMER -- PERMIT TIMEOUT RIGHT
0016   ; AWAY.
0017   STRT  T           ;START THE TIMER
0018   EN   TCNTI       ;ENABLE TIMER INTERRUPTS
;END OF INITIALIZATION CODE; INIT.
;
;*****
; THIS SECTION OF CODE IS THE MAIN CONTROLLING LOOP, WHICH
; CHECKS FOR CHARACTER INPUT AND STORES RECEIVED CHARACTERS
; IN APPROPRIATE CHARACTER BUFFER STORAGE LOCATIONS, SCROLLING
; THE DISPLAY IF NECESSARY.
;
0019   146F   MAIN: CALL  CHKURT   ;HAS A VALID CHARACTER BEEN
0019   ; RECEIVED?
001B   C619   JS   MAIN         ;IF NOT, CHECK AGAIN
001D   AF     MOV   R7,A       ;YES, STORE THE CHAR. TEMP.
001E   D38C   XRL   A,@CTRL    ;IS THE RECDV CHAR. A CTRL-L?
0020   9626   JNE  NOCLR       ;IF NOT, CONTINUE BELOW
0022   1442   CALL  CLRDSF     ;OTHERWISE, CLEAR THE CHAR.
0022   ; DISPLAY BUFFER AREA.
0024   9419   JMP   MAIN       ;GO BACK AND LOOK FOR ANOTHER
0024   ; CHARACTER.
0026   B830   NOCLR: MOV   R0,@CHRPTR ;PUT THE ADDRESS OF THE CURRENT
0026   ; CHAR. POSITION ADDR. INTO R0.
0028   F0     MOV   A,R0       ;PUT THE CURRENT CHARACTER POS.
0028   ; ADDRESS INTO THE ACC.
0029   AA     MOV   R2,A       ;NOW PLACE IT INTO R2 TEMPORARY
002A   8320   ADD   A,@STDSP     ;ADD THE STARTING ADDRESS OF
002A   ; THE DSPLY CHAR. BUFFER, TO
002A   ; POINT AT THE CORRECT CHAR.
002C   A9     MOV   R1,A       ;POSITION IN THE BUFFER.
002C   ; PLACE THE CHAR. POINTER VALUE
002D   B631   JFB  DOSEPT     ;INTO REG. R1 FOR ADDRESSING.
002D   ; IF FLAG F0 IS SET, THE BUFFER
002F   9433   JMP   SAVCHR     ;CHAR'S MUST BE SHIFTED LEFT.
0031   1492   DOSEPT: CALL  SHFTD8 ;OTHERWISE, JUST SAVE THE CHAR.
0031   ; SHIF THE CHAR'S IN THE CHAR.
0031   ; STORAGE AREA LEFT ONE POS.
0033   FF     SAVCHR: MOV  A,R7 ;GET THE CHARACTER TO BE SAVED

```

Listing 1 continued

Listing 1 continued

```

0034 A1      MOV    @R1,A      ;SAVE THE CHAR. IN THE BUFFER
0035 B619    JF0     MAIN    ;IF THE FLAG F0 IS SET, THE
                        ; CHAR. PTR IS OK AS IS, LOOK
                        ; FOR ANOTHER CHARACTER INPUT.
0037 PA      MOV    A,R2    ;OTHERWISE, GET THE CHAR. PTR
                        ; VALUE PREV. SAVED IN R2.
0038 17      INC    A      ;INCREMENT IT, TO POINT TO THE
                        ; NEXT BUFFER LOCATION.
0039 923D    JB4     DSPEND  ;IF BIT 4 OF THE ACC. IS NOW
                        ; SET, THE END OF THE BUFFER
                        ; HAS BEEN EXCEEDED. BRANCH
                        ; BELOW TO DECR. AND SET F0.
003B 043F    JMP    PTROK   ;OTHERWISE, THE NEW POINTER
                        ; VALUE IS OK, SAVE IT.
003D 07      DSPEND: DEC  A    ;DECREMENT THE POINTER VALUE,
                        ; TO POINT AT LAST BUFFER LOC.
003E 95      CPL    F0     ;SET FLAG F0 TO INDICATE THAT
                        ; FUTURE CHARACTERS MUST CAUSE
                        ; A CHAR. SHIFT.
003F A8      PTROK: MOV  @R0,A ;STORE THE NEW POINTER IN ITS
                        ; APPROPRIATE LOCATION IN RAM.
0040 0419    JMP    MAIN    ;LOOP AGAIN TO LOOK FOR
                        ; ANOTHER CHARACTER.

;END OF MAIN CONTROLLING CODE: MAIN.
;
;*****
0042        CLRDSF:
;
; THIS SUBROUTINE CLEARS THE DISPLAY BUFFER AREA IN RAM
; AND RESETS THE CORRESPONDING BUFFER POINTER VARIABLE,
; "CHRPTR", TO #0H, CORRESPONDING TO THE BEGINNING OF THE
; BUFFER. THE FLAG F0 IS ALSO CLEARED, SINCE DISPLAY SCROLLING
; IS NOT NEEDED UNTIL THE BUFFER AREA IS FILLED.
;
0042 B020    MOV    R0,#STDSP ;GET THE STARTING ADDRESS OF
                        ; THE DISPLAY BUFFER AREA.
0044 B910    MOV    R1,#NUMCHR ;GET THE NUMBER OF CHARACTERS
                        ; IN THE BUFFER.
0046 B020    CLRLP: MOV  @R0,#20H ;PLACE AN ASCII SPACE CHAR.
                        ; INTO THE CURRENT BUFFER LOC.
0048 10      INC    R0     ;POINT TO THE NEXT LOCATION IN
                        ; THE BUFFER AREA.
0049 E946    DJNZ  R1,CLRLP ;LOOP UNTIL ALL LOCATIONS OF
                        ; THE BUFFER AREA HAVE BEEN
                        ; "SPACED".
004B B000    MOV    @R0,#00H ;NOW CLEAR THE BUFFER POINTER
                        ; VARIABLE, "CHRPTR".
004D 85      CLR    F0     ;CLEAR FLAG F0 TO INDICATE THAT
                        ; NO SCROLL IS NEEDED NOW.
004E 83      RET     ;CLEAR DISPLAY DONE -- RETURN
                        ; TO THE CALLING ROUTINE.

;END OF SUBROUTINE: CLRDSF.
;
;*****
004F        SETURT:
;
; THIS SUBROUTINE SETS UP THE 8250 UART. THE PARAMETERS
; INCLUDE 7 DATA BITS, NO PARITY, AND 1 STOP BIT. THE BAUD
; RATE IS SELECTED BY THE CONFIGURATION OF THE ON-BOARD DIP
; SWITCH, AS INDICATED BY THE BAUD RATE DIVIDER VALUE TABLE,
; "BAUDTB".
;
004F B003    MOV    R0,#LCR    ;GET THE ADDR. OF THE 8250
                        ; "LINE CONTROL REGISTER".
0051 2302    MOV    A,#02H    ;SELECT 7-BIT, NO PARITY,
                        ; 1 STOP BIT. ALSO SET BIT 7
                        ; FOR ACCESS TO THE "DLL/DLM".
0053 90      MOVX  @R0,A ;WRITE THE VALUE TO THE 8250
                        ; "LINE CONTROL REGISTER".
0054 8A70    ORL    P2,#70H ;SET BITS 4-6 OF P2 TO ASSURE
                        ; CORRECT DIP SWITCH READ.
0056 0A      IN    A,P2   ;GET THE P2 BYTE, CONTAINING
                        ; THE DIP SWITCH INFO.
0057 47      SWAP  A     ;PLACE THE DIP SWITCH INFO.
                        ; INTO THE LOW NYBBLE OF ACC.
0058 D3FF    XRL    A,#0FFH ;COMPLEMENT ALL BITS, SINCE
                        ; GROUNDED DIP SWITCH PINS
                        ; REPRESENT ONES.
005A 5307    ANL    A,#07H ;CLEAR ALL BUT THE DIP SWITCH
                        ; BITS IN ACC.
005C E7      RL     A     ;SHIFT THE VALUE LEFT ONE BIT
                        ; POSITION TO CREATE AN OFFSET
                        ; INTO THE BAUD RATE DIVIDER
                        ; TABLE, "BAUDTB".
005D 0300    ADD    A,#BAUDTB-300H ;ADD THE BASE ADDRESS OF THE
                        ; BAUD RATE DIVIDER TABLE TO
                        ; POINT AT THE DESIRED ENTRY.
005F A9      MOV    R1,A ;PLACE THE ADDRESS INTO R1 TO
                        ; SAVE IT TEMPORARILY.
0060 E3      MOVFP3 A,#0A ;GET THE LOW-ORDER BAUD RATE
                        ; DIVIDER BYTE.
0061 AA      MOV    R2,A ;SAVE IT TEMPORARILY IN R2
0062 F9      MOV    A,R1 ;GET THE BAUD RATE DIVIDER
                        ; ADDRESS BACK.
0063 17      INC    A     ;INCREMENT IT TO POINT AT THE
                        ; HIGH-ORDER DIVIDER BYTE.
0064 E3      MOVFP3 A,#0A ;GET THE HIGH-ORDER BAUD RATE
                        ; DIVIDER BYTE.
0065 B901    MOV    R1,#DLM ;POINT AT THE 8250 "DIVISOR
                        ; LATCH MSB" REGISTER.
0067 91      MOVX  @R1,A ;WRITE THE HIGH-ORDER BAUD RATE
                        ; DIVIDER BYTE TO IT.
0068 C9      DEC    R1    ;POINT AT THE 8250 "DIVISOR
                        ; LATCH LSB" REGISTER.

```

Listing 1 continued

Position crystals and associated circuitry close to where you'll connect them.

data pin (pin 2 on the DB-25S). The inputs to the 1489A receivers connect to a right-angle DB-25S connector, and are specified in a DCE (data communication equipment) configuration. If you were to connect to a DTE (data terminal equipment) device, such as a standard terminal, you'd have to do so with a straight-through RS-232C cable, connecting pins 2-2, 3-3, 4-4, and so on. A cable with only pins 2 and 7 connected through is all you need to run this board, since the remaining signals are optional and currently unsupported.

The connections between the AC5947 and the HDSP-6300s may be a bit confusing. Each of the AC5947's 18-segment outputs must connect to a unique 36-ohm current-limiting resistor. You then connect the other side of each resistor to the appropriate segment pin on both of the two HDSP-6300 displays. For example, the B segment line (pin 8) of the AC5947 connects to a 36-ohm resistor, the other side of which connects to pin 23 (the B segment pin) on both of the HDSP-6300 displays. Be careful on the numbering of the HDSP-6300 pins; since it's a 26-pin device, one row of pins numbers from 1-13, while the other row numbers from 14-26. Also, don't inadvertently count the unused two legs of the 28-pin socket when searching for a pin.

Only three of the switches on the four-position DIP switch connect to the 8748. The 8748 software reads these to determine which baud rate to select. The schematic shows the switch settings for the various baud rates available, as currently decoded by the software. Be careful when connecting the DIP switch; the switches are numbered 1-4 from left to right; the rightmost three form the binary baud rate select value.

The schematic includes power and ground connections for the ICs. You should position crystals and associated circuitry as close as possible to where you'll connect them. You need to put three 0.1- μ F decoupling capacitors on the board, across the power and ground pins of their respective chips, as close as possible to the power pins.

Besides the items listed in the parts list and the sockets mentioned above, you'll

need a 0.1-inch matrix prototyping board with at least 15 square inches of circuit area, and a +5-volt power supply at 500 milliamperes.

Operating the Display Board

The reset circuitry at the RESET/ input of the 8748 generates a reset whenever you apply power or press the reset button. The 8250 also resets at these times, and the 8748 must initialize it for use.

The 74LS245 that appears between the 8748 and the 8250 is merely used for data bus buffering and isolation. Without the 74LS245, the 8250 could corrupt the data lines during the time the 8748 tries to put an address on the lines. For proper operation, you need the 74LS245.

The Assembly-language program that controls the 8748 is shown in the Program Listing. The 8748 then clears the display buffer (to ASCII blanks) and initializes the 8250 to receive characters with 7 data bits and no parity. It also sets the 8250's internal baud rate generator to the rate determined by the value on the DIP switches. On reset, all the 8748 I/O lines go high (or become inputs). Since this includes the port 2, bit 7 line to the NE590s, the NE590s are disabled at reset. This is important since some of the LEDs on the HDSP-6300 displays could be damaged otherwise.

Once you initialize the display buffer and the 8250, the program writes the value OFF hexadecimal (hex) to the timer and the timer kicks in; it also enables timer interrupts. An interrupt then occurs within 80 microseconds (the internal clock time to the timer).

Meanwhile, program execution continues into its Main section, continually checking the UART for a character input. If one occurs, the program checks to make sure the character's valid (either above 1F hex or equal to 0C hex (control-L), the Clear Screen command). The program ignores invalid characters.

When the program gets a valid character, it converts it from lower- to upper-case if necessary, then stores it in the next display buffer location. If the program finds the display buffer full, it moves the display characters left one position to accommodate the new character, simultaneously losing the leftmost character.

The entire responsibility of the Main program section is to look for and process incoming characters. All other 8748 processing activity (mostly display updating) takes place under timer interrupt servicing, in the PRCTMR timer service routine. As mentioned, I designed the HDSP-6300 displays for multiplexed operation. Each LED segment has both an absolute current limit and an average current limit. I chose the current-limit-

Listing 1 continued

```

0069 FA      MOV     A,R2      ;GET THE LOW-ORDER BAUD RATE
                                ; DIVIDER BYTE.
006A 91      MOVX    @R1,A     ;WRITE THE LOW-ORDER BAUD RATE
                                ; DIVIDER WORD TO THE 8250
                                ; "DLL" REGISTER. THE BAUD RATE
                                ; IS NOW SET.
006B 2382    MOV     A,#02H    ;GET THE ORIGINAL 8250 "LCR"
                                ; VALUE, CHANGING BIT 7 FOR
                                ; ACCESS TO OTHER REGISTERS.
006D 98      MOVX    @R0,A     ;WRITE THE NEW "LCR" REGISTER
                                ; VALUE TO THE 8250.
006E 83      RET                      ;8250 SET-UP DONE -- RETURN TO
                                ; THE CALLING ROUTINE.

;END OF SUBROUTINE: SETURT.
;
;*****
006F          CHKURT:
;
; THIS SUBROUTINE CHECKS THE 8250 UART FOR A RECEIVED
; CHARACTER. IF ONE HAS BEEN RECEIVED, IT IS READ FROM THE
; RECEIVE REGISTER AND CHECKED FOR VALIDITY. IF ITS VALUE IS
; LESS THAN 20H, EXCEPT THE VALUE 0CH, IT IS CONSIDERED
; INVALID, AND IS NOT RETURNED. THE 0CH VALUE (CTRL-L) IS
; THE "CLEAR DISPLAY" COMMAND AND IS ACCEPTED. IF THE
; RECEIVED CHARACTER HAS BOTH BIT 5 AND BIT 6 SET (GENERALLY
; A LOWER CASE CHARACTER), BIT 5 IS CLEARED TO MAKE THE VALUE
; AN UPPER CASE VALUE. IF A VALID CHARACTER IS RECEIVED, IT
; IS RETURNED IN THE ACCUMULATOR; OTHERWISE THE ACCUMULATOR IS
; RETURNED CLEARED.
;
006F B805    MOV     R0,#LSR     ;POINT AT THE 8250 "LINE STATUS
                                ; REGISTER".
0071 80      MOVX    A,@R0     ;READ THE 8250 STATUS BYTE.
0072 5381    ANL     A,#01H    ;CHECK ONLY BIT 0
0074 C691    JZ      EXURT     ;IF ZERO, EXIT WITH ACC. 0
0076 B800    MOV     R0,@R0   ;OTHERWISE A CHARACTER HAS BEEN
                                ; RECEIVED. POINT AT THE 8250
                                ; "RECEIVER BUFFER REGISTER".
0078 80      MOVX    A,@R0     ;GET THE RECEIVED CHARACTER
0079 537F    ANL     A,#7FH    ;CLEAR THE HIGH-ORDER BIT,
                                ; SINCE IT IS UNUSED.
007B A8      MOV     R0,A     ;SAVE THE CHAR. TEMP. IN R0
007C D38C    XRL     A,@CTRL    ;IS THE VALUE A CTRL-L?
007E 9683    JNZ     NOCTRL   ;IF NOT, CONTINUE BELOW
0080 FB      MOV     A,R0     ;OTHERWISE, GET THE VALUE BACK
                                ; FROM R0.
0081 0491    JMP     EXURT     ;RETURN IT TO THE CALLING ROUT.
0083 FB      NOCTRL: MOV    A,R0     ;GET THE CHAR. BACK FROM R0
0084 5360    ANL     A,#60H    ;CLEAR ALL BUT BITS 5 AND 6
0086 C691    JZ      EXURT     ;IF BITS 5 AND 6 ARE BOTH 0,
                                ; AND INVALID CHAR. WAS RCVD.,
                                ; RETURN BELOW WITH 0 IN ACC.
0088 D360    XRL     A,#60H    ;COMPLEMENT BITS 5 AND 6 TO
                                ; SEE IF THEY ARE BOTH SET.
008A 9698    JNZ     NOLC     ;IF NOT, THE CHAR. WASN'T
                                ; LOWER CASE.
008C FB      MOV     A,R0     ;OTHERWISE THE CHAR. IS A LOWER
                                ; CASE VALUE. GET IT FROM R0.
008D 535F    ANL     A,#5FH    ;CLEAR BIT 5 OF THE VALUE TO
                                ; MAKE IT UPPER CASE.
008F A8      MOV     R0,A     ;PLACE IT BACK INTO R0 FOR NOW
0090 FB      NOLC:  MOV    A,R0     ;GET THE CHARACTER VALUE FROM
                                ; R0 TO RETURN.
0091 83      EXURT:  RET                      ;UART CHECK DONE -- RETURN TO
                                ; THE CALLING ROUTINE.

;END OF SUBROUTINE: CHKURT.
;
;*****
0092          SHPTDS:
;
; THIS SUBROUTINE SHIFTS THE DISPLAY CHARACTERS IN THE
; CHARACTER BUFFER LEFT ONE POSITION, TO EFFECTIVELY SCROLL
; THE SCREEN. THIS PERMITS A NEW CHARACTER TO BE PLACED AT
; THE END OF THE DISPLAY.
;
0092 FB      MOV     A,R0     ;SAVE REGISTER R0 IN R3
0093 AB      MOV     R3,A
0094 F9      MOV     A,R1     ;SAVE REGISTER R1 IN R4
0095 AC      MOV     R4,A
0096 B821    MOV     R5,@TDSF+1 ;POINT AT THE SECOND CHAR.
                                ; POS. IN THE BUFFER.
0098 B90F    MOV     R1,#NUMCHR-1 ;MAKE N-1 CHAR. SHIFTS; N IS
                                ; THE NUMBER OF CHAR LOC'S IN
                                ; THE BUFFER.
009A F8      SHFTLP: MOV    A,@R0     ;GET THE CURRENT BUFFER CHAR.
009B C8      DEC     R0         ;POINT AT THE PREV. BUFFER LOC.
009C A0      MOV     @R0,A     ;SAVE THE CHARACTER THERE
009D 18      INC     R0         ;POINT AT THE NEXT NEW LOC.
009E 18      INC     R0
009F E99A    DJNZ    R1,SHFTLP ;LOOP UNTIL ALL BUFFER CHAR'S
                                ; SHIFTED.
00A1 FC      MOV     A,R4     ;RESTORE REGISTER R1 FROM R4
00A2 A9      MOV     R1,A
00A3 FB      MOV     A,R3     ;RESTORE REGISTER R0 FROM R3
00A4 A8      MOV     R0,A
00A5 83      RET                      ;DISPLAY BUFFER SHIFT DONE --
                                ; RETURN TO THE CALLING
                                ; ROUTINE.

;END OF SUBROUTINE: SHPTDS.
;
;*****
00A6          PRCTMR:
;

```

Listing 1 continued

Listing 1 continued.

```

; THIS IS THE INTERRUPT SERVICE ROUTINE TO SERVICE THE 8748
; TIMER INTERRUPT. THE INTERRUPT SHOULD OCCUR EVERY 640 NS,
; TO ALLOW THE NEXT DISPLAY CHARACTER TO BE DISPLAYED, IN
; A MULTIPLEXED FASHION. THE TIMER IS FIRST SET FOR THE NEXT
; INTERRUPT, THEN THE NEXT BUFFER CHAR. TO BE DISPLAYED IS
; DISPLAYED.
;
00A6 D5          SEL      RB1          ;SELECT REGISTER BLOCK 1, TO
; KEEP FROM CORRUPTING REG'S
; IN BLOCK 0.
00A7 AF          MOV      R7,A         ;SAVE THE ACCUMULATOR IN R7 TO
; KEEP IT FROM BEING ALTERED.
00A8 23P9        MOV      A,00F9H     ;GET THE VALUE TO BE PLACED
; INTO THE TIMER FOR A 560 NS
; TIME DELAY.
00AA 62          MOV      T,A         ;PUT IT INTO THE TIMER TO
; PREPARE FOR THE NEXT INT.
00AB 8A80        ORL      P2,080H     ;TURN OFF THE CURRENTLY DISPLYD
; CHARACTER.
00AD B831        MOV      R0,0MPXVLU  ;POINT TO THE VARIABLE THAT
; HOLDS THE MULTIPLEX COUNT.
00AF F0          MOV      A,ER0      ;GET THE MULTIPLEX COUNT VALUE
00B0 530F        ANL      A,00FH     ;ONLY THE LOW-ORDER FOUR BITS
; ARE SIGNIFICANT.
00B2 AA          MOV      R2,A         ;SAVE IT TEMP. IN R2
00B3 0320        ADD      A,0STDSP     ;ADD THE STARTING ADDR. OF THE
; CHAR. BUFFER, TO POINT AT THE
; DESIRED CHARACTER.
00B5 A9          MOV      R1,A         ;PLACE THE ADDR. INTO R1 TO
; PERMIT CHAR. ACCESS.
00B6 F1          MOV      A,@R1      ;GET THE NEXT CHARACTER TO BE
; DISPLAYED.
00B7 533F        ANL      A,03FH     ;CLEAR THE HIGH-ORDER 2 BITS,
; TO PERMIT LATCHING INTO THE
; AC5947.
00B9 39          OUTL     P1,A         ;WRITE THE NEW CHARACTER TO THE
; AC5947.
00BA 8940        ORL      P1,040H     ;RAISE BIT 6 TO LATCH THE VALUE
; INTO THE AC5947.
00BC 10          INC      @R0      ;INCREMENT THE MULTIPLEX VALUE
00BD FA          MOV      A,R2         ;GET THE MULTIPLEX VALUE BACK
00BE 4300        ORL      A,000H     ;KEEP THE DIGIT DRIVER OFF FOR
; NOW, WHILE SELECTING THE
; EXACT DIGIT OUTPUT.
00C0 3A          OUTL     P2,A         ;SELECT THE NEXT (NEW) CHAR.
; OUTPUT.
00C1 9A7F        ANL      P2,07FH     ;TURN ON THE NEW CHARACTER
00C3 FF          MOV      A,R7         ;RESTORE THE ACCUMULATOR
00C4 C5          SEL      RB0         ;RE-SELECT REG. BLOCK 0
00C5 93          RETR      ;TIMER SERVICE DONE -- RETURN
; TO THE CALLING ROUTINE.
;
; END OF ISR: PRCTMR.
;
0300          ORG      3000H
;*****
0300          BAUDTB:
;
; THIS TABLE HOLDS THE 2-BYTE 8250 TIMER DIVIDE VALUES FOR
; THE BAUD RATES PERMITTED BY THIS SYSTEM, AS SELECTED BY
; THE ON-BOARD DIP SWITCH.
;
0300 1704          DB      17H,04H     ;110 BAUD -- LOW/HIGH BYTES
0302 8001          DB      80H,01H     ;300 BAUD -- LOW/HIGH BYTES
0304 C000          DB      C0H,00H     ;600 BAUD -- LOW/HIGH BYTES
0306 6000          DB      60H,00H     ;1200 BAUD -- LOW/HIGH BYTES
0308 3000          DB      30H,00H     ;2400 BAUD -- LOW/HIGH BYTES
030A 1000          DB      10H,00H     ;4800 BAUD -- LOW/HIGH BYTES
030C 0C00          DB      0CH,00H     ;9600 BAUD -- LOW/HIGH BYTES
030E 0600          DB      06H,00H     ;19,200 BAUD -- LOW/HIGH BYTES
;
;
Error total = 0
    
```

ing resistors to provide a bright display while being multiplexed at approximately a 100-Hz character refresh rate. If any digit were left on for a prolonged period of time (one millisecond or longer), the lighted LED segments would probably suffer damage.

The software invokes a timer interrupt every 640 microseconds. At this time, the PRCTMR service routine turns off the currently lighted character by setting bit 7 of port 2, thereby deselecting the NE590 devices.

The program then writes the ASCII value for the next character to be displayed to port 1, to appear at the inputs to the AC5947; port 1, bit 6 is low at this time, to permit the program to latch a new ASCII value in the AC5947. After it writes the ASCII value to port 1, it sets bit 6 of port 1, latching the ASCII value into the AC5947.

The AC5947 then turns on the appropriate segment outputs. The program updates the character multiplex counter in 8748 memory and writes the multiplex value to turn on the new character to port 2. It then clears port 2, bit 7 to turn on the new character. This process repeats every 640 microseconds. ■

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.

References

Remote RS-232C-accessed alphanumeric display references.

8748 data sheet and manuals:
Intel Corporation
3065 Bowers Ave.
Santa Clara, CA 95051

8250 data sheet
National Semiconductor Corp.
2900 Semiconductor Drive
Santa Clara, CA 95051

AC5947 data sheet
Texas Instruments, Inc.
P.O. Box 225012
Dallas, TX 75265

HDSP-6300 data Information and application note
"Hewlett-Packard 1984 Optoelectronics Designer's Catalog"
Hewlett-Packard Components
640 Page Mill Road
Palo Alto, CA 94304

Tidbit #24

If you'd like the convenience of numbered, titled pages when you print out a Basic listing, merge this six-line utility with the program. When you run the merged program, the utility prompts you to type in a name, then lists the program to the printer. The program name appears on each page along with the system date, the pages are numbered, and blank lines appear between program lines. Program lines longer than the printer's maximum line width will generate spurious line feeds; split long lines or embed down-arrows where Basic accepts blank spaces.

```

0 REM 1234567
1 CLEAR500:DEFINT A-Z:DEFNIT(A1)=A1+65536
*(A1>32767):DEFNPE(X)=CVI(CHR$(PEEK(X))+
CHR$(PEEK(FNIT(X+1)))):LNS="":VP=VARPTR(L
N$):POKEVP+1,PEEK(16551):POKEVP+2,PEEK(16
552):POKE16425,1
2 CLS:LINEINPUT"when printer ready input
program name ";PG$;LA=FNPE(16548):DEFUSR0
=LA+5:FORI=1TO7:READK:POKELA+4+I,X:NEXT:G
OSUB5:FORI=1TO6:LA=FNPE(LA):NEXT:DATA205,
127,10,205,126,43,201
3 IFFNPE(LA)=0ENDELSEIFPEEK(16425)>PEEK(1
6424)-8THENLPRINTCHR$(12);:GOSUB5
4 LPRINT:LN1=PEEK(FNIT(LA+2))+256*PEEK(FN
IT(LA+3)):LPRINTRIGHT$(STR$(LN1),LEN(STR$
(LN1))-1)" ";:I=USR0(FNIT(LA+4)):POKEVP,2
55:J=INSTR(LN$,CHR$(0)):POKEVP,J-1:LPRINT
LN$:LA=FNPE(LA):GOTO3
5 PG=PG+1:LPRINT"PROGRAM : ";PG$:USING"
LISTED * PAGE ###":L2
FT$(TIME$,8),PG:LPRINT:RETURN
    
```

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Taking the Fast Track With GOSUBs

A subroutine is a collection of Basic code designed to do a special job. It can be anything from a one-line timing loop to a huge collection of Basic that does open-heart surgery on a program in progress. You can identify a subroutine by two statements: GOSUB, which sends program control from any line to the first line of a subroutine, and Return, which returns program control to a point just past the GOSUB.

Before I go into detail, let me set down three rules governing subroutines:

1. If a set of events happens more than once in a Basic program, put it in a subroutine. You'll save bytes and typing time.
2. You should keep large Basic events triggered only by If...Then tests in subroutines so they don't slow the program when you don't need them.
3. If you are programming for your own use and your program works, disregard the first two rules. I've destroyed many a nice sloppy program trying to pare it into Spartan elegance.

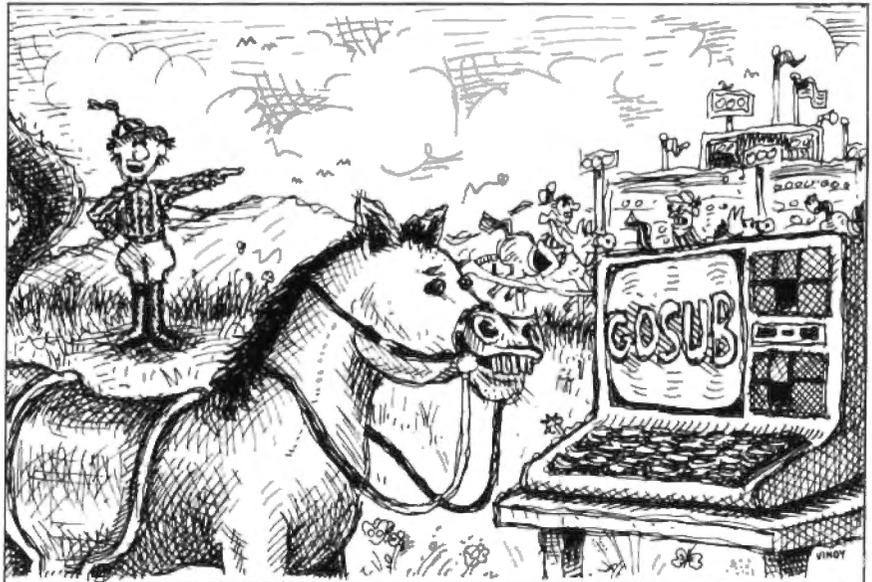
The Naked GOSUB

GOSUB means "Go to the subroutine." Here it is completely naked:

```
100 GOSUB 120
110 END
120 PRINT "Line 120 reporting for duty!"
130 PRINT "Line 130 reporting, too!"
140 RETURN
150 END
```

Line 100 contains the GOSUB statement followed by a line number destination, 120. This transfers program control to line 120. The program then carries out all instructions—the Print statements in lines 120 and 130—until it finds the Return statement in line 140. The Return sends the program back from whence it came, where it continues on to line 110.

You might ask why you couldn't use GOTO 120 instead, and then replace the



Program Listing 1. An example of nested GOSUBs.

```
100 REM * The Three Gosubs *
110 CLS: GOSUB 1000: END
1000 PRINT " Moe: Hello-o": GOSUB 2000: RETURN
2000 PRINT "Larry: Hello-o-o": GOSUB 3000: RETURN
3000 PRINT "Shemp: Hello-o-o-o": RETURN
4000 END
```

End

Program Listing 2. An example of ON X GOSUB.

```
100 INPUT "Type a number from 1 to 3 and press enter";X
110 X=INT(X): IF X<1 OR X>3 THEN PRINT "It's as simple as 1-2-3":
GOTO 100
120 ON X GOSUB 1000,2000,3000: END
1000 PRINT "One for the money.": RETURN
2000 PRINT "Two for the show.": RETURN
3000 PRINT "Three to get ready.": RETURN
4000 END
```

End

Program Listing 3. How a menu can use ON X GOSUB.

```
100 CLS: PRINT "Menu": PRINT "<S>ing": PRINT "<D>ance"
110 A$=INKEY$: IF A$="" THEN 110 ELSE X=INSTR("SDsd",A$)
120 ON X GOSUB 1000,2000,1000,2000
130 PRINT "Don't like music?": END
1000 PRINT "Mi-mi-mi-mi-mi-mi!": END
2000 PRINT "One-two-three, one-two-three!": END
```

End

System Requirements

Models III, 4, 1000, 1200,
2000, and 100
Disk Basic

```
0 GOTO 100
1 subroutine
2 to 20 subroutines
100 REM * Program name
110 INPUT X
120 ON X GOSUB 1,2,3,4,5,6 etc.
```

Figure. How to use ON X GOSUB with many line destinations.

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Return in line 140 with GOTO 110. In this simple example, the results would be the same. But often you'll find that GOSUBs are far more flexible. They differ from GOTOs as much as yo-yos differ from bows and arrows. For example, a GOSUB lets you access the same subroutine from different parts of the program. Also, you can put a GOSUB in a multiple-statement line, and the program returns to execute the rest of the line.

GOSUB Ways

Consider a couple of examples. This is a GOSUB in a multiple-statement line:

```
100 GOSUB 120: PRINT "Hey, don't forget me!"
110 END
120 PRINT "I'm pretty important around here."
130 RETURN
140 END
```

The GOSUB sends the program from line 100 to line 120, where it executes the Print statement. The Return in line 130 sends the program back to line 100, where it moves on to the next event, the second Print statement.

Here's an example of how you can GOSUB to an earlier line:

```
100 GOTO 130
110 PRINT "ANSWER: Cool Hand Luke."
120 RETURN
130 PRINT "QUESTION: Whom do the cows hate to see at 5 a.m.?"
140 GOSUB 110:END
```

In this listing, Line 100 does an important job by skipping past the early subroutine. Delete line 100, run the program, and you'll get a "Return without GOSUB in 120" error message. This error results when a program ploughs into a subroutine without being told to go there. For beginners, this event can be mystifying because it can happen in a listing that looks flawless, as in the next example:

```
100 FOR X = 1 TO 3
110 GOSUB 1000
120 NEXT X
1000 PRINT X: RETURN
1010 END
```

The listing above counts to 3 as requested. Then it prints a 4, which is a surprise, and the program crashes with a "Return without GOSUB in 1000" error message. The listing needs a line 130 to prevent the program from continuing. In this case, 130 END suffices because the requested work is complete.

Here's another possibility:

```
100 X = RND(100)
110 N = N + 1
120 IF X = 50 THEN L = L + 1:GOSUB 1000
130 GOTO 100
1000 PRINT L "50s in " N " trials."
1010 IF N = > 1000 THEN END ELSE
RETURN
```

First, look at line 1000. Understand that you can use a template subroutine with different variables. This is important, for you'll write programs in which you'll want to stipulate certain values and immediately call a subroutine to test them in some way.

The listing above tests how many times the number 50 is the random result of the statement $X = RND(100)$. Line 130 seems to loop back to line 100 endlessly. However, line 110 increments N by 1 each time. Line 120 increases L by 1 and GOSUBs to line 1000 if X equals 50. In the subroutine, line 1000 prints the in-progress result, and line 1010 ends the program if N equals 1000 or more.

You could write the program without a subroutine, putting the If...Then tests and results of lines 120, 1000, and 1010 into line 120. But don't do it: You'll thicken the program where it should be leanest, at a focal point where it must make many tests quickly. The difference won't show in this example, but if the subroutine involved much more material, you'd increase program run time.

I have a related example to illustrate a different point. It's a pseudo-Basic program:

```
100 X = RND (ALL POSSIBILITIES)
110 IF X = "go to moon" THEN assemble crew, build space ship, condition crew, test ship, buy high octane fuel...
```

Assume line 110 involves more sequential results than will fit in one line. You could break up each event into lines beginning with the same If...Then test. But it's cleaner and faster to invoke a subroutine whose straightforward events result from one simple If...Then test:

```
1000 Assemble crew
1010 Build space ship
1020 Et cetera
1030 RETURN
```

Yes, you can get around the initial awkwardness in other ways unless, of course, the program offers possibilities of moon trips in different program lines.

Losing Your Memory?

In an earlier column I included a variation of the following listing. I trot it out again because of its germane GOSUB:

```
100 GOSUB 120
110 GOTO 100
120 GOTO 100
```

When you run this program, you'll get an "Out of memory in 100" error message. It seems to happen instantly, but the program actually executes numerous GOSUBs. The listing is an example of a nonreturned GOSUB. Line 100 GOSUBs to line 120, which GOTOs line 100. Oh, what a vicious cycle, and poor line

110 never runs!

The program crashes because every GOSUB that is current costs bytes of memory. If you mistakenly transfer control to another line with a GOTO or variation, rather than a Return, the computer debits your RAM account every time it runs the subroutine. A subroutine ended by a Return recredits the amount debited. If you get an "Out of Memory" error and can find no obvious reason, check errant GOTOs within subroutines. Remember that multiple-nested GOSUBs charge interest until you return them.

I waited until now to make this warning so you'd see that you can call subroutines from within subroutines, but with each necessary Return the program flows back to the initial source, the point just after the first GOSUB. Nested subroutines resemble those wooden Russian dolls that sit within each other. If you don't put them all back correctly, something is going to rattle around inside. Program Listing 1 shows you how to do it.

You can use GOSUBs in another way, in the form ON X GOSUB. This lets a single keystroke determine to which of several subroutines the program branches, based on the value of a numeric variable. Program Listing 2 shows an example. The program goes to line 1000 if X = 1, line 2000 if X = 2, and line 3000 if X = 3.

What if the ON X GOSUB line contains so many possible line destinations that the line exceeds the maximum 249-character length? Then put the subroutines in low line numbers, preceded by a GOTO line taking the action to the actual start of the program. The Figure shows a dummy example.

The ON X GOSUB event is good for directing choices made from a menu, as the example in Program Listing 3 provides.

You can also use a subroutine as a timer. This is usually an empty For...Next loop in which the program does nothing but suspend operation for a moment to, for instance, flash a message on the screen. FOR T = 1 to 500:NEXT is an example. You might use such a timer many times in a program. Accessing that timing loop with a GOSUB is economical programming. You can even throw in something like 100 GOSUB 1000:GOSUB 1000:GOSUB 1000 to increase the timer.

There's more to GOSUB. There's always more to everything in Basic. I hope that with this foundation the permutational possibilities will occur to you when needed. GOSUB in peace. ■

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Open the Windows A Little Wider

Last month, I showed you how to set up a window driver for the Model 4 and TRSDOS 6.2. This month, I'll tell you how to add to it with an interface that lets your programs, in whatever language, open and close windows, frame those windows with a border, and save screens in memory for later recall. In a sense, last month's program provided the potential for a windowing system; this month's develops that potential.

I had to make two crucial decisions when I designed this month's program. The first was about where the computer should store previous screens. If I stored them in high memory, the program and two screens would use 5K of RAM, which many people would find unacceptable. I decided, therefore, to dedicate one of the Model 4's alternate memory banks to this storage area. To run the program as presented here, you must have a Model 4 or 4P with 128K RAM.

What if your Model 4 only has 64K? Adding the second 64K yourself is easy. Several companies sell the necessary chips and provide installation instructions; you merely push the chips into sockets inside your computer. If you'd rather not add memory, you'll have to modify the program to reside in 64K, but you'll have to give up a lot of high memory.

The second decision involved making the interface available to other programs. One program can find another by using the @GTMOD supervisory call (SVC) if every program in protected high and low memory has a standard TRSDOS header. That method works well, but it's a little clumsy.

My method involved writing a new SVC. This month's program (Program Listing 1) installs itself as SVC 127, one of

**LOAD
80**

System Requirements

Models 4 and 4P
128K RAM
TRSDOS 6.2
Disk Basic
Assembly language
Editor/assembler



Entry conditions:

A = 127 (X'7F')

B selects function:

- If B = 0, close window that is open and return to previous window, restoring contents of screen as it was immediately before latest window was opened. Cursor position is restored.
- If B = 1, open a new window on top of screen display.
 - H = row on screen of top left edge (0-22).
 - L = column on screen of top left edge (0-78).
 - D = row on screen of bottom right edge (1-23).
 - E = column on screen of bottom right edge (1-79).
 - If C <> D then window will be outlined with character in C.
- If B = 2, query about present window.

Exit conditions:

If B = 0:

- Success, Z flag set.
- Failure, NZ flag set.
- If A = 64 (X'40') then no lower window exists.

If B = 1:

- Success, Z flag set.
- Failure, NZ flag set.
- If A = 64 (X'40') then window storage room is full. Otherwise, A contains TRSDOS error code.
- Will return an error unless HL and DE are in bounds and H < D and L < E.

If B = 2:

- Success always.
- C = count of windows stored.
- H,L = row & column of top left edge of current window.
- D,E = row & column of bottom right corner of current window.

Uses BC,DE,HL.

Figure. Window SVC definition.

the four SVCs that TRSDOS 6.2 reserves for programmers. Other programs can open and close windows by properly setting up the BC, DE, and HL registers and then calling the window interface just as they would call any other SVC.

I wrote my program with Radio Shack's ALDS editor/assembler, but I've included comments that explain what changes you must make for Pro-Create or EDAS.

The Figure is a complete definition of the @ WINDOW SVC. The SVC lets your programs determine the status of the current window, find out how many windows you stored in memory, open a new window, or restore a former window. The register definitions are similar to those of @VDCTL, so you should have little trouble using it.

The program is long—just over 1,000 bytes—but after you install it, it requires only 380 bytes of high memory plus one of the alternate banks. During installation, the program loads the portion of code responsible for saving and restoring screens into an alternate bank, which has enough room to store 15 screens. In other words, you can define up to 16 windows. As your program finishes with each, you can restore the previous screen in its entirety.

Sections to Note

Because the program is so long, I don't have room to describe all its functions in detail. However, a few sections deserve careful attention. The section called Framer (line 229) saves memory by continually altering the routine that puts a frame around a window (lines 262–270). Framer does not need to determine if the frame will fit on the screen. It makes calls to the @VDCTL SVC to position the frame characters around a window; if Framer tries to put a frame character off the edge of the screen, @VDCLT will refuse to display it.

The Save and Get sections the program stores in alternate memory address the screen directly. They must do so because @VDCTL always returns to bank zero, the memory bank that is usually present, before it starts operating. Therefore, any alternate bank routine that needs to communicate with the screen must do so on its own. This isn't an elegant way to program, but the only alternative is to use @VDCTL to transfer one screen character at a time, a process that is far too slow.

Using the alternate banks involves careful programming and some tricky debugging. The description of the @BANK SVC in the *Model 4 Technical Reference Manual* is fairly clear; the examples in this program should help you over any difficulties. Notice that the stack must be

Program Listing 1. Window SVC.

```

00002 ;*****
00003 ;
00004 ; WINDOW SVC -- This routine will become SVC #127 (X'7F')
00005 ; unless that SVC has already been taken by
00006 ; another routine.
00007 ;
00008 ;*****
00009 ;
00010 ;SVCs and system addresses:
00011 ;
00012 @BANK EQU 102
00013 @DSP EQU 2
00014 @DSPLY EQU 10
00015 @EXIT EQU 22
00016 @FLAGS EQU 101
00017 @GTMOD EQU 83
00018 @HIGH$ EQU 100
00019 @VDCTL EQU 15
00020 @PREG$ EQU 0070H ;Screen/bank storage
00021 RC_2_ADDR EQU 0DD0H ;Translation routine
00022 HI$ EQU 8000H ;Ptr to 1st free storage byte
00023 ;
00024 ;-----
00025 ;
00026 ; If you use PRO-CREATE or BDAS, add the following Macro definition:
00027 ;
00028 ;SVC MACRO #NUM
00029 ; LD A,#NUM
00030 ; RST 28H
00031 ; ENDM
00032 ;
00033 ;-----
00034 ;
00035 ; PSECT 3000H ;With EDAS use ORG 3000H
00036 BEGIN JR START ;Set up standard header
00037 OLDHIGH DW $-$ ;Memory linkage
00038 DB 2 ;Bytes of title
00039 DEPM 'WS' ;Module title
00040 MODDCB DW $-$,0 ;System pointers (unused)
00041 ;
00042 ;Storage:
00043 ;
00044 WD_ADDR DW $-$ ;Address for window params
00045 WINDOWS DB 0 ;Windows in storage
00046 TOP$ DW $-$ ;Top row & col of this open
00047 BOT$ DW $-$ ;Bottom row & col of this open
00048 CHAR$ DB 0 ;Frame character
00049 ;
00050 START PUSH IX ;Save index registers
00051 PUSH IY
00052 LD A,B ;Function request to A
00053 OR A ;Is it function #?
00054 JR 2,CLOSE ;Yes -- go
00055 DEC A ;Is it 1?
00056 JR 2,OPEN ;Yes -- go
00057 DEC A ;Is it 2?
00058 JR 2,QUERY ;Yes -- go
00059 ERROR1 LD A,43 ;Parameter error
00060 ENDI OR A ;Set 2/NZ
00061 POP IY ;Recover index registers
00062 POP IX
00063 RET
00064 ;
00065 QUERY CALL PICK_UP ;Get current params in HL/DE
00066 RL0 EQU $-2
00067 LD A,(WINDOWS) ;P/u count of windows
00068 RL1 EQU $-2
00069 LD C,A ;Put into C
00070 XOR A ;A = 0
00071 JR ENDI ;And leave
00072 ;
00073 OPEN LD (TOP$),HL ;Save row & col
00074 RL2 EQU $-2
00075 LD (BOT$),DE ;Save row & col
00076 RL3 EQU $-2
00077 LD A,C ;Get char.
00078 LD (CHAR$),A ;Save frame character
00079 RL4 EQU $-2
00080 CALL TST_PARAS ;Test parameters
00081 RL5 EQU $-2
00082 JR NC,ERROR1 ;Leave if error
00083 LD A,(WINDOWS) ;# of open windows
00084 RL6 EQU $-2
00085 CP 10H ;Over the maximum?
00086 JR C,OK ;Go if okay
00087 ERROR2 LD A,64 ;Window error
00088 JR ENDI ;And go
00089 ;
00090 O1$ INC A ;Add to count
00091 LD (WINDOWS),A ;Save new count
00092 RL7 EQU $-2
00093 CALL SAVR_OLD ;Save current screen
00094 RL8 EQU $-2
00095 CALL MEN_WIND ;Open the window
00096 RL9 EQU $-2
00097 LD A,(CHAR$) ;Get frame character
00098 RL10 EQU $-2
00099 OR A ;Is it zero?
00100 CALL NZ,FRAMER ;No -- frame screen
00101 RL11 EQU $-2
00102 LD C,1CH ;Cursor to top
00103 SVC @DSP ;Clear frame
00104 LD C,1FH
00105 SVC @DSP

```

Listing 1 continued

Listing 1 continued

```

00106      XOR      A          ;Set A = 0
00107      JR       END1      ;And leave
00108 ;
00109 CLOSE      LD       A,(WINDOWS) ;# of stored windows
00110 RL12      EQU      $-2
00111      OR       A          ;Is it 0?
00112      JR       2,ERROR2   ;Go if yes
00113      DEC      A          ;Reduce by 1
00114      LD       (WINDOWS),A ;And save new count
00115 RL13      EQU      $-2
00116      LD       C,@PB      ;Cursor off character
00117      SVC      @DSP      ;Turn on the cursor
00118      CALL    GET_OLD    ;Recover last screen
00119 RL14      EQU      $-2
00120      LD       B,3        ;Function: set cursor
00121      SVC      @VDCTL    ;
00122      CALL    NEW_WIND   ;Set window edges
00123 RL15      EQU      $-2
00124      LD       C,@BH      ;Cursor on character
00125      SVC      @DSP      ;Turn on the cursor
00126      XOR      A          ;A = 0
00127      JR       END1      ;And leave
00128 ;
00129 ; Test Parameters for range
00130 ;
00131 TST_PARAS   LD       A,H          ;P/u top row
00132      CP       23          ;Too big?
00133      RET      NC          ;Yes -- leave
00134      CP       D          ;D > E ?
00135      RET      NC
00136      LD       A,D          ;P/u bottom row
00137      CP       24          ;Off screen?
00138      RET      NC
00139      LD       A,L          ;P/u top col
00140      CP       79          ;Too big?
00141      RET      NC
00142      CP       E          ;E > L ?
00143      RET      NC
00144      LD       A,E          ;P/u bottom col
00145      CP       80          ;Off screen?
00146      RET
00147 ;
00148 ; Pick up parameters for current screen
00149 ;
00150 PICK_UP     LD       IX,(WD_ADDR) ;IX==> current driver parameters
00151 RL16      EQU      $-2
00152      LD       L,(IX+14)   ;LSB of end of current window
00153      LD       H,(IX+15)   ;MSB
00154      CALL    @DF4H      ;Convert to row/col form
00155      PUSH    HL          ;And save
00156      LD       L,(IX+12)   ;LSB of top of current window
00157      LD       H,(IX+13)   ;MSB
00158      CALL    @DF4H      ;Convert to row/col form
00159      POP     DE          ;Recover bottom row/col
00160      RET
00161 ;
00162 ; Save old screen
00163 ;
00164 SAVE_OLD   CALL    PICK_UP    ;Get current parameters
00165 RL17      EQU      $-2
00166      PUSH    DE          ;Transfer bottom to
00167      POP     IY          ; IY
00168      PUSH    HL          ;Transfer top to
00169      POP     IX          ; IX
00170      LD       B,4        ;Function: get cursor
00171      SVC      @VDCTL    ;Find current cursor
00172      EX      DE,HL      ;DE has cursor pos'n
00173      CALL    SAV_STACK   ;Move stack if too high
00174 RL18      EQU      $-2
00175      LD       B,0        ;Function: select bank
00176      LD       C,2        ;P/u bank number
00177 BANK1     EQU      $-1
00178      LD       HL,0000H   ;Addr of save routine
00179      SET     7,C          ;Flag: Execute banked prog.
00180      SVC      @BANK     ;Do it
00181      CALL    GET_STACK   ;Recover old stack
00182 RL19      EQU      $-2
00183      RET
00184 ;
00185 ; Retrieve last window saved
00186 ;
00187 GET_OLD    CALL    SAV_STACK   ;Move stack if necessary
00188 RL20      EQU      $-2
00189      LD       B,0        ;Function: select bank
00190      LD       C,2        ;P/u bank number
00191 BANK2     EQU      $-1
00192      LD       HL,8030H   ;Addr. of get routine
00193      SET     7,C          ;Flag: Execute banked prog.
00194      SVC      @BANK     ;Do it
00195      CALL    GET_STACK   ;Recover old stack
00196 RL21      EQU      $-2
00197      LD       (TOP$),IX   ;Save top row/col
00198 RL22      EQU      $-2
00199      LD       (BOT$),IY   ;Save bottom row/col
00200 RL23      EQU      $-2
00201      EX      DE,HL      ;Cursor pos'n to HL
00202      RET
00203 ;
00204 ; Set WD parameters for new window
00205 ;
00206 NEW_WIND   LD       IX,(WD_ADDR) ;IX==> WD table
00207 RL24      EQU      $-2
00208      LD       HL,(TOP$)   ;P/u top row/col
00209 RL25      EQU      $-2
00210      LD       (IX+11),L   ;Save left column

```

Listing 1 continued

The sections of code seem long, but most of the instructions compile into single-byte commands.

below 8000 hexadecimal before the computer switches an alternate bank into memory. The SAVSTACK routine (lines 278-292) moves the stack into the system area if it's too high.

The sections of code moved to the alternate memory bank, Save and Get (lines 311-389), seem longer than they are. Most of the instructions compile into single-byte commands. I could condense the source code if I used the extended commands built into the ALDS assembler, but this would make the code more difficult to translate to other assemblers.

The installation routine (from line 394 on) must make three checks before moving the program to high memory and the alternate memory bank. First, it makes sure that you've already installed last month's window driver because it needs the address of the driver's data area. Second, it must be sure that you're not already using SVC 127. And third, it has to find an alternate memory bank to use for the Save and Get routines. The routine first tries to use bank 2, but goes to bank 1 if you're using the second bank.

Once it makes the necessary tests, the routine moves the program to high memory and the alternate bank and reports a successful installation. If any of the tests fail, it reports the cause of the failure.

When you've written and installed this month's portion of the Model 4 window system, test it with the Basic program in Program Listing 2. This demonstration will give you a feel for the power of the windowing system. Next month, I'll add the last segment (a user interface) to the window system and make the windows more useful by taking care of a couple of inconsistencies in TRSDOS. ■

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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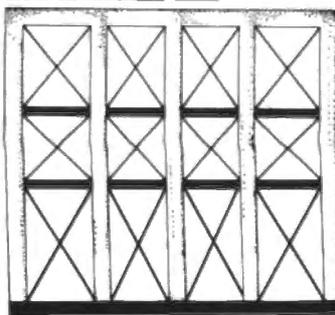
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Listing 1 continued

```

00211 CALL RC_2_ADDR ;Get top addr. in DE
00212 LD (IX+12),E ;Save in table
00213 LD (IX+13),D
00214 LD DE,(TOP9) ;P/u top row/col again
00215 RL26 EQU S-2
00216 LD HL,(BOT9) ; and end row/col
00217 RL27 EQU S-2
00218 LD A,L ;Get right col
00219 SUB E ;Find line length
00220 LD (IX+16),A ;Save in table
00221 CALL RC_2_ADDR ;Get end addr. in DE
00222 LD (IX+14),E ;Save in table
00223 LD (IX+15),D
00224 RET
00225 ;
00226 ; Frame current window with char. in A
00227 ; IX already points to WD module
00228 ;
00229 FRAMER LD C,A ;Character into C
00230 LD HL,(TOP9) ;P/u top row/col
00231 RL28 EQU S-2
00232 DEC H ;Up a row
00233 DEC L ;One column left
00234 LD A,(IX+16) ;P/u line length
00235 ADD A,2 ;Line length + 2
00236 LD B,A ;Save in B
00237 LD A,2CH ;INC L instruction
00238 CALL DRAW ;Draw top line
00239 RL29 EQU S-2
00240 ;
00241 LD A,(BOT9+1) ;P/u end row
00242 RL30 EQU S-2
00243 SUB H ;A = # of rows
00244 INC A ;Add 1
00245 LD B,A ;Save in B
00246 LD A,24H ;INC H instruction
00247 CALL DRAW ;Draw right side
00248 RL31 EQU S-2
00249 ;
00250 LD A,(IX+16) ;P/u line length
00251 ADD A,2 ;Line length + 2
00252 LD B,A ;Save in B
00253 LD A,2DH ;DEC L instruction
00254 CALL DRAW ;Draw bottom
00255 RL32 EQU S-2
00256 ;
00257 LD A,(TOP9+1) ;P/u top row
00258 RL33 EQU S-2
00259 LD B,A ;Save in B
00260 LD A,H ;Get bottom + 1
00261 SUB B ;A = # of rows
00262 INC A ;Add 1
00263 LD B,A ;Save in B
00264 LD A,25H ;DEC H instruction
00265 ;
00266 DRAW LD (DR29),A ;Set instruction in place
00267 RL34 EQU S-2
00268 DR19 BC ;Save counter
00269 LD R,2 ;Function: Dsp C @ HL
00270 SVC @VDCTL ;Display char. on screen
00271 DR29 INC L ;Move HL pointer
00272 POP BC ;Recover counter
00273 DJNZ DR19 ;Finish one side
00274 RET
00275 ;
00276 ; Move the stack if it will be under the alternate memory bank
00277 ;
00278 SAV_STACK DI ;No stack access for now
00279 XOR A ;A = # for stack flag
00280 LD HL,0005H ;Stack can't be above 7FFAH
00281 ADD HL,SP ;Add present stack loc'n
00282 JR NC,SS1 ;Go if okay
00283 POP HL ;Get return addr.
00284 LD (SPSAV),SP ;Save stack pointer
00285 RL35 EQU S-2
00286 CPL ;A = FFh
00287 LD SP,0360H ;Move to system area
00288 PUSH HL ;Return addr. on new stack
00289 LD (SPFLAG),A ;Save the flag
00290 RL36 EQU S-2
00291 EI ;Turn interrupts on again
00292 RET
00293 ;
00294 GET_STACK DI ;No stack access for now
00295 LD A,0 ;P/u flag
00296 EQU S-1 ;Stack change flag
00297 OR A ;Test flag
00298 JR Z,GS1 ;Go if no change
00299 POP HL ;Get return addr.
00300 LD SP,0-9 ;Load with original addr.
00301 SPSAV EQU S-2 ;Stuff old SP address
00302 PUSH HL ;Return addr. on new stack
00303 EI ;Turn on interrupts
00304 RET
00305 ;
00306 B9END EQU $ ;End of Bank 9 routines
00307 ;
00308 ; Alternate bank routines -- SAVE and GET
00309 ; Will be placed in Bank 1 or 2 on installation
00310 ;
00311 SAVE PUSH BC ;Save bank data
00312 PUSH HL ;Save return addr.
00313 LD HL,(HI9) ;Get first vacant addr.
00314 LD (HL),E ;Save col of cursor
00315 INC HL

```

Listing 1 continued

THE NEXT STEP

Circle 456 on Reader Service card.

Listing 1 continued

```

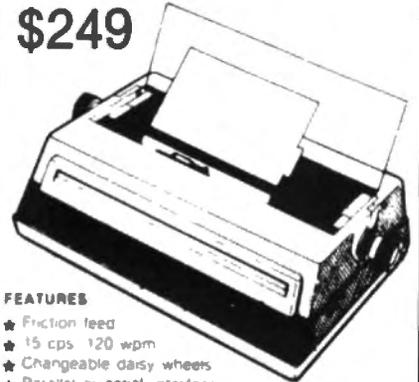
00316 LD (HL),D ;And save row of cursor
00317 INC HL
00318 PUSH IX ;Transfer top row/col
00319 POP DE ;To DE
00320 LD (HL),E ;And save it
00321 INC HL
00322 LD (HL),D
00323 INC HL
00324 PUSH IY ;Transfer end row/col
00325 POP DE ;To DE
00326 LD (HL),E ;And save it
00327 INC HL
00328 LD (HL),D
00329 INC HL
00330 ;
00331 EX DE,HL ;Pointer to DE
00332 LD HL,0F800H ;HL=> top of video
00333 LD BC,24*00H ;Length of screen
00334 LD A,(OPREGS) ;Get current memory status
00335 PUSH AF ;And save
00336 AND 0FCH ;Strip select bits
00337 OR 02H ;Set for map 3
00338 DI ;Not now
00339 OUT (04H),A ;Bring up video
00340 LDIR
00341 POP AF ;Recover OPREGS
00342 OUT (04H),A ;Original map
00343 EI
00344 LD (HI0),DE ;Save memory pointer
00345 ;
00346 POP HL ;Recover transfer addr.
00347 POP BC ;And bank data
00348 SVC @BANK ;Back to Bank 0
00349 ;
00350 ;
00351 GET PUSH BC ;Save bank data
00352 PUSH HL ;And transfer addr.
00353 LD HL,(HI0) ;P/u memory pointer
00354 DEC HL ;DE=> last used byte
00355 LD DE,0FF7FH ;HL=> bottom of screen
00356 LD BC,24*00H ;Length of screen
00357 LD A,(OPREGS) ;Get current memory status
00358 PUSH AF ;And save
00359 AND 0FCH ;Strip SRL bits
00360 OR 02H ;Set for map 3
00361 DI
00362 OUT (04H),A ;Bring up vid ram
    
```

Listing 1 continued

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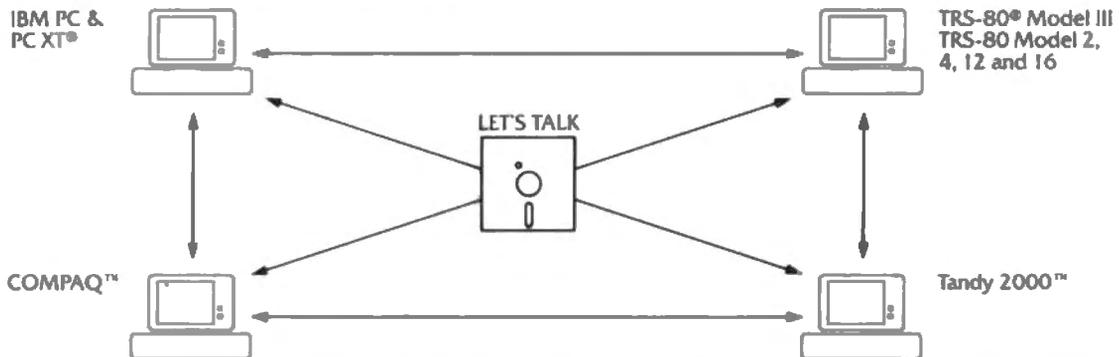
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THE NEXT STEP

Listing 1 continued

```

00363 LDDR ;Transfer to screen
00364 POP AF ;Recover original
00365 OUT (84H),A ;
00366 EI ;
00367 ;
00368 LD D,(HL) ;Get row of end
00369 DEC HL ;
00370 LD E,(HL) ; and col of end
00371 PUSH DE ;Transfer to IY
00372 POP IY ;
00373 DEC HL ;Move back a space
00374 LD D,(HL) ;Get row of top
00375 DEC HL ;
00376 LD E,(HL) ;And col of top
00377 PUSH DE ;Transfer to IX
00378 POP IX ;
00379 DEC HL ;Move back a space
00380 LD D,(HL) ;Get row of cursor
00381 DEC HL ;
00382 LD E,(HL) ;And col of cursor
00383 LD (HI8),HL ;Save pointer for next time
00384 ;
00385 POP HL ;Recover Transfer addr.
00386 POP BC ;Recover bank data
00387 SVC @BANK ;Return to bank #
00388 ;
00389 B2END EQU $ ;End of alt. bank programs
00390 ;
00391 ;
00392 ; Install program, if possible
00393 ;
00394 INSTALL LD DE,MODNAME ;DR=> Driver name
00395 SVC @GTMOD ;Find driver
00396 JR Z,INST1 ;Go if found
00397 LD HL,NO_MOD ;Else point to failure msg
00398 JP INST_END ;And leave
00399 INST1 LD (WD_ADDR),HL ;Stuff address
00400 SVC @FLAGS ;Get addr. of flags table
00401 LD H,(IY+26) ;MSB of SVC table
00402 LD L,127*2 ;LSB of SVC 127 addr.
00403 LD (SVC127),HL ;Save addr. in SVC table
00404 ;
00405 LD HL,{S-$} ;P/u SVC address
00406 SVC127 EQU $-2 ;
00407 LD DE,2688H ;Top of DOS area
00408 SBC HL,DE ;Test location of SVC 127
00409 JR C,INST2 ;Go if okay
00410 LD HL,NO_SVC ;Point to error msg
00411 JP INST_END ;And leave
00412 INST2 LD C,2 ;See if Bank 2 is avail
00413 PUSH BC ;Save Bank #
00414 LD B,2 ;Function: Bank in use?
00415 SVC @BANK ;Recover bank #
00416 POP BC ;Go if Bank is open
00417 JR Z,INST3 ;Try bank 1
00418 DEC C ;Save C again
00419 PUSH BC ;Function: Bank in use?
00420 LD B,2 ;
00421 SVC @BANK ;Recover bank #
00422 POP BC ;Go if Bank is open
00423 JR Z,INST3 ;Point to error
00424 LD HL,NO_BANK ;And leave
00425 JP INST_END ;Get bank #
00426 INST3 LD A,C ;Put in program
00427 LD (BANK1),A ; twice
00428 LD (BANK2),A ;
00429 ADD A,38H ;Change to ASCII
00430 LD (BANK3),A ;Put into message
00431 PUSH BC ;Save bank number in C
00432 LD B,3 ;Function: Set BUR
00433 SVC @BANK ;Mark bank in use
00434 POP BC ;Recover bank number
00435 LD B,0 ;Function: bring up bank
00436 SVC @BANK ;
00437 JR Z,INST4 ;Go if successful
00438 LD HL,BANK_ERR ;Point to error
00439 JP INST_END ;And leave
00440 INST4 PUSH BC ;Save bank data
00441 LD DE,8888H ;Set up to move program
00442 LD HL,SAVE ; modules to bank
00443 LD BC,B2END-SAVE ;
00444 LDIR ;Move it all
00445 LD HL,HI$+2 ;HL=> 1st free byte
00446 LD (HI$),HL ;Save it
00447 POP BC ;Recover bank data
00448 SVC @BANK ;Swap banks back
00449 ;
00450 ; Move main program to high memory and install as SVC 127
00451 ;
00452 LD HL,0 ;Function: Get current HIGH$
00453 LD B,H ;Function: Handle HIGH$
00454 SVC @HIGH$ ;
00455 LD (OLDHIGH),HL ;Save in header
00456 LD BC,B2END-BEGIN ;Length of program
00457 PUSH BC ; and save it
00458 XOR A ;Reset C flag
00459 SBC HL,BC ;Find new HIGH$ value
00460 LD B,0 ;Function: Handle HIGH$
00461 SVC @HIGH$ ;Set new HIGH$
00462 INC HL ;New addr. for start
00463 PUSH HL ;Save it
00464 LD BC,BEGIN ;P/u current BEGIN addr
00465 XOR A ;Reset C-flag
00466 SBC HL,BC ;Calculate offset
00467 EX DE,HL ;Offset in DE
    
```

Listing 1 continued

Listing 1 continued

```

00468 LD IX,RELTAB ;IX==> Reloc. table
00469 RELE1 LD L,(IX) ;Get next value
00470 LD H,(IX+1) ; into HL
00471 LD A,H ;Get MSB for testing
00472 OR A ;Is it zero?
00473 JR Z,REL2 ;Go if done
00474 PUSH HL ;Else transfer to
00475 POP IY ; IY
00476 LD L,(IY) ;Get value from program
00477 LD S,(IY+1)
00478 ADD HL,DE ;Add offset
00479 LD (IY+1),H ;Save new addr.
00480 LD (IY),L
00481 INC IX ;Point IX to addr. of
00482 INC IX ; next location
00483 JR RELE1 ;Loop until done
00484 ;
00485 RELE2 LD HL,(SVC127) ;Get SVC address
00486 POP DE ;Recover new BEGIN addr.
00487 LD (HL),E ;Save in table
00488 INC HL
00489 LD (HL),D
00490 LD HL,BEGIN ;HL==> current beginning
00491 POP BC ;Recover program length
00492 LDIR ;Move it all
00493 ;
00494 LD HL,SUCCESS ;Point to message
00495 INST_END SVC @DSPLY ;Display message
00496 LD HL,0 ;Show no error
00497 SVC @EXIT ;Return to TRSDOS
00498 ;
00499 RELTAB DW RL0,RL1,RL2,RL3,RL4,RL5,RL6,RL7,RL8
00500 DW RL9,RL10,RL11,RL12,RL13,RL14,RL15
00501 DW RL16,RL17,RL18,RL19,RL20,RL21,RL22
00502 DW RL23,RL24,RL25,RL26,RL27,RL28,RL29
00503 DW RL30,RL31,RL32,RL33,RL34,RL35,RL36
00504 DW 0 ;End of relocation table
00505 ;
00506 MODNAME DEFM 'WD'
00507 DB 0
00508 ;
00509 NO_MOD DEFM 'Window Driver not found. Installation aborted.'
00510 DB @DH
00511 ;
00512 NO_SVC DEFM 'SVC 127 already in use. Installation aborted.'
00513 DB @DH
00514 ;
00515 NO_BANK DEFM 'Unable to use Bank 1 or Bank 2. '
00516 DEFM 'Installation aborted.'
00517 DB @DH
00518 ;
00519 BANK_ERR DEFM 'Bank transfer unsuccessful. Installation aborted.'
00520 DB @DH
00521 ;
00522 SUCCESS DEFM 'SVC 127, @WINDOW, successfully installed in'
00523 DB @AH
00524 DEFM 'high memory and Bank '
00525 BANK3 DB '2'
00526 DB @DH
00527 ;
00528 END INSTALL
    
```

End

Program Listing 2. Test program for window system.

```

100 DIM HL%, BC%, DE%, WINDOW%, R%, ROUTINE$
110 DATA 229, 235, 94, 35, 86, 197
120 DATA 225, 78, 35, 70, 221, 225
130 DATA 221, 43, 221, 110, 1, 221
140 DATA 102, 2, 62, 127, 239, 201, -1
150 '
160 WHILE A% => 0
170 READ A%
180 IF A% > 0 THEN ROUTINE$ = ROUTINE$ + CHR$(A%)
190 WEND
200 '
210 CLS
220 INPUT "<O>pen or <C>lose";O$
230 IF O$ = "C" OR O$ = "c" THEN BC% = 0:
    GOSUB 1000: GOTO 350
240 IF O$ <> "O" AND O$ <> "o" THEN GOTO 220
250 INPUT "Frame value (ASCII)";F
260 BC% = CVI(CHR$(F) + CHR$(1))
270 '
280 INPUT "Top left corner (row, col)"; TR%, TC%
290 HL% = CVI(CHR$(TC%) + CHR$(TR%))
300 '
310 INPUT "Bottom right corner (row,col)";BR%, BB%
320 DE% = CVI(CHR$(BB%) + CHR$(BR%))
330 '
340 GOSUB 1000 'run window SVC
350 GOTO 220 'start over
360 '
1000 R% = VARPTR(ROUTINE$)
1010 WINDOW% = CVI(CHR$(PEEK(R%+1)) + CHR$(PEEK(R%+2)))
1020 CALL WINDOW% (HL%, DE%, BC%)
1030 RETURN
    
```

End

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Terms of Endearment

by John B. Harrell III

Borrowing money is never pleasant, and trying to understand interest rates and payments makes a tough chore more difficult. One way to ease the process and get a clear idea of what you're getting into is to use a spreadsheet to manipulate the terms of the loan and observe various outcomes. While this won't make the borrowing any more pleasant, it might help you decide which terms are best.

My two-part spreadsheet template, Amortize (see Fig. 1), provides a complete breakdown of your loan (lines 1-17) and furnishes a year-by-year listing of the actual loan payment schedule (lines 20-53). I used Multiplan to design Amortize, but you can easily convert it for other spreadsheets.

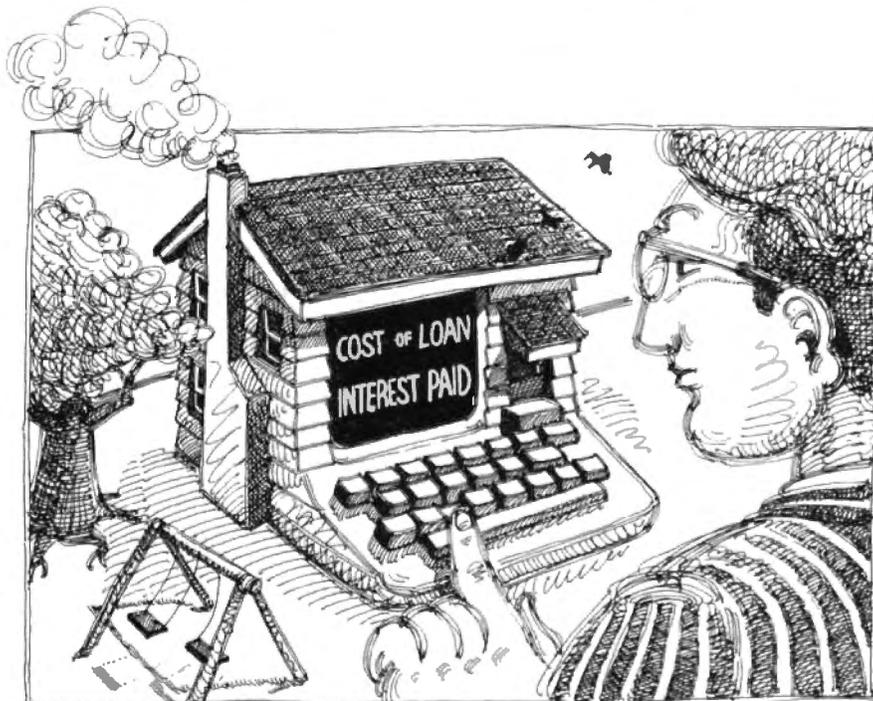
To use the template, enter the amount of your loan (called the principal or PV) in line 4, the length of payment in line 5, and the annual percentage rate (normally referred to as the APR) in line 6. These numbers are the basis for the remainder of the spreadsheet, so make sure they're valid. My template calculates the payment for the loan, the loan's total cost, the total interest paid, and the overall interest rate (rows 9, 11, 12, and 13 in column 5).

The second part of Amortize summarizes each year's performance as you pay the loan. Period totals give you the total paid in 12 months, the total interest, and the total principal (lines 34 and 53). The month and year labels depend on the entries in cells R16C6 (row 16, column 6) and R17C6.

Background

I derived the amortization data in this template by compounding the interest on a monthly basis. Among the other compounding methods available are straight interest, simple interest, or daily compounding. The template results are accurate enough that you can use them to study most loan-repayment schedules.

I calculated the monthly interest rate (I) by dividing the APR by 12. Cell R6C5 displays this result as a fractional value. The formula in R9C5 calculates the



| | 1 | 2 | 3 | 4 | 5 | 6 |
|----|---------------------|--------------------------------------|------|-------------|------------|------------|
| 1 | ----- | | | | | |
| 2 | I Loan Amortization | | | | | |
| 3 | ----- | | | | | |
| 4 | I | Loan Principal Value | | \$10,000.00 | | I |
| 5 | I | Number of Payments | | 24 | | I |
| 6 | I | Annual Percentage Rate (APR) | | 12.90% | | I |
| 7 | ----- | | | | | |
| 8 | I | Monthly Interest Rate (frac) | | 0.010750 | | I |
| 9 | I | Monthly Payment on Loan | | \$474.95 | | I |
| 10 | ----- | | | | | |
| 11 | I | Total Cost of Loan | | \$11,390.00 | | I |
| 12 | I | Amount of Interest Paid | | \$1,390.00 | | I |
| 13 | I | Overall Percentage Rate | | 13.99% | | I |
| 14 | ----- | | | | | |
| 15 | | Enter the month of the first payment | | 6 | | |
| 16 | | Enter the year of the first payment | | 1985 | | |
| 17 | | | | | | |
| 18 | | Month | Year | Payment | Interest | Principal |
| 19 | | | | | | Balance |
| 20 | | 6 | 1985 | \$474.95 | \$187.50 | \$367.45 |
| 21 | | 7 | 1985 | \$474.95 | \$183.55 | \$371.40 |
| 22 | | 8 | 1985 | \$474.95 | \$89.56 | \$375.39 |
| 23 | | 9 | 1985 | \$474.95 | \$95.52 | \$379.43 |
| 24 | | 10 | 1985 | \$474.95 | \$91.44 | \$383.51 |
| 25 | | 11 | 1985 | \$474.95 | \$87.32 | \$387.63 |
| 26 | | 12 | 1985 | \$474.95 | \$83.15 | \$391.80 |
| 27 | | 1 | 1986 | \$474.95 | \$78.94 | \$396.01 |
| 28 | | 2 | 1986 | \$474.95 | \$74.68 | \$400.27 |
| 29 | | 3 | 1986 | \$474.95 | \$70.38 | \$404.57 |
| 30 | | 4 | 1986 | \$474.95 | \$66.03 | \$408.92 |
| 31 | | 5 | 1986 | \$474.95 | \$61.64 | \$413.31 |
| 32 | | | | | | |
| 33 | | | | | | |
| 34 | | | | \$5,699.40 | \$1,019.71 | \$4,679.69 |
| 35 | | | | | | |
| 36 | | | | | | |
| 37 | | | | | | |
| 38 | | | | | | |
| 39 | | Month | Year | Payment | Interest | Principal |
| 40 | | | | | | Balance |
| 41 | | 6 | 1986 | \$474.95 | \$57.19 | \$417.76 |
| 42 | | 7 | 1986 | \$474.95 | \$52.70 | \$422.25 |
| 43 | | 8 | 1986 | \$474.95 | \$48.16 | \$426.79 |
| 44 | | 9 | 1986 | \$474.95 | \$43.58 | \$431.37 |
| 45 | | 10 | 1986 | \$474.95 | \$38.94 | \$436.01 |
| 46 | | 11 | 1986 | \$474.95 | \$34.25 | \$440.70 |
| 47 | | 12 | 1986 | \$474.95 | \$29.52 | \$445.44 |
| 48 | | 1 | 1987 | \$474.95 | \$24.72 | \$450.23 |
| 49 | | 2 | 1987 | \$474.95 | \$19.88 | \$455.07 |
| 50 | | 3 | 1987 | \$474.95 | \$14.99 | \$459.96 |
| 51 | | 4 | 1987 | \$474.95 | \$10.05 | \$464.90 |
| 52 | | 5 | 1987 | \$474.95 | \$5.05 | \$469.90 |
| 53 | | | | | | |
| 54 | | | | \$5,699.40 | \$379.02 | \$5,320.38 |

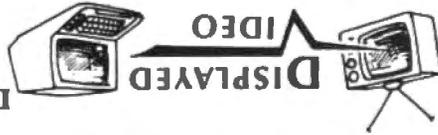
Figure 1. The Amortize template.

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monthly payment (PMT) with the following formula and then rounds it to the nearest cent:

$$PMT = \frac{(i \cdot PV)}{(1 - (1 - i)^{-n})}$$

I used the rounding function to make the calculation as accurate and realistic as possible. Since the computer uses binary arithmetic, it often creates repeating decimals out of numbers that are exact fractions in decimal arithmetic.

Once it computes the loan payment, the template derives the total cost by multiplying the number of payments by the individual payment (R11C5).

Similarly, the interest is the total cost minus the principal of the loan (R12C5), and the overall interest percentage rate is the total interest divided by the original principal (R13C5).

Extending the Template

I've used Amortize to illustrate the payments on a two-year loan. You'll

probably want to add years to the payment schedule to allow for a longer amortization period (no one can afford a two-year loan anymore), and you can easily reproduce the schedule of payments in part two of the template. The only limitation on extending the template is the computer's internal memory and how much your spreadsheet can pack into it.

Remember that the date information depends on the data in cells R16C6 and R17C6. The formulas in columns 1 and 2 of the second part are pretty straightforward. They check the cells preceding them to determine if the year has ended and increment the month and year accordingly.

The formula in column 3 carries forward the payment from the initially calculated values. For ease of replication, make the reference to this cell absolute. You can do this in Multiplan by pressing the @ key after you enter the appropriate cell reference (for example, this would turn the cell reference

R(-12)C(+2) into R9C5). With Lotus, use the ABS function key (F4).

My template calculates interest (column 4) by applying the monthly interest rate (i) to the balance of the loan. The difference between the payment and the interest required is the amount applied toward the principal (column 5). This principal amount reduces the balance of the loan for the next payment (column 6).

Figure 2 lists the formulas I used in my template; Fig. 3 shows the cell formats. I redefined the widths of columns 5 and 6 to accommodate 13 characters. ■

Write to John B. Harrell III at 1519-A Carswell Circle, Bolling Air Force Base, Washington, DC 20366.

Submit your template (include a disk version) to Spreadsheet Beat, c/o 80 Micro, 80 Pine St., Peterborough, NH 03458. We'll pay \$50 for each one we publish. We'll also publish any valuable hints and patches you'd like to share.

Figure 2. Amortize's formulas.

| | | | |
|-------|---|-------|---|
| R8C5 | +R[-2]C/12 | R29C5 | +RC[-2]-RC[-1] |
| R9C5 | INT((R[-1]C*R[-5]C)/(1-EXP(-R[-4]C)*LN(1+R[-1]C)))*100+0.5)/100 | R29C6 | +R[-1]C-RC[-1] |
| R11C5 | +R[-2]C*R[-6]C | R30C1 | IF(R[-1]C=12,1,R[-1]C+1) |
| R12C5 | +R[-1]C-R[-8]C | R30C2 | IF(R[-1]C[-1]=12,R[-1]C+1,R[-1]C) |
| R13C5 | +R[-1]C/R[-9]C | R30C3 | +R[-2]C+2 |
| R21C1 | +R[-5]C+5 | R30C4 | INT((R[-22]C[+1]*R[-1]C[+2])*100+0.5)/100 |
| R21C2 | +R[-4]C+4 | R30C5 | +RC[-2]-RC[-1] |
| R21C3 | +R[-2]C+2 | R30C6 | +R[-1]C-RC[-1] |
| R21C4 | INT((R[-13]C[+1]*R[-17]C[+1])*100+0.5)/100 | R31C1 | IF(R[-1]C=12,1,R[-1]C+1) |
| R21C5 | +RC[-2]-RC[-1] | R31C2 | IF(R[-1]C[-1]=12,R[-1]C+1,R[-1]C) |
| R21C6 | +R[-17]C[-1]-RC[-1] | R31C3 | +R[-22]C+2 |
| R22C1 | IF(R[-1]C=12,1,R[-1]C+1) | R31C4 | INT((R[-23]C[+1]*R[-1]C[+2])*100+0.5)/100 |
| R22C2 | IF(R[-1]C[-1]=12,R[-1]C+1,R[-1]C) | R31C5 | +RC[-2]-RC[-1] |
| R22C3 | +R[-13]C+2 | R31C6 | +R[-1]C-RC[-1] |
| R22C4 | INT((R[-14]C[+1]*R[-1]C[+2])*100+0.5)/100 | R32C1 | IF(R[-1]C=12,1,R[-1]C+1) |
| R22C5 | +RC[-2]-RC[-1] | R32C2 | IF(R[-1]C[-1]=12,R[-1]C+1,R[-1]C) |
| R22C6 | +R[-1]C-RC[-1] | R32C3 | +R[-23]C+2 |
| R23C1 | IF(R[-1]C=12,1,R[-1]C+1) | R32C4 | INT((R[-24]C[+1]*R[-1]C[+2])*100+0.5)/100 |
| R23C2 | IF(R[-1]C[-1]=12,R[-1]C+1,R[-1]C) | R32C5 | +RC[-2]-RC[-1] |
| R23C3 | +R[-14]C+2 | R32C6 | +R[-1]C-RC[-1] |
| R23C4 | INT((R[-15]C[+1]*R[-1]C[+2])*100+0.5)/100 | R34C3 | SUM(R[-13]C;R[-2]C) |
| R23C5 | +RC[-2]-RC[-1] | R34C4 | SUM(R[-13]C;R[-2]C) |
| R23C6 | +R[-1]C-RC[-1] | R34C5 | SUM(R[-13]C;R[-2]C) |
| R24C1 | IF(R[-1]C=12,1,R[-1]C+1) | R40C2 | IF(R[-8]C=12,1,R[-8]C+1) |
| R24C2 | IF(R[-1]C[-1]=12,R[-1]C+1,R[-1]C) | R40C3 | IF(R[-8]C[-1]=12,R[-8]C+1,R[-8]C) |
| R24C3 | +R[-15]C+2 | R40C4 | +R[-31]C+2 |
| R24C4 | INT((R[-16]C[+1]*R[-1]C[+2])*100+0.5)/100 | R40C5 | INT((R[-32]C[+1]*R[-8]C[+2])*100+0.5)/100 |
| R24C5 | +RC[-2]-RC[-1] | R40C6 | +RC[-2]-RC[-1] |
| R24C6 | +R[-1]C-RC[-1] | R40C7 | +R[-8]C-RC[-1] |
| R25C1 | IF(R[-1]C=12,1,R[-1]C+1) | R41C1 | IF(R[-1]C=12,1,R[-1]C+1) |
| R25C2 | IF(R[-1]C[-1]=12,R[-1]C+1,R[-1]C) | R41C2 | IF(R[-1]C[-1]=12,R[-1]C+1,R[-1]C) |
| R25C3 | +R[-16]C+2 | R41C3 | +R[-32]C+2 |
| R25C4 | INT((R[-17]C[+1]*R[-1]C[+2])*100+0.5)/100 | R41C4 | INT((R[-33]C[+1]*R[-1]C[+2])*100+0.5)/100 |
| R25C5 | +RC[-2]-RC[-1] | R41C5 | +RC[-2]-RC[-1] |
| R25C6 | +R[-1]C-RC[-1] | R41C6 | +R[-1]C-RC[-1] |
| R26C1 | IF(R[-1]C=12,1,R[-1]C+1) | R42C1 | IF(R[-1]C=12,1,R[-1]C+1) |
| R26C2 | IF(R[-1]C[-1]=12,R[-1]C+1,R[-1]C) | R42C2 | IF(R[-1]C[-1]=12,R[-1]C+1,R[-1]C) |
| R26C3 | +R[-17]C+2 | R42C3 | +R[-33]C+2 |
| R26C4 | INT((R[-18]C[+1]*R[-1]C[+2])*100+0.5)/100 | R42C4 | INT((R[-34]C[+1]*R[-1]C[+2])*100+0.5)/100 |
| R26C5 | +RC[-2]-RC[-1] | R42C5 | +RC[-2]-RC[-1] |
| R26C6 | +R[-1]C-RC[-1] | R42C6 | +R[-1]C-RC[-1] |
| R27C1 | IF(R[-1]C=12,1,R[-1]C+1) | R43C1 | IF(R[-1]C=12,1,R[-1]C+1) |
| R27C2 | IF(R[-1]C[-1]=12,R[-1]C+1,R[-1]C) | R43C2 | IF(R[-1]C[-1]=12,R[-1]C+1,R[-1]C) |
| R27C3 | +R[-18]C+2 | R43C3 | +R[-34]C+2 |
| R27C4 | INT((R[-19]C[+1]*R[-1]C[+2])*100+0.5)/100 | R43C4 | INT((R[-35]C[+1]*R[-1]C[+2])*100+0.5)/100 |
| R27C5 | +RC[-2]-RC[-1] | R43C5 | +RC[-2]-RC[-1] |
| R27C6 | +R[-1]C-RC[-1] | R43C6 | +R[-1]C-RC[-1] |
| R28C1 | IF(R[-1]C=12,1,R[-1]C+1) | R44C1 | IF(R[-1]C=12,1,R[-1]C+1) |
| R28C2 | IF(R[-1]C[-1]=12,R[-1]C+1,R[-1]C) | R44C2 | IF(R[-1]C[-1]=12,R[-1]C+1,R[-1]C) |
| R28C3 | +R[-19]C+2 | R44C3 | +R[-35]C+2 |
| R28C4 | INT((R[-20]C[+1]*R[-1]C[+2])*100+0.5)/100 | R44C4 | INT((R[-36]C[+1]*R[-1]C[+2])*100+0.5)/100 |
| R28C5 | +RC[-2]-RC[-1] | R44C5 | +RC[-2]-RC[-1] |
| R28C6 | +R[-1]C-RC[-1] | R44C6 | +R[-1]C-RC[-1] |
| R29C1 | IF(R[-1]C=12,1,R[-1]C+1) | R45C1 | IF(R[-1]C=12,1,R[-1]C+1) |
| R29C2 | IF(R[-1]C[-1]=12,R[-1]C+1,R[-1]C) | R45C2 | IF(R[-1]C[-1]=12,R[-1]C+1,R[-1]C) |
| R29C3 | +R[-20]C+2 | R45C3 | +R[-36]C+2 |
| R29C4 | INT((R[-21]C[+1]*R[-1]C[+2])*100+0.5)/100 | R45C4 | INT((R[-37]C[+1]*R[-1]C[+2])*100+0.5)/100 |
| | | R45C5 | +RC[-2]-RC[-1] |

Figure 2 continued.

SPREADSHEET BEAT

Figure 2 continued.

| | | |
|---|--|------------|
| <p>R45C6 +R[-1]C-RC[-1] R46C1 IF(R[-1]C=12,1,R[-1]C+1) R46C2 IF(R[-1]C[-1]=12,R[-1]C+1,R[-1]C) R46C3 +R[-37]C[+2] R46C4 INT((R[-38]C[+1]*R[-1]C[+2])*100+0.5)/100 R46C5 +RC[-2]-RC[-1] R46C6 +R[-1]C-RC[-1] R47C1 IF(R[-1]C=12,1,R[-1]C+1) R47C2 IF(R[-1]C[-1]=12,R[-1]C+1,R[-1]C) R47C3 +R[-38]C[+2] R47C4 INT((R[-39]C[+1]*R[-1]C[+2])*100+0.5)/100 R47C5 +RC[-2]-RC[-1] R47C6 +R[-1]C-RC[-1] R48C1 IF(R[-1]C=12,1,R[-1]C+1) R48C2 IF(R[-1]C[-1]=12,R[-1]C+1,R[-1]C) R48C3 +R[-39]C[+2] R48C4 INT((R[-40]C[+1]*R[-1]C[+2])*100+0.5)/100 R48C5 +RC[-2]-RC[-1] R48C6 +R[-1]C-RC[-1] R49C1 IF(R[-1]C=12,1,R[-1]C+1)</p> | <p>R49C2 IF(R[-1]C[-1]=12,R[-1]C+1,R[-1]C) R49C3 +R[-40]C[+2] R49C4 INT((R[-41]C[+1]*R[-1]C[+2])*100+0.5)/100 R49C5 +RC[-2]-RC[-1] R49C6 +R[-1]C-RC[-1] R50C1 IF(R[-1]C=12,1,R[-1]C+1) R50C2 IF(R[-1]C[-1]=12,R[-1]C+1,R[-1]C) R50C3 +R[-41]C[+2] R50C4 INT((R[-42]C[+1]*R[-1]C[+2])*100+0.5)/100 R50C5 +RC[-2]-RC[-1] R50C6 +R[-1]C-RC[-1] R51C1 IF(R[-1]C=12,1,R[-1]C+1) R51C2 IF(R[-1]C[-1]=12,R[-1]C+1,R[-1]C) R51C3 +R[-42]C[+2] R51C4 INT((R[-43]C[+1]*R[-1]C[+2])*100+0.5)/100 R51C5 +RC[-2]-RC[-1] R51C6 +R[-1]C-RC[-1] R53C3 SUM(R[-13]C:R[-2]C) R53C4 SUM(R[-13]C:R[-2]C) R53C5 SUM(R[-13]C:R[-2]C)</p> | <p>End</p> |
|---|--|------------|

Default Format

F;K;DGOG11

- F Format symbol
- K Commas format option set
- D Indicates the symbols following it define the default format
- G General cell display format
- O Zero digits after the decimal
- G General cell alignment (letters flush left, numbers flush right)
- 11 Cell width is 11 characters

Special Formats

\$OD (Formatted in dollars, zero digits after the decimal, default alignment)

| | | |
|----------|----------|----------|
| R4C5 | R27C3-C6 | R43C3-C6 |
| R9C5 | R28C3-C6 | R44C3-C6 |
| R11C5 | R29C3-C6 | R45C3-C6 |
| R12C5 | R30C3-C6 | R46C3-C6 |
| R21C3-C6 | R31C3-C6 | R47C3-C6 |
| R22C3-C6 | R32C3-C6 | R48C3-C6 |
| R23C3-C6 | R34C3-C5 | R49C3-C6 |
| R24C3-C6 | R40C3-C6 | R50C3-C6 |
| R25C3-C6 | R41C3-C6 | R51C3-C6 |
| R26C3-C6 | R42C3-C6 | R53C3-C5 |

Special Formats

DOL (Default display format, zero digits after the decimal, flush left)

R16C6
R17C6

DOR (Default display format, zero digits after the decimal, flush right)

R19C1-C6
R38C1-C6

%2D (Formatted in percent, two digits after the decimal, default cell alignment)

R6C5
R13C5

F6D (Fixed decimal point format, six digits after the decimal, default alignment)

R8C5

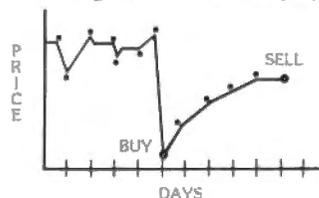
The widths of columns 5 and 6 are set at 13 characters instead of the default width.

Figure 3. Amortize's cell formats.

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Tidbit #25

Supposedly, the maximum length of a Model I/III Basic program line is 255 characters. In truth, a line can be as long as you want; it can have thousands of characters. This 12-line utility lets you create super-long lines, useful for hiding code or for tightening up a program.

Long lines run fine, but you can't type them in, you can't edit them, you can't display the entire line, and some utilities mishandle them. As always in Basic, you can reference only the beginning of the line.

However, some of these supposed disadvantages are exactly why you'd want to create a long line. In a 355-character line, the last 100 characters could contain secret information: Basic displays only the first 255. You can print the buried code, though.

Tired of having people mess with your Basic code? Anyone who tries to edit a long line will lose all characters after the 255th on leaving the edit mode: a little booby-trap.

You can use the program any time you want to combine two lines, not just to create super-long lines. It works under Cassette or Disk Basic. After you've typed in the utility and saved it to disk or tape, type in RUN 100. When the program prompts for a target, type in an existing program line number. The utility finds the target and combines it with the next program line, butting the start of the second line to the end of the

target. If the target is a program's last line, the routine doesn't work.

You'll find that the utility inserts four blank spaces between the two lines. As long as the new line has fewer than 255 characters, you can delete the spaces using Basic's edit mode; otherwise, try a space-removing utility.

*Andy Levinson
Studio City, CA*

```

100 CLEAR:CLS:PRINT "SIMPLE LINE COMBINER by Andy Levinson"
110 INPUT "TARGET";T
120 PRINT@64,CHR$(31);" TARGET =";T:PRINT "CHECKING =";?
130 C=PEEK(16548)+256*PEEK(16549):C=C+(C>32767)*65536
140 N=PEEK(C)+256*PEEK(C+1):N=N+(N>32767)*65536
150 L=PEEK(C+2)+256*PEEK(C+3):PRINT@138,L;
160 IF PEEK(N)+256*PEEK(N+1)=0 THEN ES="REACHED END":GOTO 210
170 IF L>T THEN ES="LINE NOT FOUND":GOTO 210
180 IF L<T THEN C=N:GOTO 140
190 POKE C,PEEK(N):POKE C+1,PEEK(N+1):POKE N-1,58
200 FOR X=0 TO 3:POKE N+X,32:NEXT X:ES="LINES COMBINED"
210 PRINT:PRINT ES:PRINT:END
    
```

Continued from p. 34

The Good Word

by R. Walter Steur

★★★★★

The Word Machine 3.0 runs on the Models I and III (48K) and requires one disk drive. Pel-Tek, P.O. Box 1026, Southampton, PA 18966, 800-523-2445. \$35; \$99 with Spell Check/Correct and DBLCOM.

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

Although the latest Tandy computers get all the headlines these days, the venerable Models I and III are still worthwhile machines, and you'll find plenty of inexpensive programs available for them. The Word Machine 3.0 is an impressive word processor that lets you embed text in a document from a disk file, print out documents too long for RAM by chaining them together, include headers and footers in text, preview text before printout, and specify the format for page numbering. In addition, you can use The Word Machine in conjunction with Pel-Tek's other programs, the Spell Check/Correct spelling checker and the DBLCOM telecommunications program.

Improvements

The Word Machine 3.0 is a line-oriented text editor that includes the usual word processor features such as cursor movement, appending text, insert/delete, and entering ASCII and block graphics characters. Pel-Tek has made a number of significant improvements to The Word Machine since its earlier version (2.0). First, the program comes with Micro Systems Software's TDOS operating system that provides a lowercase driver in low memory for the Model I. If you use another DOS, you must provide a lowercase driver.

You can now execute the Load and Save commands followed by a file name to avoid being prompted for one. More important, you can save files with or without text formatting data or a file extension. The Word Machine loads any ASCII file, with or without a /DOC extension, and it recognizes whether you've included format data. As in version 2.0, you can insert a disk file from a buffer in between the current and the following line.

A new improvement is the Get command that calls a disk file you want to embed in or append to the current text file while printing. This feature lets you add boilerplate paragraphs and stock headings and endings to documents. You can prepare long documents in sections so

they'll fit in RAM, then join them with the Get command to print them out.

Pel-Tek has expanded The Word Machine's document formatting section considerably. You can specify header and footer lines that become part of the format data saved with the text file, you can dictate page number placement or alternate the placement for odd and even pages, and you can print unformatted copies of your files. The Preview command lets you see your text formatted on-screen before you print it out.

You can specify how many copies of the current file you want printed and set the page on which you want numbering to start. You can embed certain printing commands such as page eject, line skip, and printer control codes. Separate options control whether or not the embedded commands are executed and/or printed. Also, you can now print from the top of a file to the end, or print from the current text line to the end of the file.

The Options

The Spell Check/Correct program works with The Word Machine (or with any other word processor) to automatically correct misspellings and saves the changes to the original file. The program provides a count of a file's total words and unique words.

The Word Machine's dictionary contains 31,000 words that you can augment either manually or automatically. It displays unfamiliar words in context and presents a menu of options so you can type in the correct spelling, pass over the word once, pass over it for the rest of the session, or pass over it and automatically enter it into your auxiliary dictionary file. Spell Check returns control to The Word Machine afterward. This is a quick and effective spelling checker.

The DBLCOM communications program interfaces with The Word Machine and supports many useful features: print spooling of incoming data shown on the screen, disk directory from within the program, resettable UART parameters, full/half duplex, a line feed filter, auto-dialing, and dialing from the keyboard or from a previously prepared phone list file. The split-screen option is particularly useful for conference calls and for CompuServe's CB feature. DBLCOM transmits all 26 telecommunications control codes.

One feature DBLCOM lacks is the ability to transmit/receive disk files with error-checking. Pel-Tek provides a utility to convert binary files to hexadecimal and vice versa for up- and downloading, but you're still limited by memory and the lack of error-checking.

The documentation accompanying these programs is satisfactory. It presents all the necessary information in a clear and readable style. ■

Rapidos: No Waiting

by Gary A. Ludwick

★★★★★

Rapidos runs on the Models I and III with 48K and on the 4 with 64K; it requires one disk drive. Rapidynamic Software Inc., 14358 Dyer St., Sylmar, CA 91342. \$30.

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

As a recent convert from a Model III to a Model 4P, I couldn't believe how slowly TRSDOS 6.2 formatted and backed up disks. While a combination format and back-up operation takes three or four minutes on a Model III, it takes nearly six minutes with TRSDOS 6.2. And that doesn't include the time required to invoke TRSDOS 6.2's separate Format and Back-up commands.

Rapidos is a high-speed disk formatting and duplicating utility. As you can see from the Figure, Rapidos makes a significant difference in the time it takes to back up a disk, particularly on the Model 4. TRSDOS 6.2 takes six minutes and 18 seconds to format and back up a disk, plus the time it takes to invoke the two commands. With Rapidos, it only takes one command and 43 seconds.

But Rapidos does have problems reading disks formatted in different drives (for example, trying to read a disk in drive 1 that was backed up in drive zero). This happens when your drives run at different speeds.

Rapidos is also a miniature operating system that includes a small library of commands you can use from Rapidos Ready (see below).

Choosing from the Menu

Since the Rapidos program and operating system are memory-resident, you can remove the program disk from your drive after boot-up. The main menu offers the following choices: Format, Back-up, Format and Back-up, Display Speed, Change Parameters, and Exit to Rapidos.

Use Format to prepare data disks. You can mass-format without ever returning to the menu—just keep replacing disks in your drive and hitting the F key.

Back-up is for use with already formatted disks. Again, you can make mass back-ups with just one keystroke.

Format and Backup do both tasks in one operation.

Display Speed is a drive timing program. As long as your drive doesn't go above 302 rpm, the manual says that everything should work fine. Appar-

ently, slower speeds don't cause any problems.

Change Parameters lets you specify the number of tracks on a disk (up to 80), the disk name and password, and the date.

How RapiDOS Works

RapiDOS reads and writes a disk track in a single revolution of the drive. To do this, it formats your disks differently from TRSDOS, but not so differently that it affects performance.

RapiDOS verifies every read/write operation. If something isn't right, it lets you know and then retries the operation. I used RapiDOS to format several flaky disks in my collection where TRSDOS 6.2 had locked out sectors as bad.

For RapiDOS to work correctly, your disk drives have to be in good shape, particularly in terms of rotational speed. According to the manual, any deviation in speed above 7.5 percent (two revolutions per minute) is likely to cause problems.

From my experience, RapiDOS seems much more sensitive than that. The built-in disk drive program says there's only about 1 rpm difference between my two drives. Yet, I can't read a disk formatted and backed-up on drive 1 on drive zero.

RapiDOS's Little DOS

RapiDOS's proprietary operating system commands include Directory, Kill, Step (to changing the stepping rate of your drives), Load, Do, and Auto. You can use all the commands without the system disk in place.

With the RapiDOS disk in drive zero, you have access to the Help, Format, Backup, Copy, Free, Dir1 (same as Directory, but with file lengths included), Rename, List, and Build commands.

Conclusion

RapiDOS does work fast. Its rapid formatting and back-up capabilities are needed and the price is quite reasonable. But the problems with drive speed differences are aggravating. RapiDOS' disadvantages can cause some real problems. ■

| Model III | TRSDOS 6.2 | RapiDOS |
|-------------------|------------|---------|
| Format only | 1:14 | 0:15 |
| Backup | 2:43 | 0:27 |
| Backup and format | 3:57 | 0:42 |
| Model 4 | TRSDOS 6.2 | RapiDOS |
| Format only | 0:36 | 0:15 |
| Backup only | 5:42 | 0:28 |
| Backup and format | N/A | 0:43 |

Figure. RapiDOS operation times.

Flight Simulator

★★★★★

Flight Simulator runs on the Tandy 1000 and 1200 and requires 128K and one disk drive. Microsoft Corp., 10700 Northrup Way, Box 97200, Bellevue, WA 98009. \$49.95.

Microsoft's Flight Simulator has been out for several years, and it's still tops. It's the only personal computer flight simulator that feels like the real thing. It has endless possibilities; you can fly to any of 80 airports in North America or pit your armed Cessna 182 against World War I biplanes.

Flight Simulator comes with 10 preset situations including a demo flight, the WWI combat mode, and a range of flight conditions from easy to emergency. You can also create up to 20 additional modes with the program editor and save them to disk.

You can set a multitude of environmental parameters. Circle over Boston's Logan Airport on a summer night. Land at O'Hare in Chicago in fog with FAA-approved IFR (instrument flight rules) instrumentation. Or, if you want a real thrill, put yourself in a spin at 10,000 feet in a zone of turbulent winds with unreliable instruments.

Flight Simulator's editor lets you manually set your location and altitude, the speed and attitude of your single-engine Cessna, and up to two layers of clouds and three levels of wind shear and turbulence above the ground wind. You also control the season, time of day, the reliability of your craft, and the simulator sound (on/off). You have radio communication with the local airport, views out all the windows, and a radar function to zoom in on your position on a map.

There are limits to Flight Simulator's realism. Once I landed on New York Harbor and taxied around the Statue of Liberty. And you'll encounter a few Bermuda Triangles. But the program is so good that it's fun to find the occasional bug.

Flight Simulator's manual is a match for the program. It's attractive and well written with maps, fold-out keyboard charts (for the IBM PC and PCjr), a glossary of aviation terms, technical specs on your plane, and, of course, flight instruction.

Since Flight Simulator doesn't use DOS at all, there are some keyboard differences between the Tandy 1000 and the IBM PC, but they are relatively minor. You can use the keyboard layout for either the IBM PC or the PCjr. I haven't tried using Flight Simulator with joysticks (should be better), but I suspect there'd be compatibility problems on the 1000.

—Dave Rowell

Omniterm2

★★★★★

Omniterm2 runs on the Tandy 1000, 1200, and 2000 and requires 128K. Lindbergh Systems Inc., Worcester, MA 01609. Express Order Software number 90-0270 (Model 1000, 1200); 90-0180 (Model 2000). \$175.

Omniterm2 is a telecommunications package for the Tandy 1000, 1200, or 2000. It offers automatic dialing and log-on, macro keys, buffer controls for sending and receiving files, and options for screen color selections and prompting with sound. You can call file directories, delete files, review and search files, change your default drives, and change the directory path.

In addition to ASCII file transfer, Omniterm2 supports Christensen protocol (XMODEM) that lets you send and receive files from a remote computer in compressed Basic or binary (/CMD) format. Christensen protocol also provides superior error-checking to eliminate the chance of receiving erroneous code during a download.

You can use Omniterm2 for unattended host operations, too. Using a modem, you can call your home or office computer running Omniterm2 and upload or download files from a remote location, or use the chat option similar to those in many electronic bulletin board programs.

You can get a help file at all times by pressing the F2 key, and the F1 key returns you to the terminal mode. Other function keys send and receive files, toggle the printer, redial a phone number, and more.

Omniterm2 supports different types of terminals, including the standard TTY (teletype) and Digital VT100 and VT52. You can also set your own terminal parameters.

The manual is well organized and the information moves the user quickly from booting up the program through explanations of the terminal mode to the options available through the program's main menu. The package includes extensive appendixes that outline the program's more technical aspects as well as a glossary of telecommunications terminology and an index.

—Bradford N. Dixon

PowerScript

★★★★★

PowerScript runs on the Models I, III, and 4/4P and requires Scriptit. Powersoft, 17060 Dallas Parkway, Suite 114, Dallas, TX 75248. \$39.95.

PowerScript adds a number of new features to Radio Shack's standard

EXPRESS CHECKOUTS

Scriptit word processor. You can access a disk directory, delete a disk file, chain files together during printing, halt the printer during printout to insert text in the file, save blocked sections of text to disk, redefine your keyboard, reenter PowerScript with your text file intact after returning to DOS, and access an on-line help file. It also offers high-memory protection for machine-language programs, and four new cursor control functions (control/right- or left-arrow jumps one word, and control/up- or down-arrow moves a screen of 12 lines).

You can invoke your printer's typeface features using embedded control codes or embedded control lines, and you can assign each control code (such as underlining, bold face, and expanded and contracted printing) to a key. You can even print graphics characters for headers.

You can also define printer control characters, redefine keyboard key characters, define new printer characters, send carriage returns with or without line feeds, select either the ROM or the PowerScript printer driver, and select the exact DOS patch needed for your system.

PowerScript works with all versions of Scriptit (Models I, III, and 4/4P), and operates under all the popular DOSes (TRSDOS 1.3, 2.3, 6.X; LDOS, DOS-PLUS 3.4, and NEWDOS/80 2.X). The only disadvantage is that it reduces Scriptit's buffer size by about 2K.

PowerScript would be useful to Scriptit users who find its shortcomings annoying, but don't want to abandon it for another word processor.

—Terry Kepner

TKISolver

★★★★

TKISolver runs on the Model 4 (128K) under TRSDOS 6.X and requires two disk drives. Tandy/Radio Shack. One Tandy Center, Fort Worth, TX 76102. Radio Shack catalog number 28-1630. \$299.95.

TKISolver is designed to solve equations in analysis, design, and planning. While it's a powerful program, it runs slowly, with noticeable and annoying pauses between every command.

TKISolver solves both simple and complex equations. For example, consider the equation $A = B + C$. You type in the equation, assign values to any two variables, and TKISolver calculates the value of the third variable. It can also solve multiple simultaneous equations while changing units, develop tables of values such as monthly mortgage payments and loan amortization rates, draw simple graphs, work with both formulas and user-defined functions, and develop a series of solutions based on a list of variable values.

If it doesn't have enough information to derive a single, definitive solution to a series of equations, TKISolver uses an iterative technique to find the closest solutions to your best guess.

TKISolver is unlike any other program I've seen. Though some of its functions are similar to those of a spreadsheet, it operates differently. The program is divided into a number of "sheets" that act like scraps of paper. You can display any sheet or pair of sheets on the screen at one time. Use the sheets to hold formulas, variables, unit conversions, tables of values, and system parameters.

You enter information in the sheets for the problem you're working on, and move from one to another as needed. When you've entered all the information, you merely type an exclamation mark and TKISolver works out a solution.

Using TKISolver involves a lot of commands. The manual is several hundred pages long and it's generally clear. Half of it is a tutorial that takes you through most of TKISolver's functions. The other half is a reference section that explains each function in detail. Included with the documentation is a reference card and a large wall chart that shows how the various parts of the program interact.

—Hardin Brothers

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Circle 589 on Reader Service card.

Makin' Macros

SuperKey (\$69.95), a RAM-resident keyboard enhancement program for MS-DOS computers, features macro processing and automatic data encryption.

The program offers context-sensitive help, and its cut-and-paste feature stores data under single-key control for use in other applications. It also switches the monitor off if the computer sits idle for a long period.

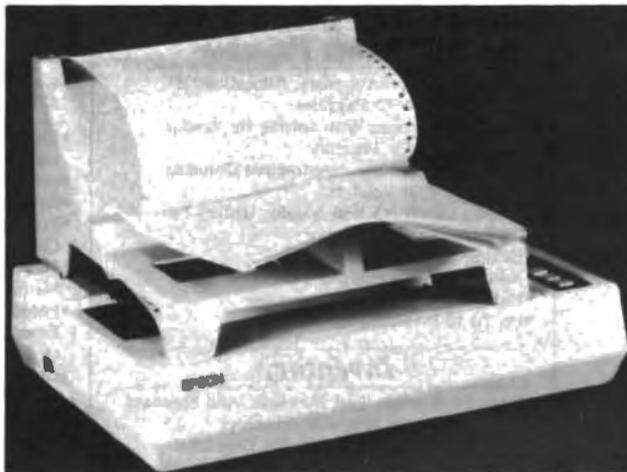
SuperKey encodes binary files in ASCII format and uses direct overwrite protection for non-encrypted files. For more information, contact Borland International, 4113 Scotts Valley Drive, Scotts Valley, CA 95066, 408-746-0911.

Circle 551 on Reader Service card.

Write On

The Portable Computer Support Group makes your Model 100 a complete word processor with Write ROM, a machine-coded snap-in ROM Text enhancement.

Write ROM saves the RAM space you'd usually need to store Text files. It also offers a library function so you can call boilerplates for form letters, and it generates interactive forms, where input screens prompt you to enter appropriate information. PCSG has



Paper Catcher folds your printed pages neatly on top of your printer.

added pixel mapping (shows you a graphics screen display of how your printout will look on paper), search and replace, mail merge (allows you to send a personalized document to every name on your mailing list), and tab features.

Write ROM's commands are compatible with Wordstar's dot commands. It works with any serial or parallel printer and pressing a function key lets you track RAM file size and check the number of words in a document.

The price is \$149.95. For more information contact Portable Computer Support Group Inc., 11035 Harry Hines Blvd. #207, Dallas, TX 75229, 214-351-0564.

Circle 558 on Reader Service card.

Sunny Side Up

Longview (\$29.95) prints your VisiCalc spreadsheet down the page instead of across, giving you the effect of a 400-character or wider printer. It does so by "rotating" your spreadsheet before printing it out.

Longview is an add-on to

Prosoft's DotWriter text formatter. It runs on the Models I, III, and 4/4P and requires two disk drives and 48K. For more details, contact Prosoft, Box 560, N. Hollywood, CA 91603, 818-764-4555.

Circle 559 on Reader Service card.

Express Mail

Ultimate Mail is a mailing list program for the Models I, III, and 4 with a fast machine-language search and sort. When in the search, sort, edit, or print mode Ultimate Mail takes about a second to find any record regardless of the file size. You can search and sort by any field.

Ultimate Mail lets you define what label lines you want to print and in what order. You can also predefine 15 different print formats and then specify which format number to print.

A manual is included in the \$49 price; you can buy it separately for \$20.

For further information, contact Ultimate Software, P.O. Box 1291, Hayden Lake, ID 83835, 208-772-7634.

Circle 562 on Reader Service card.

Miracle Worker

Miracle (\$299) is an integrated software package for MS-DOS computers that handles data obtained from telecommunications. The package includes a spreadsheet, graphics, and a word processor.

You can download information to create sophisticated reports incorporating graphs, text, and spreadsheet data. Miracle learns commonly used command sequences for execution in one keystroke.

By using the Procedural Activities Language, you can, for example, automatically flag information in a data base, extract the information, and retrieve it in a format compatible with Miracle's spreadsheet. The program generates two- and three-dimensional graphs.

For more information, contact Micro Systems Software Inc., 4301-18 Oak Circle, Boca Raton, FL 33431, 305-391-5077.

Circle 553 on Reader Service card.

Number Play

Targets is a Model III/4 game that challenges students to play with, develop, and expand their knowledge of numbers. It teaches basic math operations and finding the most efficient solution to a problem.

You solve sample problems by reaching a target value in the fewest steps possible. Students may choose from three levels of play.

For \$55 you get one disk, a back-up disk, and a teacher's guide. Contact Sunburst Communications Inc. (39 Washington Ave., Pleasantville, NY 10570, 800-431-1934, 914-769-5030) for more information.

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| 5 LEASEINT | Interest rate on lease |
| 6 BREAKEVN | Break-even 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 RECOWITH | 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 BONDAVAL | 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 BONDAVAL2 | Value of a bond |
| 35 EPSBEST | Estimate of future earnings per share for company |
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| 37 SHARPE1 | Portfolio selection model i.e. what stocks to hold |
| 38 OPTWRITE | Option writing computations |
| 39 RTVAL | Value of a right |
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| 43 VALADINF | Value of additional information |
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| 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 CONDPFOT | Conditional profit tables |
| 51 OPTLOSS | Opportunity loss tables |
| 52 FQOQOQ | Fixed quantity economic order quantity model |
| 53 FQOQWSH | As above but with shortages permitted |
| 54 FQOQCPB | 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 |

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| 60 COMBAL | True rate on loan with compensating bal. required |
| 61 DISCBAL | True rate on discounted loan |
| 62 MORGANAL | Merger analysis computations |
| 63 FINRAT | Financial ratios for a firm |
| 64 NPV | Net present value of project |
| 65 PRINDLAS | Laspeyres price index |
| 66 PRINDPA | Pasche price index |
| 67 SEASIND | Constructs seasonal quantity indices for company |
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| 74 LABEL1 | Shipping label maker |
| 75 LABEL2 | Name label maker |
| 76 BUSBUK | DOME business bookkeeping system |
| 77 TIMECLK | Computes weeks total hours from timeclock info. |
| 78 ACCTPAY | In memory accounts payable system-storage permitted |
| 79 INVOICE | Generate invoice on screen and print on printer |
| 80 INVENT2 | In memory inventory control system |
| 81 TELDIR | Computerized telephone directory |
| 82 TIMJAN | Time use analysis |
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| 84 ACCTREC | In memory accounts receivable system-storage ok |
| 85 TERMSPAY | Compares 3 methods of repayment of loans |
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| 87 SELLPR | Computes selling price for given after tax amount |
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| 89 DEPRSF | Sinking fund depreciation |
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If HYPERCROSS is the program for files then HYPERZAP is the program for sectors, tracks and whole disks! On the market for 2 years, HYPERZAP is more than just another disk copying program - it is the program for analyzing, copying, repairing, creating floppy disks of all kinds. It will copy any TRS-80 format as well as many others such as CP/M, PC, CoCo etc. Specially designed to handle mixed density sectors on any track in any sequence. Many features for reading, writing, editing track and sector data. Hyperzap is the tool that lets you be in charge.

Make your own self booting disks. Take your own CMD file and turn it into a dual booting Mod 1/III/IV disk.

Autopilot mode allows learn, saves and repeats procedures. Disk comes with fascinating examples showing how to backup Funsoft, Copycat 3 and others - magic indeed!

Hardware needed: 48K 1 drive minimum, One version for all TRS-80 models 1, 3 and 4. Manual and disk **\$49.95 ppp.**

Arranger II Disk Index System

World's finest disk cataloging system. Runs on Model I, III or IV and automatically recognizes virtually any DOS even NewDOS 80 double sided! Fast machine language with many features too numerous to mention here. Reviewed in Jan 84 80 Micro -heartily recommended - **\$49.95 - \$3 ship**

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NEW PRODUCTS

DMP 2100P, DOWNLOAD FONT DISK #2

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 LIGNE3IT ABCDEFGHIJKLM NOPQRSTUVWXYZ abcdefghijklmnopqrstuvwxyz 0123456789
 COLC3 abcdefghijklmnopqrstuvwxyz abcdefghijklmnopqrstuvwxyz 0123456789
 00 ABCDEFGHIJKLM NOPQRSTUVWXYZ abcdefghijklmnopqrstuvwxyz 0123456789
 001 ABCDEFGHIJKLM NOPQRSTUVWXYZ abcdefghijklmnopqrstuvwxyz 0123456789
 0010 ABCDEFGHIJKLM NOPQRSTUVWXYZ abcdefghijklmnopqrstuvwxyz 0123456789
 PUMP3 ABCDEFGHIJKLM NOPQRSTUVWXYZ abcdefghijklmnopqrstuvwxyz 0123456789
 CEREAL ABCDEFGHIJKLM NOPQRSTUVWXYZ abcdefghijklmnopqrstuvwxyz 0123456789
 TUBBAA ABCDEFGHIJKLM NOPQRSTUVWXYZ abcdefghijklmnopqrstuvwxyz 0123456789
 BULL ABCDEFGHIJKLM NOPQRSTUVWXYZ abcdefghijklmnopqrstuvwxyz 0123456789
 BULLY ABCDEFGHIJKLM NOPQRSTUVWXYZ abcdefghijklmnopqrstuvwxyz 0123456789
 000 ABCDEFGHIJKLM NOPQRSTUVWXYZ abcdefghijklmnopqrstuvwxyz 0123456789

Print samples from download font disk #2 for the DMP-2100P.

Fonts and Fonts

Prosoft provides high-resolution, downloadable fonts for your DMP-2100P or Epson LQ1500 on the Models I, III, and 4/4P or with MS-DOS. Font selections include italics, cur-sive, headline, and others.

Each of Prosoft's four disks includes programs to transfer the fonts, at least 11 fonts, and sample files to demonstrate them for you. You can preload a font into the printer and then use it with any other software, including Basic.

Each disk costs \$59.95. Free print samples and further information are available from Prosoft, Box 560, N. Hollywood, CA 91803, 818-764-3131.

Circle 571 on Reader Service card.

Zap Trap

The Static Buster static potential equalizer (\$49.95) is a two-ounce grounding unit that drains dangerous static build-up from your computer.

The unit attaches to your

computer's screen and key-board or to a peripheral. You connect a ground wire to an electrical outlet, water pipe, or other grounding source. In addition to preventing data loss, the system helps prevent eye strain from dust build-up on the display.

Contact Advanced Marketing Concepts (19301 Ventura Blvd., Tarzana, CA 91356, 818-342-8877) for more details.

Circle 554 on Reader Service card.

Hard Disk Upgrade

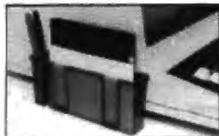
Osicom Inc. has a new line of hard disk upgrades for the Model 1000. Fixed disk drives of 10 and 20 megabytes are available for internal installation, and external drives are offered in 10-, 20-, and 30-megabyte configurations. Each includes a controller card, cables, manual, and installation instructions. Prices start at \$699 for the 10-megabyte internal upgrade and \$975 for the 10-megabyte ex-



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Powerhouse 250 keeps your computer going when the power company can't.

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Contact Osicom Inc., 18 Bank St., Morristown, NJ 07960, 800-922-0881 or 201-540-0144 for more information.

Circle 563 on Reader Service card.

Power to Spare

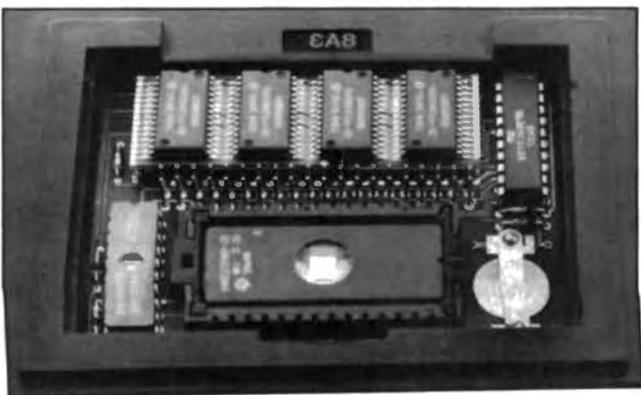
Dynatech's Powerhouse 250 (\$549) 250-watt stand-by power supply provides 14 minutes of uninterrupted power during a power dip or outage.

Powerhouse patches into your system within 2 milliseconds and remains on for several seconds following a return to power to protect against initial fluctuations.

The unit also provides surge protection and RFI/EMI noise filtration. A warning light and audible beep indicate activation.

Contact Dynatech Computer Power (4865 Scotts Valley Drive, Scotts Valley, CA 95066, 408-438-5760) for more details.

Circle 552 on Reader Service card.



Add a 32K or 64K RAM module to your Model 100.

More K for Less

PG Design Electronics' 32K and 64K RAM modules fit neatly in your Model 100's expansion compartment to add one or two 32K banks of memory. You can access them from any of the computer's other banks, and an optional data transfer program is available.

The 32K module lists for \$250, the 64K module for \$375. You can upgrade the 32K version later for \$150.

For more information, contact PG Design Electronics Inc., 66040 Gratiot, Richmond, MI 48062, 313-727-2744.

Circle 564 on Reader Service card.

Megamemory

Alpha Technology Inc. has introduced their 1-million-byte memory expansion system for the Models I, III, and 4/4P. The expansion kit comes in 256K, 512K, 768K, and 1-megabyte versions.

The kit includes an expansion board and all required

Circle 270 on Reader Service card.

A CURE FOR THE COMMON CODE

AT LAST, YOU DON'T HAVE TO BE A PROGRAMMER TO ACT LIKE ONE!

The ACT III authoring system allows you to create courseware for any kind of training or instructional purpose. It is a free-form system that enables tutorials, simulations, drill, or any other learning format software to be developed with unmatched speed and power, whether you are an absolute novice, or an experienced 2-80 programmer.

ACT III supports and facilitates the use of hundreds of CAI options, including, but not limited to...

EXTENSIVE PERSONALIZATION, UNLIMITED BRANCHING, 100 TEXT AND GRAPHIC DISPLAY OPTIONS, CLOZE PROCESSING, AUDIO AND TIMING CONTROLS, COUNTERS, DETAILED ANSWER ANALYSIS, HINTS, ALTERNATIVE ANSWERS, PRINT FUNCTIONS, LESSON REPORTS, ANIMATION, READABILITY MEASURES, STUDENT MESSAGES, SYNTAX CHECKING, SPECIAL PROMPTS, AND DOZENS MORE...

ACT III can be purchased through this ad for \$399, and allows you to simulate the function of most any other educational courseware. It contains a full functioning word processor and lesson generator, a display program, a screen artist program for special graphics, a mini data based manager, a syntax checker and a menu generator, all fully integrated for fast, easy use.

We developed this program over a three year period using professional educators and professional programmers together, and have field tested under diverse learning environments ranging in every discipline, kindergarten through post-graduate. We're sure it can meet your needs as well.

ACT III is available for the TRS-80 models III and IV. It comes with the program diskette and backup, data base diskette, tutorial and sample lesson diskette, 300 page user's manual in a stand-up binder, quick reference card, and all the support you need. You also get our 30 day, no-hassle, money back guarantee. Send for ACT III today!

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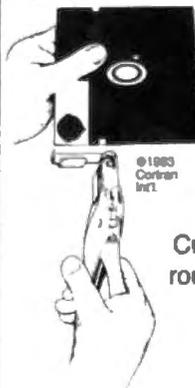
See our review in the April, '85, 80 Micro or send \$1.00 for our complete product information package.



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| 4712 | Assy. Lang. Dev. | 249 | 79 |
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NEW PRODUCTS



The Signalman Computer Mailbox stores messages with multilevel password protection.

memory chips. The board attaches to the rear of the CPU board and requires some soldering and that you clip two resistors. The kits start at \$269 for the 256K version. For more information, contact Alpha Technology Inc., 280 Roosevelt Ave., Satellite Beach, FL 32937, 305-773-2956.

Circle 561 on Reader Service card.

Circle 561 on Reader Service card.

ysis program. The computer analyzes and rates each horse from data you input.

According to Software Exchange, the handicapping systems have correctly selected first-, second-, and third-place winners over 65 percent of the time.

Circle 560 on Reader Service card.

Typing Teacher

Type Right (\$39.95) teaches correct typing on a Model III or 4. It consists of eight programs. The first three teach you the location of individual keys (upper- and lowercase letters, numerals, and special symbols) in a game format.

Two other programs teach you how to type common English words and Basic key words. Some of the other programs provide exercises in data entry simulation, writing Basic programs, and maintaining a telephone list.

Type Right comes on a disk with student worksheets and teacher and student instructions. For more information, contact E. David & Associates, Small Computer Systems, 22 Russett Lane, Storrs, CT 06268, 203-429-1785.

Circle 556 on Reader Service card.

Mail Box

Anchor Automation Inc.'s Signalman Computer Mailbox, a modem message center, enhances electronic mail by providing down-dialing capabilities to any computer system and receives and stores incoming messages whether or not your computer's on-line. It provides remote access and message pickup with multilevel password protection.

The Mailbox costs \$299. For additional information, contact Anchor Automation Inc., 6913 Valjean Ave., Van Nuys, CA 91406, 818-997-7758.

Circle 570 on Reader Service card.

Bugbusters Basic

Debugging Basic Programs, written by David R. Cecil, is for the Basic programmer who wants to resolve typographic, syntax, assignment, and other Basic program errors. It also gives advice in trapping errors in logic, arithmetic, strings, and input/output.

Horsing Around

Make some big bucks with this horse racing handicapping package for the Models III and 4 and IBM PC compatibles. It includes a thoroughbred racing analysis, a harness racing analysis, and a bet return anal-



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"Window-Comm" Communications System For TRS-80 Models III/4 with at least one drive and 48K RAM.

- *Talk to bulletin boards, CompuServe and other computers!
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NEW PRODUCTS



Write your own tests with QuizRite from Class 1 Systems.

The book includes myriad examples and costs \$9.95 from Tab Books Inc., Blue Ridge Summit, PA 17214, 717-794-2191.

Circle 567 on Reader Service card.

Quiz Time

Class 1 Systems' QuizRite test management program (\$89.00) for the Model III/4/4P lets you generate tests with four types of questions (multiple-choice, true/false, matching, and completion) from a single data file.

QuizRite data files are upward compatible with Class 1's TestRite. It allows teachers to store and edit tests.

The tests may be printed as write-on forms or specially formatted to utilize a separate machine graded answer card. Each generation of a test produces an answer key.

QuizRite requires 64K, one disk drive, and a printer. It is also available for the Models 1000 and 2000. For more information, contact Class 1 Systems, 17909 Maple St., Lansing, IL 60438, 312-474-4664.

Circle 568 on Reader Service card.

Get Rich Quick

The Computer Gold Rush (\$12.95), from Pageant Publishing Co. (P.O. Box 240334, Memphis, TN 38124, 901-386-2874) is for computer owners who want to make some money at home. It outlines the many kinds of full- and part-time businesses you can operate from home by computer and includes a listing of more than 500 places to advertise free.

The guide also features a special section (updated weekly) listing companies that offer computer-related jobs throughout the U.S.

Circle 566 on Reader Service card.

Fast Driver

CorDos 2.X, a network operating system from Computormz Developers Inc. (P.O. Box 182, 416 N. Washington St., Clinton, KY 42031, 502-653-4212) allows both Xenix and TRSDOS 2.X operating systems to run with either Corvus or Sunol hard drives on a Model II/12/16.

CorDos 2.X allows two or more multiuser (Xenix) and/or single-user (TRSDOS) computers to share data, printers, and other peripherals. The operating system also makes possible high-speed videotape and/or streaming tape back-up of data stored on the hard drives.

Corvus/Sunol drives run Xenix three to five times faster than Tandy hard drives. Hard drive partitioning enables all Corvus/Sunol-compatible computers to operate simultaneously.

An installation disk, a boot disk and a manual are available for \$500 from Computormz Developers Inc. (The boot ROM is available for \$50.)

Circle 557 on Reader Service card.

New Products listings are based on information supplied in manufacturers' press releases. 80 Micro has not tested or reviewed these products and cannot guarantee any claims.

THE RS-232

MODEL III

MODEL 4



State of the art technology in board design, our direct replacement of Radio Shack's internal RS-232 board, mounts inside the Model III or 4 on the existing brackets. All cables, screws and complete mounting instructions are included. Non-technical people will find that installation is quick, straight forward and simple requiring less than 15 minutes to complete.

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Note: We also manufacture the Model 100 A/D for the TRS-80* Model 100 Computer MODEL III, IV, or 4P—A/D, converter and digital interface for your TRS-80* Model III or IV:

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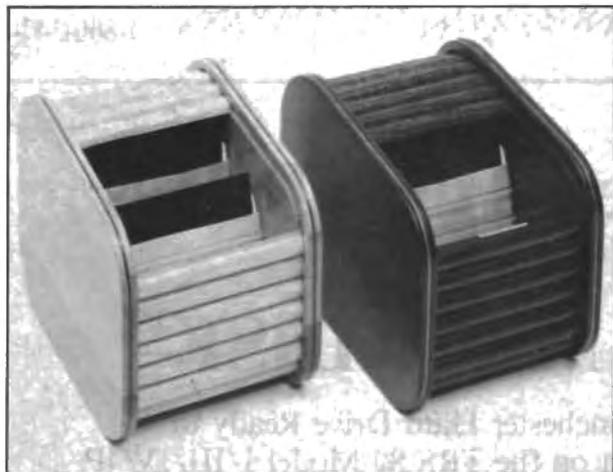
If you order direct, please specify whether you have Model I or Model III (the media are different) and whether you want disk or cassette. Include \$1.50 and indicate UPS or first class mail. Illinois residents add 5% sales tax. Visa and Mastercard accepted.

If you don't yet own a disk, don't fret. You can upgrade anytime. Cassette users may send back their cassette (but not the manual) along with \$10 (first class shipping included) and receive the disk version.

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Solid oak rolltop disk storage chest by Smith & Bellows.

Rollin' Along

This rolltop solid oak disk storage chest is a distinctive addition to any executive desk. Its slanting lines allow for quick sorting and locating of up to 70 5¼-inch disks.

The rolltop chest costs \$59.95. For further information, contact Smith & Bellows Co., P.O. Box 668, Amherst, NH 03031, 603-673-8482.

Circle 565 on Reader Service card.

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Circle 464 on Reader Service card.

Graphics Solutions

High-Resolution Software and Hardware

GBASIC 3.0 - Radio Shack Model 4/4P/III hi-res board owners take note of an enhanced graphics Basic; GBASIC 3.0 not only has an equivalent for each of the BASICG commands but adds a number of important new commands while using less memory. The hi-res screen can be printed on any of 20 popular printers or saved to or loaded from disk without leaving Basic. The software works with TRSDOS 1.3, 6.1.2, 6.2, LDOS, NEWDOS80, and DOSPLUS. The disk contains 40 graphics programs/files. Also included is a detailed manual which includes assembly language entry addresses. \$49.95. (Specify Model 4 or III mode or add \$10 for both.)

The following nine programs run on a Model 4/4P/III equipped with a Radio Shack graphics board and GBASIC 3.0 or a Micro-Labs Grafyx Solution board:

DRAW - A powerful full screen graphics drawing and editing program. \$39.95.

BIZGRAPH - Create business graphs from hand-entered or VisiCalc data. \$98.00.

xT.CAD - Professional drafting aid which outputs to a printer or plotter. \$449.95.

CHESS - A very powerful program with 10 skill levels, 40 play options. \$49.95.

REVERSI - Play Othello with 10 skill levels, 20 execution options. \$39.95.

3D Tic-Tac-Toe - Play the computer or a friend on a 4 x 4 x 4 matrix. \$29.95.

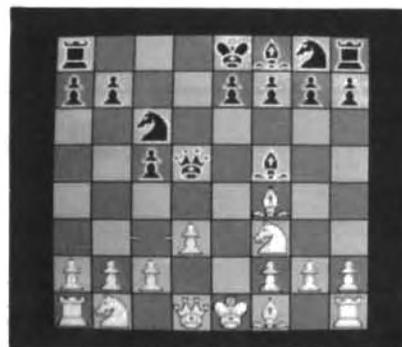
3D-PLOT - View three-dimensional data from any perspective or angle. \$39.95.

MATHPLOT - Plot equations of the form $Y=F(x)$ with auto scaling. \$39.95.

SURFACE PLOT - Plot three-dimensional equations of the form $Z=F(x,y)$. \$39.95.

GRAFYX SOLUTION. Plug-in, clip-on board enhances any Model 4/4P/III to provide 640 x 240 / 512 x 192 dot graphics. Comes with over 40 programs and files including GBASIC 3.0 which adds over 20 new commands. \$199.95.

JOY-MOUSE. Allows a Radio Shack CoCo joystick, mouse, or touch pad to be connected to any Model 4/4P/III. Hardware provides X, Y position values from 0 to 255. A built-in speaker produces sound from the cassette port. \$129.95.



G.I.N.A. Software program for the Model 4/4P/III/I which uses the standard block graphics screen to display a window to a larger 65536 x 65536 dot tablet. The arrow keys are used to draw two or three-dimensional figures. The display can be scaled, shifted, or rotated in any dimension. The final picture is printed in hi-res on Radio Shack, Epson, Gemini, NEC 8023, or Prowriter printers. \$75.00.

Please specify your exact system configuration when ordering or requesting information. Payment may be by check, Visa, Mastercard, or COD. Domestic shipping is free on pre-paid orders. Texas residents add 5½% sales tax.

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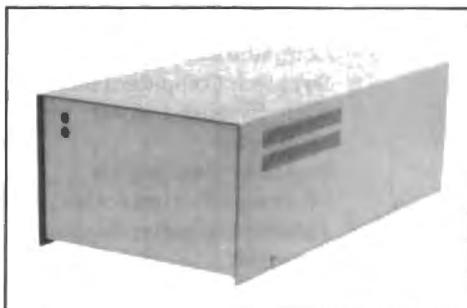
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DeskMate Moves To the 4

Send your questions dealing specifically with Tandy products, services, or policies to Ask Tandy, 80 Micro, 80 Pine St., Peterborough, NH 03458. A representative at Tandy's Fort Worth, TX, headquarters supplies all answers published here.

Q Will Tandy offer a version of DeskMate for the Model 4/4P? I find a lot of useful features in the package.

A Yes. The program's still being debugged, and you probably know how software debugging goes, so I don't want to speculate on just when it'll be available. But there will be a 4/4P version of DeskMate.

Q In April's column, (p. 128), a reader asked why Radio Shack refuses to support user's groups. Your reply was inadequate. I'd like to know why you don't even acknowledge them. Our group asked permission to post a small notice in several Computer Centers, and we were refused.

A Our Computer Centers have instructions not to distribute third-party advertising material. Some employees might misread that to include information about user's groups. In fact, Tandy encourages user's groups, and doesn't object if stores post meeting announcements or other non-commercial user's group notices. Have Computer Center people contact Rich Hollander, manager of Tandy's Business Products Division in Fort Worth, if they want verification.

Q Is it possible to buy the old Model 4 keyboard without clustered arrow keys? How much? Part number?

A Yes. \$81.81. Part #AXX-0216. You can still buy almost any part for any computer we've sold in the past seven years. Order through your local Radio Shack store for installation, or from Radio Shack National Parts direct (817-870-5662).

Q I hope someone can answer what I thought were simple questions; so far, I've had no luck. I want to know the amount of free (user) memory avail-

able in a Tandy 1000 with each of these programs loaded: Lotus 1-2-3, WordStar, VisiCalc, Multiplan, EasyWriter, and DeskMate.

A Unfortunately, I don't have all that software available to test. I will tell you that you should have about 40-45K less RAM available in a Tandy 1000 than in a comparably equipped IBM PC, since some of the PC's Basic is in ROM. A 256K Tandy 1000 should run all the software you listed. With DeskMate, you should have about 25,800 free bytes, depending on the version. The version of Basic I tried shows 60,875 free bytes. (Microsoft Basic, whether on the Tandy 1000 or IBM PC, can't address more than 64K of RAM.)

Q TRSDOS 2.8DD (double density for the Model I) still has some bugs. Is it possible you'll release a new version?

A So few people would want the product that a new release is totally impractical. Chances are slim to none.

Q With increasing use of spreadsheets, it's more important to be able to print the output on one continuous sheet of paper. A program for the IBM PC, called Sideways, supports printouts of unlimited width. Does Radio Shack offer, or plan to offer, a similar program?

A You didn't say what model computer you have. If you have a 1000 or 1200, the IBM program should work. On a 2000, it might work. We are looking at other similar products, but I'm really not able to say much about unannounced products. No dates or specifics yet.

Q I own a Model III, and I'm a teacher. Why hasn't Tandy done as much educational programming as Apple? When I talk with other teachers about computers, they always throw cold water on the TRS-80 line because it lacks educational software.

A Tandy and Apple both encourage educational software development by outside publishers. We

currently have working agreements with 79 nationally recognized educational publishers. Those folks have more than 400 programs for TRS-80s. In fact, we just compiled a list of more than 300 Network 3-compatible programs, just for the Model III/4. Radio Shack publishes an Educational Software Sourcebook listing about 1,500 titles, and the TESS Software Sourcebook also lists about 1,500 programs, so I think that's a safe minimum number to quote. Armed with this information, maybe you won't have to take quite as much flak about "no" software.

Q Does Tandy plan to manufacture another computer in the I/III/4 family?

A Sorry, it's company policy not to speculate about future products. I can tell you, though, that we have NO plans to eliminate the Model 4 family.

Q I love my Tandy 2000, but I'm disappointed with Tandy's software support. I got a notice about the MS-DOS 2.11.01 upgrade on Dec. 10, 1984. As of February, my Radio Shack store couldn't, wouldn't, or didn't care about getting me a copy. They're back-ordered, out of stock, or just not able. Why not mail me a disk instead of a letter?

A Unfortunately, we do sometimes have these problems. In this case, some stores might have been at fault, but part of the problem was that our product manager didn't anticipate the number of folks who'd want 2.11.01. We're often asked for many more upgrades than the number of products out there to be upgraded.

The good news is that, since mid-February, Tandy's filling orders for MS-DOS 2.11.01 with version 2.11.02. You should have received a letter announcing the upgrade by the time you read this. See, we do try to have a product available before we advise you.

Mailing disks isn't practical. They often don't work on arrival, too many people move, and too many never send in their registration cards. We generally have better luck mailing letters and having stores contact their local customers. ■



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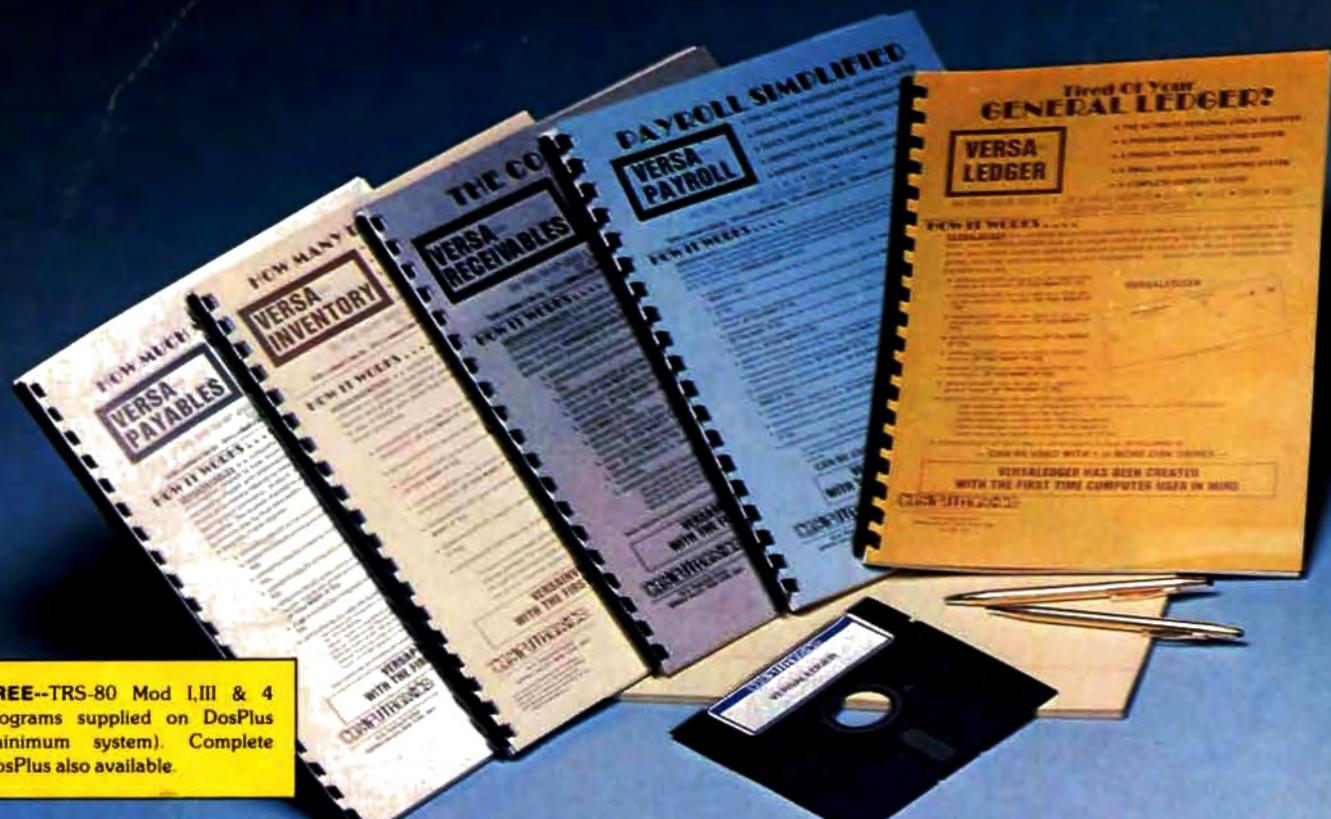
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