

DESKMATE: The Tandy 1000's Bundle of Joy

MAY 1985  
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# 80micro

A CWC/1 PUBLICATION

the magazine for TRS-80\* users

## Write Your Own SIMULATIONS

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Shows You How

New Column  
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Scroll Protect  
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In an effort to give our customers even better value for their software dollar, we have now eliminated shipping charges for all orders over \$25 to the continental US or Canada. Simple. Except for an extra charge if you order by COD, there are no other charges at all. The price you see is the price you get. Someday, all dealers will sell this way, but for now you'll just have to stick with the best — JMG Software.

## NEW! from **INFOCOM™** HITCHHIKERS GUIDE TO THE GALAXY

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Model 3/4 only (unfortunately) ..... \$34.50

### ACCEL 3/4 Basic Compiler

This compiler from Southern Software and Allen Gelder is one of the best; it compiles almost all BASIC commands, and produces fast machine language programs.

ACCEL 3/4, Mod 1/3 Disk ..... \$89.50

JMG has recently expanded its line with some excellent programs, and here is a run-down of the new guys on our software block:

### T/MAKER

This integrated software package for the Model 4 combines word processing, spelling checking, spreadsheet, data base management, and graphics all into one package. An excellent over-all package, and a great price.

T/Maker, Mod 4 only .... (List \$299) \$269.50

### ENBase

This is a "relational data base manager" and what that all boils down to is a very powerful program. This will handle most any data base job you can throw at it, and more.

ENBASE, Model 1 or 3 .... (List \$140) \$129.50

### DIS'n'DATa Dissassembler

This is a disassembler with a unique and efficient way of automatically separating data areas from machine language code. It's not 100% foolproof, but it is as close as you can get.

DIS'n'DATa Model I/III Disk ..... \$37.50  
DIS'n'DATa Model 4 ..... \$46.50

### OTHERS:

Disk Drive Analyzer, Model I ..... \$84.50  
Disk Drive Analyzer, Model 3/4 ..... \$74.50  
(Does what it says, list \$89/\$79)

PASCAL80 Model I/III ..... \$69.50  
PASCAL80 for CP/M ..... \$36.50  
(A well-praised Pascal Compiler)

EDIT Mod I/III from Allen Gelder ..... \$36.50  
(A full-screen editor for BASIC)

SBE from Allen Gelder ..... \$94.50  
(“Mid-level language compiler”...)

VersaBusiness Series ..... \$89.50  
(AR, AP, Payroll & Inventory available)

Versaledger II ..... \$134.50

CNVBASIC for Mod I/III or 4 ..... \$27.50  
(Powersoft's entry in the conversion club)

And there's more new stuff coming!

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LESCRIPT Models I/III/4 ..... (List \$129.95) \$94.50

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## WORDPROCESSING PACKAGE DEAL \$199.50

Buy both LESCRIPT and ELECTRIC WEBSTER together and save even more! These two programs work great together, so if you're getting into serious word processing this is the "first class" way to go. This is a special offer for, as they say, "a limited time."

SAVE \$80 OFF THE LIST PRICE!!

## KSoft's LOG and SUPERLOG

Very versatile "Electronic Notebook" programs that allow you to access stored information at the touch of a key, even when running other programs. Keep notes, memos, lists, or other information in the instantly accessible "pages". SUPERLOG4 for the Model 4 also contains many advanced features and commands that will make you wonder how you ever lived without the program.

LOG for Model I or III ..... \$44.50  
SUPERLOG for Mod I or III LDOS ..... \$99.50  
SUPERLOG4 for Mod 4 ..... (List \$119.95) \$99.50

## DOSPLUS 3.5 and DOSPLUS IVa

DOSPLUS is an excellent alternative to TRSDOS for Models I/III and Model 4. As they say, it's "better, faster and stronger"; in this case stronger means more powerful. Both versions come bundled with many utilities that are alone worth the price. It won't leap tall buildings in a single bound, but it will do the next best thing, which is to make life a little easier for you.

DOSPLUS 3.5 for Model I or III ..... \$ 59.50  
DOSPLUS IVa for Model 4 ..... (List \$169.95) \$119.50

## The Home Accountant ..... \$59.50

A complete personal finance package. A thorough program; somewhat slow, but otherwise a very good package.

Home Accountant, Model III only ..... \$59.50

## TAS Public Domain Disks

These disks are a collection of quality public domain programs from all over. There's lots of stuff here, from games to utilities to applications and much more. Each disk is a "flippy" disk, and both sides are filled to the brim.

Public Domain Disk Package, #1 to #4 ..... \$34.50  
Public Domain Disk Package, #1 to #6 ..... \$49.50  
Single Disk (specify 1 to 6) ..... \$ 9.50

# JMG

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IF YOU BOUGHT YOUR SOFTWARE ELSEWHERE, YOU PROBABLY PAID TOO MUCH

JMG is one of the largest sources for TRS-80 software around; we specialize in software for Models I, III and 4. Our prices are the best, and if you find a better price then we'll beat it (see below). As well, we support the programs we sell; we sell only top-quality software, and our 99% satisfaction rate speaks for itself. With the best prices, selection and support on your side, you can't lose. Model 4 owners: ALL Model 3 programs we sell will work on the Mod 4 in "III mode".

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J&M's Disk Drive Analyzer - III	( 79.00)	\$ 74.50
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### OTHER GOODIES:

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ROM ROUTINES Documented	\$16.50
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TRSDOS 2.3 Decoded	\$23.50
BASIC Faster & Better	\$23.50
BFBLIB or BFDDEM Disks	each \$16.50
BASIC Disk I/O F & B	\$23.50
DFBLOAD disk	\$16.50
DISKS: On a trial basis we are offering Wabash "Datatech" blank diskettes for sale. Lifetime guarantee, in soft box with labels etc. These are Single Side Double Density (other formats available).	
SSDD Wabash (10 pack)	\$15.00

## OUR NEW PHONE NUMBER: (416) 575-2867

Use this number for ordering and for technical information. Phones are usually staffed Monday to Saturday, 10 A.M. to 7 P.M. (No technical info on Wednesday.)

### OUR PRICING POLICY:

We will beat any legitimate price advertised for any product that we carry. If you find a lower price advertised, our price will be \$1.00 less, under the same conditions (eg. same shipping and other charges, etc). To receive the lower price you must mention the location of the other ad when ordering.

### AN APOLOGY:

This is an open apology to Powersoft and Hypersoft for a mistake we made in our original pricing of their new product, Hypercross/Supercross. While controlling dealer prices is illegal ("pricefixing"), it is JMG's policy to co-operate with our suppliers as much as possible and observe their concerns. Both companies would like to maintain a stable market for their new program, so we'd like to apologize to them and any other people affected by our inappropriate pricing. Thank you.

### THIS AND THAT:

Hope you like our latest ad... keep your eyes open for new things coming soon, such as even more new products. Also, we will soon venture into the Model 1000 world (don't worry, we won't leave I/III/4 behind). This isn't all we have, by the way; write for a complete product/price list and our latest newsletter. Canadians: write for our Canadian price list. Till next month - The Prez.

### TO ORDER:

We accept orders by phone or mail. When ordering please specify the Model of TRS-80 you own, the exact program(s) wanted, and the method of payment. We accept Check, Money Order, VISA, MasterCard. (For Electric Webster please mention your word processor.) (For Dotwriter & PowerDot mention your printer brand.)

## OUR GUARANTEE:

We sell only top-quality software. If, however, you are unsatisfied with a product you have purchased from JMG, you may return it (in good condition) within 10 days for a refund, less a \$2.50 handling charge for programs under \$50 (\$5.00 for programs over \$50). We also ask that you send us a letter stating the reason for your return.

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**LONGVIEW**

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# IS YOUR PRINTER TOO SHORT FOR YOUR SPREADSHEET?

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The number of "rows" becomes the limit when you print this way: you can fit between 48 (Microline 92) and 180 (C.I.TOH 1550) rows across the page.

**LONGVIEW** is an "add-on" to our Dotwriter system. It includes programs and three character sizes, and runs on 48K-64K TRS-80 Models I, III, and 4/4P (native Model 4 mode). Please see our ad later in this magazine for information and pricing on Dotwriter, and the printers we support.

**LONGVIEW** is easy to use and comes with ready-to-run setups. First, tell VisiCalc to print your spreadsheet to disk. Next, rotate the file with **LONGVIEW**. Then, print it with Dotwriter. That's all there is to it.

**LONGVIEW . . . . \$29.95**  
*(does not include Dotwriter or VisiCalc)*

## DOWNLOADABLE FONTS

**W**e have dozens of high-resolution, downloadable fonts for the Radio Shack DMP 2100P and the Epson LQ-1500. They include italics, cursive, headline, and other fancy typefaces. Each font disk includes programs to perform the download, and sample files to print them for you.

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Each disk contains at least eleven fonts and supporting programs. The disks cost \$59.95 each, and we

offer substantial discounts to **ALLWRITE** owners. Please call or write to us for print samples, further information and pricing. Due to the specialized nature of this product, we recommend that you see the samples before ordering. Disk formats are available for TRS-80 I, III, 4, and MS-DOS. **ALLWRITE** is available only for TRS-80.

Information on these products is not available at our toll-free answering service, so please call or write to our Technical Support group for details:

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

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*80 Micro* (ISSN-0744-7868) is published monthly by CW Communications/Peterborough Inc., 80 Pine St., Peterborough, NH, 03458. Phone: 603-924-9471. Second class postage paid at Peterborough, NH, and additional mailing offices. (Canadian second class mail registration number 9663.) Subscription rates in U.S. are \$24.97 for one year, \$38 for two years, and \$53 for three years. In Canada and Mexico \$27.97—one year only, U.S. funds drawn on a U.S. bank. Nationally distributed by International Circulation Distributors. Foreign subscriptions (surface mail), \$44.97—one year only, U.S. funds drawn on a U.S. bank. Foreign subscriptions (air mail) please inquire. In South Africa contact *80 Micro* P.O. Box 782815, Sandton, South Africa 2146. All subscription correspondence should be addressed to *80 Micro*, Subscription Department, P.O. Box 981, Farmingdale, NY 11737. Please include your address label with any correspondence. Postmaster: Send address changes to *80 Micro*, Subscription Services, P.O. Box 981, Farmingdale, NY 11737. Send Canadian changes of address to *80 Micro*, P.O. Box 1051, Fort Erie, Ontario L2A 5N6, Canada. Return postage guaranteed.

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- 62. **Current Events**  
*by Mark D. West*  
A consumer's guide to surge protectors.
- 70. **Restricted Entry**  
*by José E. Anaya*  
Keep bogus input from sneaking into your programs. (Models I, III, and 4; Load 80; Models 1000, 1200, and 2000)
- 74. **Stationary Department**  
*by Raymond C. Boggs*  
Add scroll protection to your Model 4's video display. (Model 4; Load 80)
- 106. **Spreadsheet Beat**  
*by Russ Couey*  
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# LOAD 80

**L**oad 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, you must convert the programs from Model III TRSDOS to Model 4 disk using the Model 4 CONV command.

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

## Directory

### Endgame

Article: Fight Simulator (p. 40).  
Systems: Models I and III, 32K RAM, one disk drive.  
Language: Disk Basic.

A combat simulation that demonstrates simulation programming techniques.  
Cassette filespec: B.  
Disk filespec: ENDGAME/BAS.

### Prompter

Article: Restricted Entry (p. 70).  
System: Models I, III, and 4, 32K RAM, one disk drive.  
Language: Disk Basic.

Predefine acceptable user input.  
Cassette filespec: C.  
Disk filespec: PROMPTER/BAS.

### Scroll

Article: Stationary Department (p. 74).  
System: Model 4, 64K RAM, one disk drive.  
Language: Assembly.

Adds scroll protection to Model 4 video display.  
Cassette filespec: SCROLL (object code).  
Disk filespec: SCROLL/SCR (source code), SCROLL/CMD (object code). Source code requires ALDS editor/assembler.

### Fractals

Article: Fractals in Focus (p. 58).  
Systems: Models III and 4, 32K RAM, one disk drive, high-resolution board.  
Language: BasicG.  
High-resolution modification of

Michael van de Panne's fractals program.  
Cassette filespec: D.  
Disk filespec: FRACTALS/BAS.

### BBS

Article: BBS Express (p. 92).  
System: Model III, 48K RAM, two disk drives.  
Language: Assembly.

Put the finishing touches on your bulletin board system.  
Cassette filespec: BBS (source code).  
Disk filespec: BBS/SRC (source code). Requires Radio Shack Editor/Assembler.

### Extend

Article: The Next Step (p. 100).  
System: Model 4, 64K RAM, one disk drive.  
Language: Assembly.

Demonstration of an extended command interpreter.  
Cassette filespec: EXTEND (object code).  
Disk filespec: EXTEND/SRC (source code), EXTEND/CMD (object code). Source code requires ALDS editor/assembler.

### Convert

Article: Special to Load 80.  
System: Model III, 32K RAM, one disk drive.

Converts Apparat editor/assembler or Radio Shack Series 1 Editor/Assembler source files to ALDS format.  
Cassette filespec: E.  
Disk filespec: CONVERT/BAS.

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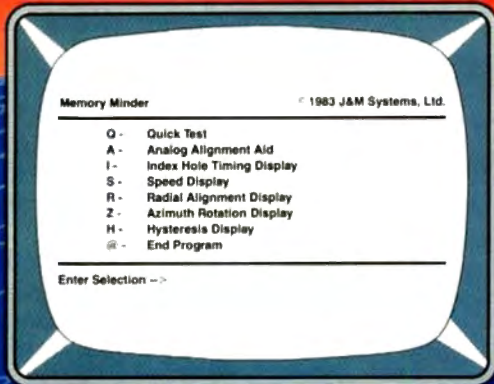
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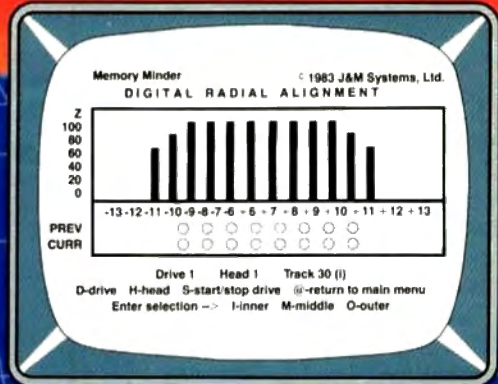


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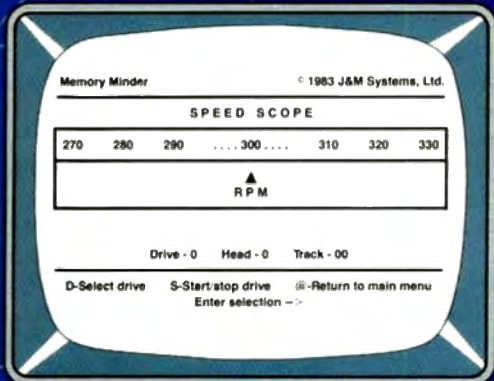
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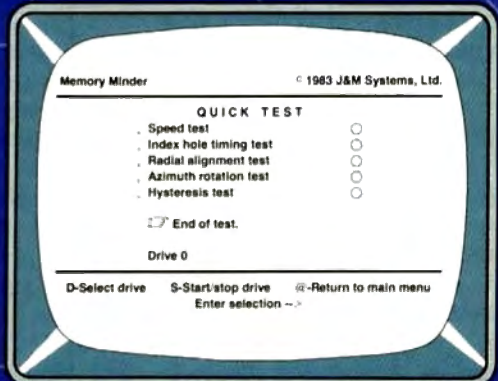
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# Spring Cleaning At 80 Micro

**S**pring is a time for housecleaning, so that's what we're doing. We've added a column, let two old ones go, and added several features.

The new column, premiering this month, is called Spreadsheet Beat. It focuses, as the name implies, on spreadsheets. We'll be giving you templates, utilities, and hints for whatever package you use, including VisiCalc, Multiplan, PerfectCalc, and SuperCalc. The column will apply to you no matter what kind of TRS-80 you own.

We hope this will be a reader's forum, and we invite you to submit your own templates and tips. Turn to p. 106 and see what it's all about.

The two columns you'll no longer see are 2000 Plus and BBS Express.

April was the last month for 2000 Plus. We decided to end it for one major reason: The Model 2000 has never caught on with 80 Micro readers. The number of readers owning Model 2000s has hung at around 3.5 percent since mid-1984, which puts the machine dead last, trailing even the Pocket and Color Computers. We could no longer justify running a column that 97 percent of our readers can't use.

Author John B. Harrell will, however, continue to submit occasional reviews of noteworthy Model 2000 products.

Also finishing its run, with this issue, is BBS Express, our series on writing your own bulletin board system. Authors J. Stewart Schneider and Charles E. Bowen have provided all of the program's modules, and followers of the column now have a fully operational BBS. Those of you who actively call electronic bulletin boards will undoubtedly run into a few installed systems.

Back to new features. In June, you'll see the debut of a monthly collection of capsule reviews called Express Checkout. These quickies have two purposes. First, we can tell you



about new products earlier than we could with full-length reviews. And second, we can give you our impressions of products that might not otherwise make the regular review pages. These include specialized software, MS-DOS software, and new releases of older packages.

In the regular Reviews section, we've started a new feature called Counterpoint. A Counterpoint comprises several minireviews to supplement a feature review. You've already seen one, accompanying the Tandy 1200 review in March. If you missed it, check out the Counterpoint that goes along with this month's DeskMate review (p. 34).

Counterpoints will give you a second, third, and fourth opinion of a major product. Sometimes the Counterpoint authors will agree with the first reviewer; other times we expect that they won't. In either case, you'll get a better idea of how good (or bad) a product really is.

## Coming Up

The feature articles are, of course, the bread and butter of 80 Micro. We've got a well-rounded line-up over the next few months.

June's cover story will be for Model 1000 owners only. We commissioned technical editor Dave Rowell, who wrote the Model 1000 review in April,

to put together a collection of hints, tips, and patches for that system.

For July, we're working on a guide to bulletin board systems for TRS-80 owners. This will not, however, be your ordinary list of phone numbers. We're calling hundreds of boards all across the country, from which we'll select only the dozen or so best. We'll tell you which ones to go to for public domain software, for technical information, and for expert advice from other TRS-80 users. We don't intend to be in the office the day the phone bill comes in, but we think it's worth the expense to let you know about some of the most valuable contacts in the computer world today.

August's feature will be "Getting Back to Basic," in which we'll focus on Basic programming techniques. Of particular interest to Model 4 owners will be a look at the advantages of Model 4 Basic over Model III Basic, including a study of such Model 4 commands as While...Wend and Swap.

We'll highlight September with a piece on transferring files between different microcomputers. What's the best way, for instance, to get a Model 4 data base file over to the Model 1000? How can you convert Model III Basic programs into Model 4 Basic? We'll look at a number of different ways you can do these jobs and others.

Other articles we're working on include a MacPaint work-alike for the III and 4 hi-res boards, a sort generator for the Model III, part II of Andy Levinson's popular "Patch Work," a comparison of word processors for the TRS-80 and Tandy computers, and a round-up of easy hardware upgrades you can do yourself.

By the way, some of these article ideas came from readers through letters, phone calls, and surveys. When we ask for your advice, we mean it. Let us know if there's something you'd particularly like to see. ■

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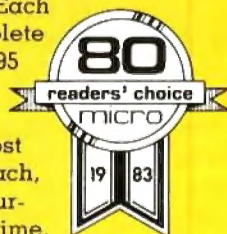
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**If you want to create your own logos,** modify our typefaces, or even design entirely new typefaces, then you will also want to order the "Letterset Design System" (LDS). We offer LDS at half-price when you order it along with DOTWRITER. LDS operates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

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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.

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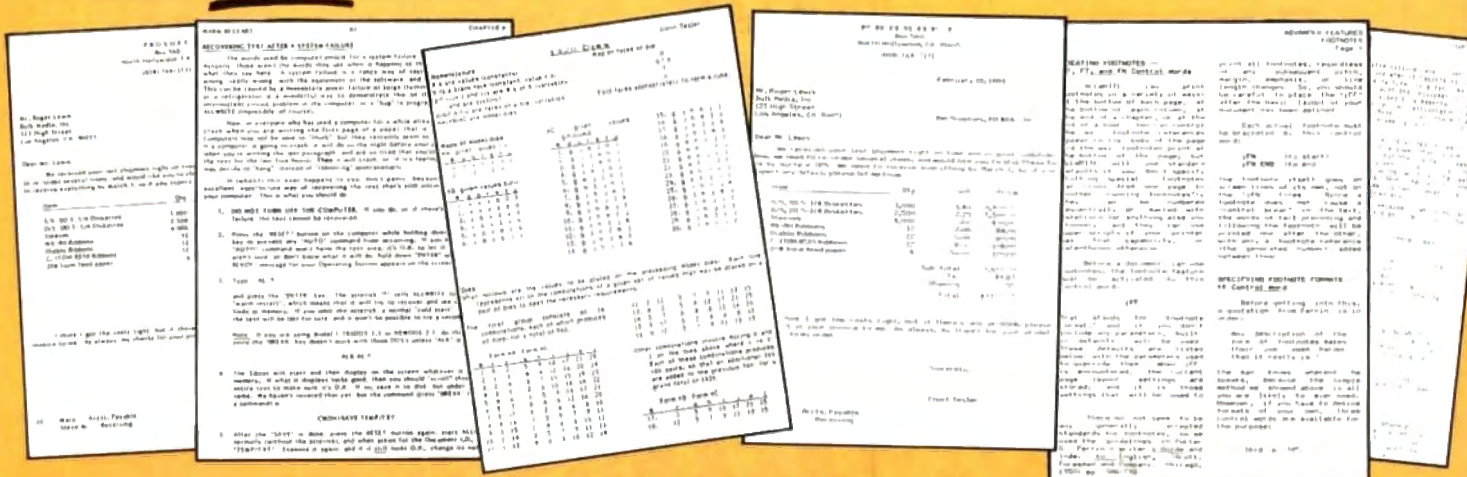
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ALLWRITE is based on the proven methods that made NEWSSCRIPT the most popular independently produced TRS-80 word processor, but it also has the speed and new features our customers have asked us for. ALLWRITE will save you time and let you produce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

### Allwrite Can Save You Time!

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

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

ALLWRITE shows you where you forgot to turn off underlining, boldface, italics, or double-width. Special on-screen Preview feature shows page breaks and page layouts...including underlining and boldface...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,

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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.

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

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## 2000 Update

In his November 1984 column, John Harrell (2000 Plus, p. 174) makes it clear that he's not satisfied with our conversion utility, Convert 2000. While that's his right as a reviewer, we feel that his negative comments aren't justified. For example, Harrell complains that Convert 2000 is slow without regard to the reasons behind this lack of speed; our utility searches for key words one line at a time, rather than checking for token codes.

Harrell also reacts negatively when he discovers that the program won't change PRINT @ statements with variables in the arguments. The documentation clearly states that it's not always possible to convert all statements to their exact equivalents. Convert 2000 flags down any statement that's not directly convertible and offers suggestions as to how the programmer can work around the problem. Convert 2000 is one of the most flexible conversion programs available and has saved us valuable time when transferring our Model I files over to the Model 2000.

*Dave Dischert and Dan Keen  
Software Horizons  
Cape May, NJ*

## Positive Thinking

I'll grant that the heyday of TRS-80 market mania has peaked, yet let's not overlook the beneficial effects of a dwindling marketplace. For example, many of the less reputable dealers are now extinct while quality-conscious companies continue to support their winning programs and develop new and exciting products as well. These dedicated people should be praised in the highest terms as they represent computing at its best. Hang on to your Radio Shack hackbox; the sun hasn't set on the TRS-80 market yet.

*Warren R. Morrisett  
Bronx, NY*



## QED Reports

In Pulse Train (January 1985, p. 24), Bradford N. Dixon refers to recent Quality Education Data (QED) reports on computer to student ratios in large school districts. Perhaps you'd like to hear from some of the less populated areas.

A neighboring elementary district has a current ratio of 12 students to 1 computer. We have a ratio of 16:1 in our kindergarten to eighth grade elementary school and 7:1 in our high school. The Office of Public Instruction for the state of Montana gives a statewide ratio of 33:1 for their most recent statistic.

Keep reading these reports and passing on the statistics. I enjoy your column as well as the rest of the magazine.

*Gary L. Webber  
Fromberg, MT*

## State of the Art

There seems to be a lot of publicity lately on the new Tandy Model 1000. With this new machine, we're told, Radio Shack has finally rectified the things it did wrong with earlier TRS-80s. But in all the enumerations of Tandy's "new look," a major factor in its earlier problems has been overlooked.

The missing factor is quality control and service. The original TRS-80

didn't become known as a "trash-80" just from poor marketing, as one is led to believe from recent editorials on this issue. Every reader of *80 Micro* should be familiar with the problems plaguing the Model I's Expansion Interface connectors that could have been avoided if Radio Shack gold-plated them in the first place.

This summer, I decided to upgrade to the Model 4 for a number of reasons, not the least of which was my impression that Radio Shack had improved its quality control. Wrong. It took three trips to the Fort Worth service center to get my machine fixed, and even then they managed to lose my packing case.

What has all this got to do with the Model 1000? Just this: It's built by the same company that built my TRS-80s, and it'll be serviced by the same people who've fouled up practically every time I've had contact with them. Unless Radio Shack is going to make a serious effort to upgrade its standards of manufacture and service, all the marketing savvy in the world won't win back the market share it once possessed in the microcomputer world.

*Gary W. Shanafelt  
Abilene, TX*

## Something Different

After buying a TRS-80 Model 4 computer, I realized the machine had an intermittent rebooting problem, resulting in lost data. The problem continued even after servicing. I wrote to Radio Shack who, to my delight and surprise, replaced the computer.

I don't know how often this happens, but it's nice to know that this kind of concern is available from both Radio Shack and its dealers.

*Marvin Weinberg  
New York, NY*

*Send Correspondence to Input, c/o  
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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.

**Q:** Our religious order uses a Model III and a Model 4 with Scripsit and LeScript and a Daisy Wheel II printer. I've noticed a cross character in the lowercase section of the daisy wheel. I've tried, but can't come up with the right combination of keys to print this character. Could you help us? (*Rt. Rev. George E. Boynton, Seattle, WA*)

**A:** The cross's character code is 168. If you check your LeScript documentation, you'll find special key combinations to embed this character in your printouts. On the screen display, though, you'll see one of the TRS-80 graphics characters, not the cross.

Unfortunately, Scripsit doesn't support characters that you can't type in from the keyboard.

**Q:** Do you know where I can get daisy wheels for my Radio Shack DWP-210 printer that offer a wide variety of typefaces and that are compatible with SuperScripsit? (*Daniel E. Roth, Grass Valley, CA*)

**A:** Your problem is finding printwheels for the DWP-210, not compatibility with SuperScripsit. As yet, I haven't been able to locate a third-party source of printwheels for any Radio Shack daisy-wheel printers. I keep hoping that one of the printwheel manufacturers will get on the ball and tackle the Radio Shack market. As soon as I find one, I'll mention it in this column.

**Q:** I have a Model 4 with dual disk drives and a null modem with an RS-232 cable connected to a



Model 12. My problem is converting programs from the Model 12 over to disk storage on the Model 4.

So far I've been able to get the Model 4 into the communication mode using the COMM program, but I can't get the Model 12 to send or receive files. Can you help? (*Jonathan C. Hall, Greenfield, MA*)

**A:** First, can you get the computers to transmit anything to each other? If you can't, your problem might be the hardware connection between the machines or your communications software. COMM should give you everything you need for the Model 4. On the Model 12, make sure you're using the correct RS-232 port (that is, that you have the software sending the data to the RS-232 port connected to your Model 4).

Once you're sure of your hardware connections, concentrate on software. Set both computers to the same parameters. Set baud rate to 300 at first, word length to 7; and stop bits to 1. Parity can be even, odd, or none, just as long as both computers use the same parity, and have the same protocol enabled, usually XON/XOFF.

If some characters transmit correctly, but others don't, change your parity, word length, or stop bits. If the baud rate is wrong, you'll get garbage characters on both ends. Keep experi-

menting with the parameters until you get reliable communication between the two computers.

Now start increasing the baud rate of both computers (no reason to waste time at slower rates). However, be warned that 19,200 baud rarely works out.

Once you're satisfied with these operations, start on your programs. You must send Basic programs in ASCII format (saved as FILE NAME,A). Since ASCII expands program lines, you might get a direct statement error message when you try to reload the file, indicating that a line is too long. If so, you'll have to break down the offending line.

Open a storage file on the destination computer and send the ASCII file to it. Then exit the telecommunications program and load the file into Basic. It should load properly. If it does, all you have to do is modify the program for the new computer and get to work. If you want to send a machine-language program, things really get complicated. First, both computers must use the same central processing unit (CPU). Second, you have to change all the input and output routines to match the new computer's input and output locations. Third, you need special software to transmit and receive these programs, and you must set your RS-232 word size to 8 bits, no parity.

**Q:** I bought one of the newer versions of the Model 4, which has clustered arrow keys and a green CRT. In Model III mode, the screen has good brightness, but in Model 4 mode, the screen is dimmer by half, even with the brightness control on full.

When I wrote to Radio Shack in Fort Worth, they told me they were aware of the problem, but had no authorized solution. I've installed one of Langley-St. Clair's green CRTs in a friend's Model 4, and Langley's in-



## Check these features:

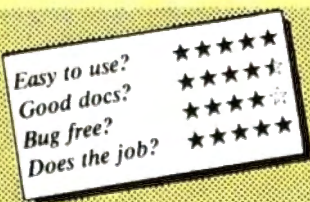
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- ✓ Detailed 48 page manual.
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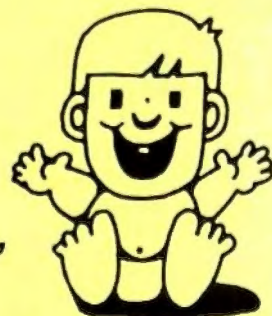
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structions mention that the internal brightness control is labeled VR303 and has a resistor labeled VR320 in series with it. They say soldering a 1 mega-ohm resistor in parallel with VR320 should correct the dimness. Do you think this solution will work on my CRT? Do you have any other suggestions? (*W.T., Fostoria, OH*)

**A.** First, check to see if the catalog number (not the serial number) on the bottom of your computer has the letter "A" after it. If the A is missing, you have an old version of the Model 4 with a new keyboard and Radio Shack does have a fix. It involves cutting an integrated circuit (IC) pin on the logic board and jumpering it to another IC. If an A follows your catalog number, this fix won't work.

Langley-St. Clair's solution modifies the contrast control in the Model 4's video board, and should work on your Model 4 if it has a VR320 resistor.

If you have a new Model 4, without a VR320 on the video board, I'm afraid you're out of luck.

The difference in brightness has to do with the area the monitor's electron beam must cover each second and how often it covers this area. The Model 4-mode screen is about 40 percent larger, decreasing the amount of time the beam stays on any one pixel. In fact, on my Lobo Max-80, the difference is such that I can't use certain DOSes in 80-column mode; it rolls continuously. When I stabilize it for 80-column, it's unstable in 64-column mode.

**Q.** A Japanese exchange student in my computer operations class must compose a letter on a word processor to fulfill the class requirements. Her family at home doesn't read or speak English.

Do you know of a patch to disk Scripsit 1.0 or 3.2 that lets you use the Japanese Kana alphabet in ROM? Failing that, does anyone know of a word processing program that does? We use Model III computers. (*James Patterson, Fremont High School, Fremont, MI*)

**A.** I don't know of any word processors that do what you want. Can anyone else help? Unfortunately,

finding a word processor that uses the Kata Kana character set is only half the battle; you also need a printer that can print the characters.

**Q.** Following a suggestion in your column, I wrote to Microhatch about the possibility of installing their BIGMEM Model I upgrade on my PMC 81. Microhatch said the upgrade should work if my PMC shared certain hardware features with the Model I. However, not being much of a hardware hacker, I'm still not sure it's feasible to install BIGMEM. Can you advise me? (*Dr. L. Piacenza, Republic of Transkei, Southern Africa*)

**A.** I've been unable to track down a PMC hardware manual, so I can't check out the schematics. Has anyone out there installed the Microhatch BIGMEM on a PMC computer?

**Q.** I have five Radio Shack Level I game cassettes that I'd like to convert to Level II for my Model III. Can you help me? (*Jean-Pierre Gugenheim, Bryn Mawr, PA*)

**A.** Radio Shack used to include a conversion cassette with the Level II upgrade. Unfortunately, these tapes are no longer available from Radio Shack's National Parts division, but you might be able to find one through a local Radio Shack store. Or, if a reader has a conversion tape he or she doesn't need, please let me know.

**Q.** I went to several Radio Shack stores and a Computer Center trying to find out if it's possible to dump Model III/4 graphics to a DMP-200 printer using control keys, or if I need a special program. At three Radio Shack stores, they didn't know what I was talking about. At another store, I was told I needed a special program.

At the Computer Center, they said I could dump graphics by pressing the down-arrow, asterisk, and shift keys on the Model III, or CTRL and the colon on the Model 4. I tried this, but it didn't work. I'm very confused. Can you help me? (*Kevin Stuebner, Reading, PA*)

**A.** Sorry, those Model III and 4 screen dump commands work only for ASCII characters. Printing graphics characters requires a printer that duplicates the Radio Shack character set from 32-256, or a printer capable of dot graphics and special software to send your graphics to the printer.

You won't find a printer that duplicates the Model III or 4 graphics characters. Finding driver software for dot-graphic printers is also a problem, since different printers use different encoding methods. Aggravating the problem are differences in printer resolution. Sending data in seven-pin chunks to a nine-pin printhead causes all kinds of problems.

The only way to get special video graphics printed out is to use a screen-dump program matched to your specific printer. Otherwise you must be content with the ASCII routines built in to the Model III and Model 4 DOSes.

**Q.** My Model III just went kaput. I can't get TRSDOS disks to boot up. The drives turn for a few seconds, then stop. Everything else seems OK. Please help me pinpoint the problem. (*Horace A. L'Heureux, Springhill, FL*)

**A.** It sounds as if your disk controller board is out. The best solution is to take your computer to Radio Shack and have them check out the board. The problem could be as simple as a bad capacitor or as complex as an entirely blown board.

**Q.** In the September 1984 issue (p. 18), you wrote that Tandy's double-density board isn't compatible with most double-density DOSes. Since some of us with the Tandy board wouldn't mind forsaking TRSDOS 2.8 DD for more widely used DOSes, do you know of a modification for the board to make it functionally similar to other doublers? (*Gary Munson, San Francisco, CA*)

**A.** The problem is that Radio Shack's board uses a different address scheme. To convert it would require rewiring the board to use standard port locations.

**Q.** I own a Model III and I have several questions. When I print labels on my Radio Shack Daisy Wheel

# LSI RELEASES NEW DATABASE MANAGER!

## “LITTLE BROTHER” NOW AVAILABLE FOR TRS-80® MODEL 4/4P AND PC-DOS® USERS

Little Brother is a new data management system from Logical Systems, Inc. Unlike many other data managers, ease of use comes first with Little Brother. Many other systems seem to concentrate on making everyone a programmer first, and a data manager second. Others require the entry of 'hu-mung-ous' command lines to achieve even the simplest of results. With Little Brother, you don't need to program ANYTHING or remember complicated command sequences to manage your data. Even for the most complex data management needs, Little Brother will produce results very quickly, often with just a few keystrokes. This is because EVERY function in Little Brother is menu driven and comes with complete on-line HELP information always at your fingertips.

LSI believes that you should do what you do best (i.e. manage your data), and leave the 'driving' to LSI. They've put all their design and programming expertise into Little Brother so that your data management needs can be satisfied quickly and 'painlessly.' Little Brother will handle almost any data base needs that you may have. Virtually the only limitation is your available disk space.

Of course, you define the layout of your data records. Little Brother will handle up to 65534 records, and each record can contain up to 1024 bytes. Little Brother supports up to 64 different data fields for each record, where each field may be from 1 to 254 bytes long. There are seven different types of data fields available.

These are:

- Alpha** Only the letters A-Z,(a-z) and < space> may be entered.
- Numeric** Only digits (0-9), a period and a minus sign may be entered.
- Right Justified** Same as numeric, except the value will be displayed and printed with 'leading spaces'.
- Literal** Any ASCII character can be entered.
- Dollar** Allows entry of 'dollar' values, with up to eight digits allowed to the left of the decimal point.
- Float** Allows 'floating point' values to be entered, with 8 digits to the left and right of the decimal point.
- Calculated** Allows calculations to be performed using any 'number' field (i.e. Right Justified, Numeric, Dollar or Float). The calculation is user defined, and may include addition, subtraction, multiplication and division. Calculations are precise up to sixteen significant digits.

Defining a data base with Little Brother is simple. Just enter a descriptive name for each field, the type of field that is (e.g. "D" for Dollar, "L" for Literal, etc.) and the length of



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the field. Little Brother even has provisions for defining a "Protected Field", so that the data for that field will not be displayed unless the proper "Password" is entered. Full editing capabilities are available when defining a data base.

After the layout of your data is defined, all you need to do is establish a "screen", and you are ready to begin entering data! Again, you are in total control of how your data will be entered and displayed on the screen. Up to 10 different screens may be used to display your data.

After you have entered information, you may view or edit any record at any time. It is always a quick and easy operation to "Find" information with Little Brother. You can even create an "Index" to your data by sorting the information in any field (except calculated fields), so that your data records can be accessed in either "ascending" or "descending" order. Using an Index will allow you to find any piece of information within a matter of seconds, even if there are tens of thousands of data records in your data base!

Once you have built a data base, you may wish to print the information. Simply define a print format, and Little Brother will print the

records according to your specified format. Up to 10 different print formats may be created. Little Brother can handle almost any kind of print format, so that you can print directory-type listings (complete with headers/footers, date, time, page numbering, totals and sub-totals if desired), mailing labels (in single or multiple across format) and even form letters. As with any data-related operation when using Little Brother, you select what records get printed (according to your specified criteria). Records can be printed in "sorted" order as well, which is great for organizing your report (especially useful for "zip code" zoning).

For 'automating' your processing needs, Little Brother can be run in an 'automatic' mode, without any operator intervention. Frequently used Little Brother procedures (such as selecting, sorting and printing records) can be saved for future use. Entire 'Job streams' may be produced, so that Little Brother operations may be intermixed with literally any DOS function that can be 'Batch Processed'.

Speaking of DOSes, Little Brother is available for either the TRS-80 Model 4/4P under TRSDOS 6.2, or the IBM PC/PC Compatibles under PC/MS-DOS 2.0 and

operates virtually the same on either machine! As a matter of fact, data files created on one machine can be directly ported and used on the other machine (Note: Separate copies of Little Brother are required and the movement of data files from one machine to another is the sole responsibility of the user).

Order L-50-510 for the Model 4/4P and L-86-510 for the IBM-PC.

\*NOTE: Hardware specifications for the Model 4 are: minimum two floppy disk drives and 128K of RAM (Hard disk owners need only have 64K of RAM and one floppy disk drive).

Hardware specifications for the IBM-PC are: two floppy disk drives (or one hard disk and one floppy) and 128K.

## Enhance TRSDOS 6.2 BASIC With BEEP

Are you tired of getting "Syntax Error" because you left out the space between "EDIT" and the line number? Remember all those handy editing features in LDOS 5.1 BASIC? (If you don't, keep going 'cause it gets better...) < Down Arrow > to list next program line and all that? Well, now you can have that convenience in TRSDOS 6 BASIC, along with better performance and additional programming aids.

BEEP (BASIC Enhancement and Extension Package) from Logical Systems adds several enhancements to TRSDOS 06.02.00 BASIC. BEEP is designed exclusively to run on the TRS-80 Model 4/4P under this version of TRSDOS 6 (BASIC 01.01.00).

BEEP provides single letter abbreviations for the following commands: AUTO, EDIT, DELETE and LIST. To use the abbreviation, simply enter the first letter of the appropriate command. Plus, when specifying a line number with these abbreviations, no space is required. Example: to edit line 20 of a program, just enter E20.

In addition, BEEP provides "immediate command keys". These are the "period", "comma" and "arrow" keys. These keys will act as "immediate commands" when pressed as the first entry on the BASIC command line.

The immediate functions are:

Key	Function
Comma	Edit the current line
Period	List the current line
Up Arrow	List the previous program line
Down Arrow	List the next program line
Left Arrow	List the first program line
Right Arrow	List the last program line

Other enhancements found in BEEP are "move" a program line to a different "place" in your program, "duplicate" a program line, and high speed program load and save. BEEP will load a 26K BASIC program in under six seconds, and save the same program in eight seconds. Compare this to unenhanced BASIC which takes twenty-five seconds to load the same program, and twenty-eight to save it.

Order L-35-209 at \$49.

## DSM4 — "THE" Disk Virtual Sort For Mod. 4/4P

DSM4 is THE versatile Disk Sort utility for the Model 4 user and programmer. DSM4 is a high speed, disk virtual sorting utility which eliminates the burden of sorting from your applications software development project. DSM4 will create and maintain index files for you. Since the sort is disk virtual, your only limitation is the amount of available disk space, not available memory.

DSM4 can sort almost any type of field in a random access file. The length of each field may be up to 253 bytes. The field types that DSM4 will handle include compressed integer,

single and double precision fields, in addition to ASCII data. Single and double precision numbers may be in the format used by Model 4 Microsoft BASIC, or may be in the 'C' floating point format (as implemented by Manx AZTEC 'C').

With DSM4, disk files can be up to 65,535 logical records, with an LRL of from 1 to 1024 bytes. You may specify up to 24 select fields to determine which records will be included in the sort. Any type of relation (e.g. 'equal to', 'less than or equal to', etc.) may be applied to your selection criteria. In addition, logical operators (AND/OR) may be used. For instance: "sort by zip all people with a last name of either Smith or Jones". Additional fields may also participate in the sort. Example: sort in zip order and alphabetically by name within the same zip.

Sorting may be in either ascending or descending order. DSM4 may be instructed to skip records that match a user specified "deleted record" value. Optionally, a list of these "deleted" records may be written to a separate file. You may also save a "template" of the sort/select specifications to disk to automate the sort. This allows you to set up a sort operation that is transparent to even the non-sophisticated user.

Perhaps the most impressive feature of DSM4 is the speed of the sort operation. Compare these statistics to the sorting method you are currently using: Select, sort and create an index of 1000 records. Selecting and sorting on a name, zip code and two double precision fields (a total of 41 characters in the sort key) will take less than thirty seconds from floppy disk, and under twenty on hard disk.

DSM4 operates under TRSDOS 6.2.0 (not included), and is intended for use with user-developed applications software. Please note that DSM4 creates an index file, as opposed to actually re-ordering the records in the data file (though once an index file is created, re-ordering the records is a simple matter if desired). Order L-35-205 at \$99.

## OVERDRIVE — For That "Extra Burst"!

How would you like to squeeze that last extra bit of speed out of your TRS-80 Model 4 or 4P? OVERDRIVE will help you get that extra burst of performance from your 128K Model 4/4P running under TRSDOS 6.2.

OverDrive will perform dynamic track buffering on up to two disk drives. Using a portion of your alternate memory, any time a sector of information is requested from a buffered drive, the entire track will be read into memory. When additional sectors from the same track are requested, the information is transferred from memory instead of accessing the disk drive, a much faster process.

In addition to drive buffering, all non-library system overlays (SYS1 through SYS5 and SYS9 through SYS12) will be placed in alternate memory for very fast access.

Besides the performance increase purely due to memory buffering, there is usually additional improvement because many fewer disk accesses will be required. Even on a hard drive system (with its normally fast access times) there will be noticeable improvement due to the fact that much less time will be spent moving the read/write heads in between file accesses.

Also, with OverDrive resident a (very!) minimum system disk may be used as your system drive to maximize your available disk space. All this uses just 32K of your 64K alternate memory, so you can still use memDISK or the system SPOOLer if desired.

Some typical speed increases:

FED II search of a 28K file		
Without OD	With OD	Increase
47 seconds	8 seconds	490%

Load a 24K BASIC program		
Without OD	With OD	Increase
23 seconds	15 seconds	53%

Very Technical Note: OverDrive's speed increase will be tremendous when running a program that currently just misses the system sector interleave pattern. If you didn't understand that, don't worry as you don't have to understand such things to use OverDrive. Order L-35-220 at \$99.

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Printer II, I don't get an out-of-paper signal. I print 1100-1400 labels at a time, and Tandy now sells labels in 1000-piece strips. Do you know how I can get this signal?

Second, when I turn on my printer, it always prints an ornate symbol, so text starts one print position farther to the right than I want. This happens only when I first power up. Can I correct this?

Third, do you know of a patch to let me use Alpha's joystick with Radio Shack's 13 Ghosts?

Finally, I've found that the chess game, Sargon II, takes a long time to answer with its move in higher skill levels. I've read that people pit these chess programs against each other in tournaments where they time responses, so I know it must be possible to speed up response time. Can you tell me how they do so and if it's feasible for a home player like me? (*Arthur Melanson, Audobon, NJ*)

**A** ■ The older model DWP II printers do have the out-of-paper signal. On page 12 of my owner's manual for that printer, the instructions indicate that pin 12 of the connector transfers that signal to your computer.

My DWP II printer was one of the first sold, way back in 1980. It has a metal rod that activates a pressure switch when the paper runs out. Get out your manual and examine the diagram of the interface signal pin assignments. If it indicates an out-of-paper line, then your printer does use that signal. All you need is the metal rod to attach to it.

However, you can buy labels from most computer supply companies in boxes of 5,000 and 10,000. You can also use scotch tape to join paper from the end of one box to the beginning of another.

I know exactly which symbol your printer prints on system power-up; I've seen it many times. The only way to escape it is to turn the printer on after you power-up the rest of the system. Other than that there's nothing you can do. The power-up sequence is in computer ROM and you can't easily change that.

Since 13 Ghosts is a machine-language program, patching it to use the Alpha joystick is a job best left to expert programmers. You have to fix the

keyboard scan routine to look at the port the joystick uses and react according to the values found there. Can anyone help?

The chess tournaments are open to any and all computer-based chess-playing software, so you get everything from small micros to giant time-sharing systems. Most tournament sponsors heavily modify the micro-computers, usually by replacing the CPU with one running two or three times as fast.

One Model I entry at a tournament three years ago used a Z80A running at 4 MHz, with most of the support chips replaced by much faster versions. Since the Models I and III normally operate at 1.7 MHz, this change alone reduced response time. It also operated with a detached keyboard, since the CPU was in a special refrigerated box for cooling purposes.

Usually, these modifications are well beyond the capabilities of most computer owners. If you're really serious, contact Holmes Engineering at 5175 Greenpine Drive, Murray, UT 84123. They make speed-up boards for the Models I and III.

**Q** ■ I've been a TRS-80 user since the earliest days, and now use a Model 4 and a Model 100, as well as two much larger minis. I own many of the major software packages from Radio Shack and a number from other suppliers. In short, I'm hardly a newcomer or a novice when it comes to microcomputing.

I've lost track of the number of times I've read statements and advertising copy in magazines like *80 Micro* to the effect that CP/M "opens the door to thousands of programs," many of which are in the public domain. But now that I've purchased CP/M 3.0, I've had trouble finding specific information about CP/M software.

How does one gain that oft-touted access to CP/M software? (*Thomas R. W. Longstaff, Waterville, ME*)

**A** ■ See my answer to Rafael Salgado in the March 1985 column (p. 18) for information about commercial and public-domain CP/M programs. Be aware, though, that Radio Shack's CP/M 3.0 uses a non-standard method of disk storage,

so it can't read CP/M 2.2 data disks in any format. I'm sure someone is working on a conversion utility, but until it becomes available, you'll have great difficulty transferring data between the two formats.

**Q** ■ Because my Model I caused interference with my amateur radio station, I bought a used Model III, after being told the III had RFI (radio frequency interference) suppression that would solve the problem. This, however, was far from the truth. The noise around 21 MHz is so bad that I can't hear any stations. The noise seems to be radiated into the antenna directly from the computer.

I have RFI filtering on the radio transceiver. When I remove the antenna from the transceiver, most of the noise abates.

When I opened up the computer, I saw no shield around the processor board. I thought all Model IIIs had this shield. Is this shield available? Will it reduce the RF noise? What other changes or modifications do you recommend to reduce interference? (*Howard Eddy, Hermosa Beach, CA*)

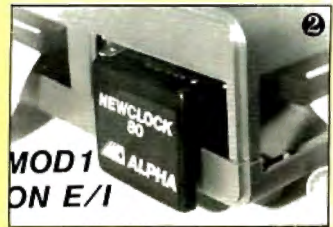
**A** ■ Someone sure goofed on your computer: All Model IIIs are supposed to have that RFI shield in position before they leave the production line. You can get the shield at any Radio Shack Computer Center, although you might be able to talk the technician into giving you one since the computer didn't have one when you bought it. The shield will reduce significantly the RFI you notice in the ham shack.

To decrease noise further, you'll have to get your soldering gun out and make sure that the grounding cables on the computer frame and shields are all solidly in place, with clean connections. If you really want to do a job on the computer, spray paint the interior of the Model III case with a metallic paint, then put bolts through the case and ground the bolts to the metal computer frame. When doing this, make sure you don't accidentally short out any connections or leads, and cover all exposed electrical joints with insulation. ■

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

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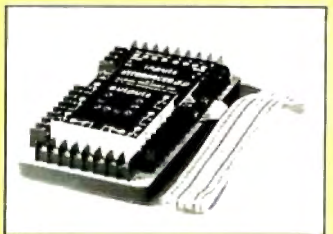
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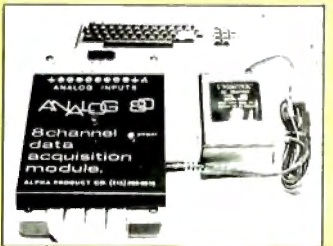
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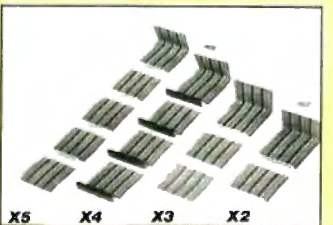
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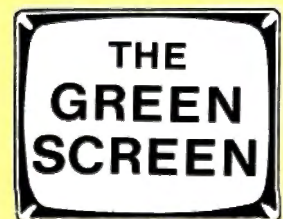
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# Things Are Tough All Over

## Tandyland

"The computer business will continue to be a zoo. Maybe it's just entering the zoo stage." So says John Roach, Tandy Corp.'s chief executive officer.

Roach, coming off another disappointing quarter at Tandy, told the Fort Worth *Star-Telegram* that he expects the market shakeout to end before next year, but he says fewer retailers will be around when it's all over.

Tandy's second-quarter profits in fiscal 1985 dropped 24 percent compared to 1984's second quarter. The drop marks Tandy's third consecutive quarter of earnings declines (see Fig. 1).

Although the profit drop was companywide the reasons for the computer division's profit problems aren't hard to find. Price-cutting and fierce competition have taken their toll on all computer manufacturers. And the cost of developing and introducing four new computers, the Tandy 200, 1000, 1200, and 6000, was bound to eat into profits.

Mark Manson, an analyst with Donaldson, Lufkin, and Jenrette Securities Corp., characterizes 1984 as painful for Tandy, but says their new computers should boost sales. Manson also thinks sales of noncomputer products, especially cellular phones, digital audio equipment, and stereo adapters for television sets, will improve Tandy's profit margin.

In spite of the dim figures, the Tandy 1000 made a strong debut in the marketplace. "For the first 40 days of its lifetime," Roach says, "the 1000 sold more than any other computer we've ever introduced." The sales are an encouraging

edited by Bradford N. Dixon

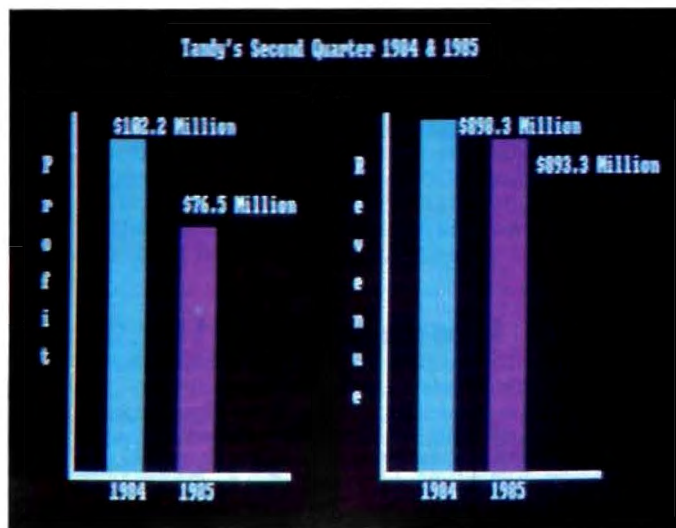


Figure 1. Tandy's quarterly profits.

start to the second half of Tandy's fiscal year. "It's certainly nice to be in a position where we have to worry about making enough [Model 1000s] to satisfy demand," mused Roach.

The microcomputer shakeout of 1984 has spilled over to become the microcomputer shakeout of 1985, but at least who will survive is becoming clearer.

Market watchers expect IBM to keep its spot at the top of the micro heap, and Apple appears likely to maintain its second-place position. After that, the picture gets murky, but it looks as if Compaq, Tandy, and Commodore will hang in there.

Tandy's large distribution chain is a real advantage in the battle for survival. Other companies lose out when they have to develop and maintain sales channels, while Tandy can rely on its well-established retail network.

As for the future, Tandy can expect to face short-term problems that may limit growth, including the overall market slump and declining third-party support for Tandy's older ma-

chines. But, in the long run, the company's size guarantees it a major role in the microcomputer market.

Some analysts suggest that Tandy's profit woes might prompt the company to spin off the computer division as a separate entity, allowing Radio Shack to reemphasize its low-priced electronics business.

However, this seems unlikely. Garland Asher, vice-president in charge of finance, tells *80 Micro* Tandy has never discussed starting a new company to handle computers.

Intensive marketing seems to be the key to Tandy's 1985 game plan. Late in 1984, Radio Shack held a month-long sale on the Tandy 1200, knocking \$1,000 off the \$2,999 sticker price.

The trend continued into 1985, when Tandy launched what may be the first two-for-one computer sale. Throughout January, you could buy a Tandy 1200 or 2000 for \$2,500 and get an 8K Model 100 free. In the past, when Radio Shack was ready to kill a product, it dropped the price drastically and held special sales, so this gimmick might presage the Model 100's demise.

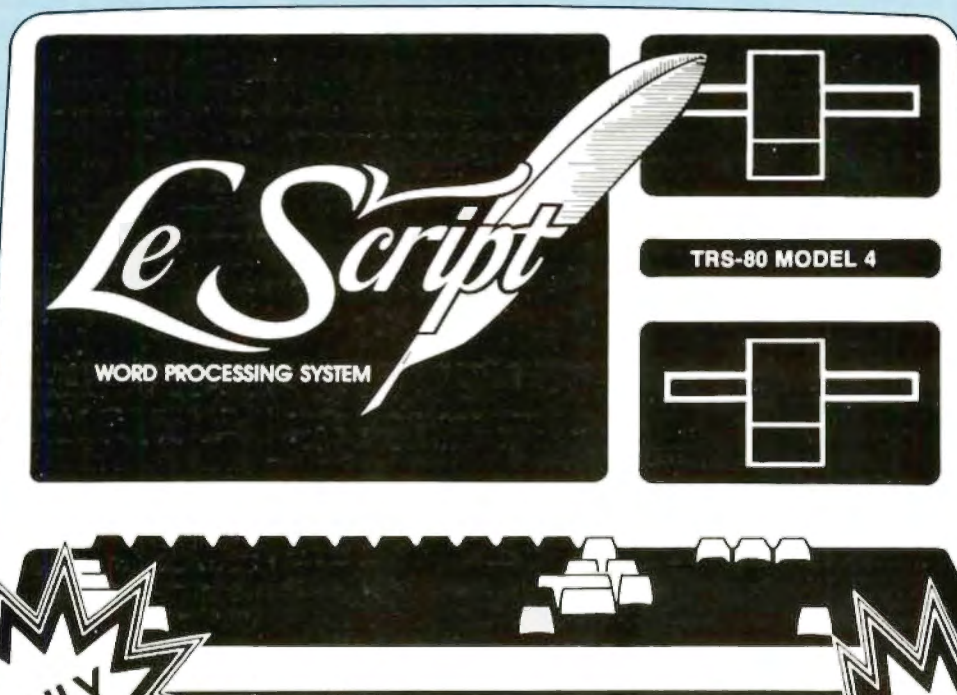
## MicroTrends

The U.S. Department of Commerce has decided to lift export controls on what it considers to be less sophisticated personal computers like the Commodore 64, Apple IIe, and Radio Shack's Model 100.

However, the Commerce Department will continue to regulate IBM's PC/AT and Apple's Macintosh to



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keep them from reaching Soviet-bloc countries or China.

The relaxed export restrictions come at a good time for Tandy, now that European Radio Shack stores have merged with outlets that sell Great Britain's Applied Computer Techniques' Apricot computers.

For the industry as a whole, the new export rules could open up a multibillion-dollar market for American computers. But even as the government eased hardware restrictions, it tightened export controls on some software. The Commerce Department must now review programs involving networking, artificial intelligence, computer-aided design and manufacturing, and high-level languages such as ADA before their release for overseas sales.

**Where does the average computer buyer get his microcomputer?** That's the question Strategic Inc. asked in a recent survey. Of the owners polled, the vast majority, 56 percent, bought their units from retail stores, while 10 percent bought them from mass merchandisers, and 8 percent bought wholesale (see Fig. 2).

Of the remaining sales, 8 percent were bought through original-equipment manufacturers, 4 percent through the mail, 3 percent via direct sales, and 11 percent through other outlets.

**If you're writing and selling programs from your home, you might be breaking the law.** It seems many communities have established zoning laws to keep doctors and dentists from opening offices in residential neighborhoods. If local authorities decide to get tough, they can apply these laws to home programmers.

That's what happened to Leah O'Connor, a Chicago woman who writes and sells games from her home. The city ordered her to stop operating her business or face a \$100-a-day fine. When the zoning board learned O'Connor had no employees and was violating no other zoning laws, it dropped the threat of a fine.

Chicago's 28-year-old zoning ordinance was written when home microcomputers were still in the realm of science fiction. According to current estimates, home-based computer businesses number in the millions nationwide. Boston and San Francisco have updated their zoning laws to reflect the

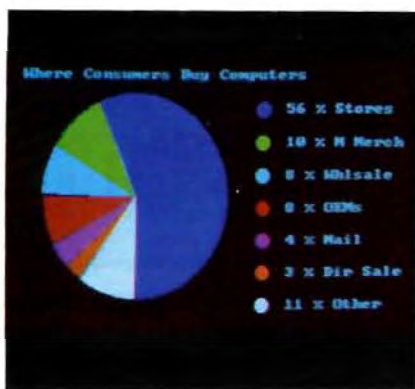


Figure 2. Categories of computer sellers ranked by number of sales.

changing times, but in many communities, the law simply hasn't caught up with reality.

## Update

**Linda Miller of Radio Shack's Marketing Information department** writes to correct an error in the December 1984 Pulse Train story about Tandy's PC Maker program (p. 21). It seems PC Maker does format double-density, double-sided disks.

Miller says the program also works with the Tandy 1000 and 1200 to assure transportability of data between all Tandy MS-DOS computers, and stresses that PC Maker is free to registered Tandy 2000 owners.

**And there's more in the mailbag from Fort Worth.** Radio Shack's director of market planning, Ed Juge, points out that the graph in February's column (p. 22) illustrates Tandy's warehouse shipments in dollars, not units.

Tandy doesn't release information on the actual number of units shipped or sold, so you have to figure it out roughly, given the dollar amounts of warehouse shipments and knowing the cost of each computer. Juge tells us, "Unit sales were up nicely, but we have to sell a lot more just to stay up with last year."

## Hot Items

**While some software publishers are turning to exotic copy protection methods to foil pirates,** MicroPro International is going in the opposite direction.

Effective Feb. 1, 1985, MicroPro dropped copy protection from its new

word processing programs WordStar 2000 and WordStar 2000 Plus.

The reason? Protection made it harder to install the programs. "We are responding to the customers' need for software that is easy to use," said H. Glen Haney, MicroPro's chief executive officer. But Haney stressed the move "is not a passive invitation to software pirates." MicroPro continues to protect its products; as Haney puts it, "we are pursuing copyright enforcement through other channels."

**Software licensing agreements tend to draw flak on the issue of software piracy.** According to Fred Volking, director of marketing for Bellsoft Inc. of Bellevue, WA, "Most users don't set out to become software pirates, but the software industry virtually forces them into lives of crime."

Volking observes that most software license agreements require small businesses to buy multiple copies of software at full price, leading many to make illegal copies. Bellsoft is trying a different approach by offering a multiple license agreement: You can make copies for up to 10 computers, saving money if you feel bound by agreements and saving guilt if you don't.

**A more radical scheme to protect software** comes from Mother Jones' Son's Software Corp. (MJSS). The company puts a "soulcatcher clause" at the end of its licensing agreement, which otherwise sounds pretty traditional.

As they put it, the license doesn't have teeth, it has fangs: "Violate this agreement and our attorneys will see to it that life on this earth, as you know it, is completely ruined. Also, you agree that 30 days after you violate this agreement, ownership of your eternal soul automatically passes to us, and we have the right to negotiate the sale of said soul to the first smoking blood-drenched apparition with fangs (SBDAWF) that meets our price. The SBDAWF may collect your soul at any time of his/her choosing."

For those not inclined to take this seriously, MJSS appeals to common sense: "Given the remotest chance that some supernatural entity could actually enforce the soulcatcher clause, you'd be a real bozo to take any chances." ■

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Circle 175 on Reader Service card.

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- 40tk DS, Half-High, TEAC FD55-B.....187
- 80tk DS, Half-High, TEAC FD55-F.....237
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## Student Special

A student in my Z80 Assembly-language course discovered this easy alternative to the traditional PEEK method of breaking down a VARPTR address into 2 bytes:

```
1000 DEFINT X,Y
1010 X = VARPTR(Y) 'ADDRESS OF Y
1020 X1 = X AND 255 'LOW BYTE
1030 X2 = S(X AND -256)/25 'HIGH
      BYTE
1040 POKE 32766,X1
1050 POKE 32767,X2
```

POKE the bytes into RAM so that a USR statement can call them.

*Phyllis Lefton  
Manhattanville College  
Purchase, NY 10577*

## Calling ROM

I stumbled on a ROM call that checks the condition of the printer from the printer status port (address 0F8H), saving you programming time as well as cutting down your program's byte count. The call, located at hex address 44BH (1099 decimal), is:

```
CALL 44BH      ;GET PRINTER
                STATUS
JR    Z,ONLINE ;GO IF PRINTER
                READY
```

(enter Not Ready routine here)

After the call, the computer sets the Z flag if the printer is ready. NZ tells you that the printer isn't ready; the computer then changes the contents of the A register.

*Dan Gookin  
15202 Willow Road  
Lakeside, CA 92020*

## Thrifty Idea

Are any of you new Model 4P owners outraged over the price of Radio Shack's parallel printer cable (\$39)? Here's an alternative that saves you about \$20: Buy a Model 100 printer cable (Radio Shack catalog number



26-1409, \$14.95), and a 34-position card-edge connector (Radio Shack catalog number 276-1564, \$4.95).

Install the card-edge connector to the ribbon cable with the blue-striped conductor at position 1, and plug the connector into the Model 4P with the blue stripe toward the outside of the case. I left the Model 100 header connector in place on my cable, and can now use the one cable for both computers.

*Michael Shrout  
200 N. 35th Ave., #98  
Greeley, CO 80631*

## Requests for Help

I'd like to correspond with people interested in exchanging programs and programming ideas. I'm 16 years old and use a Model III with two disk drives.

*Ellen Lackey  
128 Newcastle  
Jackson, MS 39208*

## Reader Assistance

After ordering the tape-based version of Simutex's ZBasic compiler, I was informed that they've discontinued the disk. I'd like to hear from anyone interested in selling their version 2.2 or anyone who knows where I might be able to get it. Also, I'm in-

terested in obtaining the discontinued Active printer interface cable (Radio Shack catalog number 26-1411).

*Paul Brunelle  
115 Delaronde Road.  
Saskatoon, Saskatchewan S7J 3W2  
Canada*

My version of Postman, the mass-mailing system for the Model III, is missing the Post-Rite portion that lets you write form letters and incorporate them with the addresses in the main program. Can anyone lead me to a copy of this portion of the program?

*Robert W. Smyka  
12407 25 Mile Road  
Utica, MI 48087*

I have a Model III with two disk drives (and access to a Model 4) and am looking for a program that will help local high school coaches to keep track of team statistics. I'd also like to be able to save this information to disk.

*Gary Sell  
Box 262  
Goodland, IN 47948*

## Error Trap

The note in Reader Exchange (February 1985, p. 30) concerning J.L. Kissel's "Tape Transfer" is incorrect. To make the correction to Kissel's listing, change the code at sector 00, offset C0, from 53 to 5E.

*Bob Hardy  
71014 Austin  
Fort Hood, TX 76544*

In Table 3 of "Tandy Rides Again" (April 1985, p. 50), we misidentified one manufacturer. Educational Micro Systems Inc., not Educational Micro-ware Inc., produces Convert 3 to 2000.—Eds.

On p. 94 of our April 1985 issue, we inadvertently indicated that the programs in Basic Takes were available

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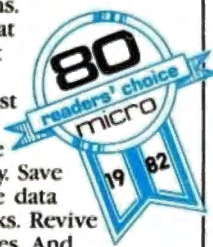
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on Load 80. The programs do not appear on the loader.—Eds.

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Fort McMurray BBS  
Fort McMurray, Alberta  
403-791-9367  
Sysop: Peter Steeper

Austin Headquarters BBS  
Austin, TX  
512-469-5936  
Sysop: Andre S. Chen

Fast80 (Master System)  
Surrey, BC  
604-594-7398  
Sysop: Mel Patrick

## DEBUG

Several readers are having problems with the DIM statement in FastBas ("Running Like the Wind," January 1985, p. 42). The usual solution is to remove the statement lines that precede the line with the DIM statement. As stated in the article, FastBas accepts only one DIM statement. You must put the DIM statement in the first line of the program, preceded only by a Clear statement. You even have to remove REM statements to insure proper compiling.

*Thomas L. Quindry  
TLQ Enterprises  
6237 Windward Drive  
Burke, VA 22015*

Barry LaLone's Tidbit #17 (January 1984, p. 157) implies that it's possible to get 96 tracks out of a

MULTIDOS disk with a 40-track drive. MULTIDOS users should not, under any circumstances, use this procedure. The method described in Tidbit #17 is based on false assumptions and is dangerous to your good disks; it's not possible to produce a disk using the back-up function and an improper track count. If it were possible, MULTIDOS would surely be the best selling DOS on the market. MULTIDOS, however, will produce 96 tracks during regular back-up only if you have 80-track drives and hardware that formats out to 96 tracks.

*David Welsh  
President, AlphaBit  
Communications, Inc.  
13349 Michigan Ave.  
Dearborn, MI 48126*

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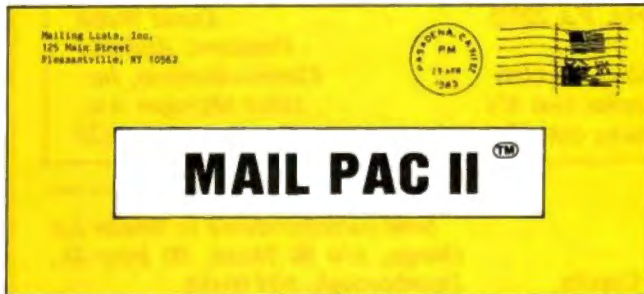


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by Bradford N. Dixon

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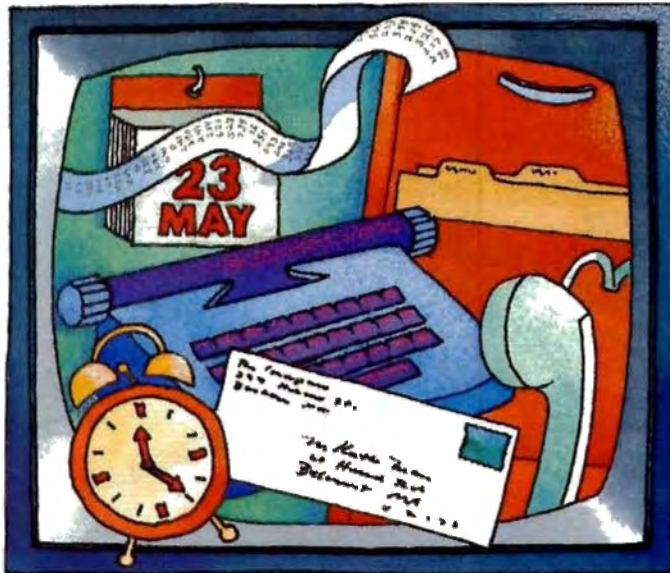
**DeskMate** runs on the Tandy 1000 and requires one disk drive. Tandy/Radio Shack, One Tandy Center, Fort Worth, TX 76102. Free with Tandy 1000 purchase.

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

One of the things that impresses me about the Model 1000, in addition to the fact that I got an IBM PC-compatible for \$1,199, is the bundled software Tandy includes with the hardware. I've never seen a more complete set of software accompany a new computer, certainly not from the Tandy Towers. DeskMate, Tandy's appropriately named package, provides six applications (a word processor, a spreadsheet, a filer, a daily calendar, telecommunications, and electronic mail) that, taken in toto, provide an impressive software starter system. And all of DeskMate's programs "communicate" with one another, making the package truly integrated.

Although 1000 owners may eventually upgrade to more advanced programs (and in some cases you really have to), DeskMate will serve new users quite well. One of the modules, the telecommunications program, is good enough to serve users for the life of their 1000. Others, like the calendar and mail packages, either have so little utility or are so amateurish that you'll never use them or you'll replace them with more sophisticated software at some point.

edited by Ryan Davis-Wright



## The Main Menu

When you boot up DeskMate after answering the MS-DOS date and time prompts, the screen displays a calendar for the current month with the date highlighted, a box labeled Events for Today, and the integrated programs (with a directory of their files) arranged in a row underneath (see the Photo).

The software comes up in black and white on Tandy's CM-2 color monitor, but you can get a color menu by pressing the control key along with either the F1, F2, or F3 keys.

DeskMate highlights the text program on boot-up, but you can pick any of the five applications by repositioning the cursor with the arrow keys.

DeskMate's main menu functions appear in a bar at the bottom most portion of the screen, along with the F1-F10 function keys assigned to them. The functions let you change the system date and time, rename a

file, display the free space on the current disk, engage or disengage the alarm function, set up host communications parameters, assign DeskMate a password, select a series of data files for deletion, duplicate a data file, delete a single data file, and swap drives.

You display DeskMate's subfunctions menu by pressing the F11 key; this lets you access the current program's help menu, display DeskMate's calculator, see the alarm event information, turn the alarm on and off, display a telephone book, set printer parameters, and change the system date and time. You invoke the subfunctions by pressing the alternate and F1-F7 keys (see Table 1).

## Text

You couldn't really consider Text a full-function word processor. In fact, it's closer to the Model 100/200's Text program than to a commercial word processor. Like these, you're always in the insert mode; when you enter characters on an existing line, the current text shifts to the right without overwriting any of the old material.

Model I/III/4 users may find Text a bit frustrating compared to Scripsit because it lacks some of the latter's special functions, like centering and justifying. But Text was never intended to be anything more than a simple text entry and printing program. Given these limitations, it performs the basic word-processing operations well.

Text uses the 1000's function keys to good advantage. It's easy to manip-

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ulate your work after you enter it. Finding strings of words in your file is as simple as pressing the search key (F1) and entering the string you want to find. If you need to substitute one string with another, pressing the F2 key prompts you for the string you want to find, then asks for the replacement string. Unfortunately, Text asks if you want to replace the string at every occurrence; I would have preferred automatic replacement, with the option of being queried.

Other Text features include a Format command to preview your document on-screen before you print it out and a merge function that accepts text from one file and adds it on to the current file. You can also move blocks of text around within a file.

Of course, Text lets you print out files in whatever format you want. Press the alternate and the F6 keys, and a menu of print options lets you define the printout's format. You can print an entire document or only that portion displayed on the screen.

**Worksheet**

Worksheet is a 99- by 99-cell spreadsheet that supplies all the basic spreadsheet functions necessary to set up accounting forms, budget sheets, or perform what-if calculations on numeric data. If you need help, the alternate and F1 keys bring up instructions on how to use it.

As in Text, you can find strings in the workspace or specify cells you

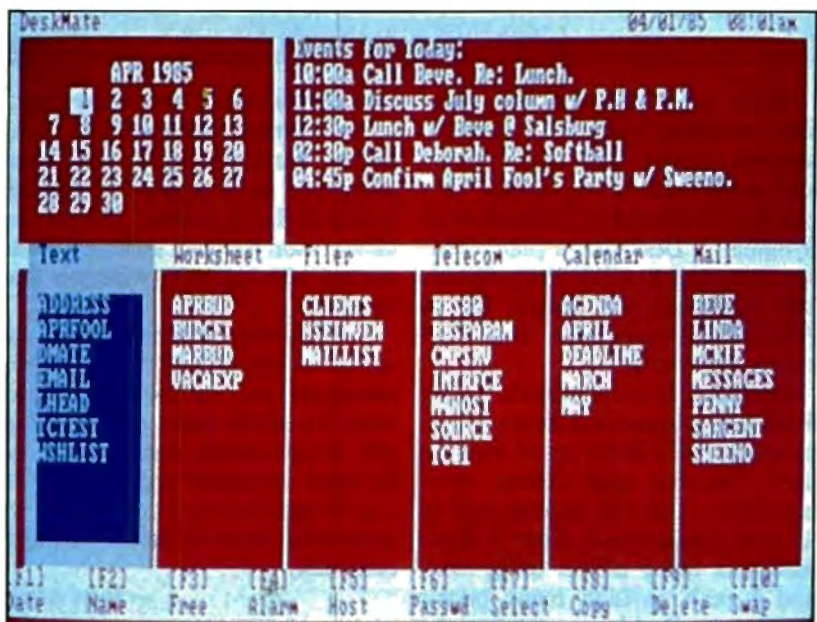


Photo. DeskMate's main screen.

want to edit. The worksheet calculates data according to the formulas you enter and prints the information using the same print commands Text uses.

One of Worksheet's nice features is that it lets you merge a document written in Text with information in the spreadsheet. Also, if one of your previous spreadsheets has information needed for the current job, you can merge one spreadsheet file with the one you're working on. Worksheet displays all the functions needed to manipulate data at the bottom of the screen, a nice feature.

Because Worksheet works like most commercial spreadsheets, you'll have little problem making the transition to full-fledged spreadsheets when you've outgrown Worksheet's capabilities.

**Filer**

DeskMate's Filer is a free-form data base manager that supports records with as many as 21 fields of up to 255 characters each. You are limited only by your imagination in setting up the forms for the data base, so the variety of applications can be very flexible.

You can search for and sort data by any field in the record. The F1 key invokes the Find function to search through the data base, and it supports a wildcard function.

You start the search by entering Boolean operators to select information that is equal to, greater than, or less than data in the search field. The F3 key displays all the records that

match your find criteria. You can add or delete information from a record, or eliminate entire fields. You print out the records that match your search criteria by pressing the F4 key.

As with Text and Worksheet, Filer has a merge function that takes information from any other DeskMate file and merges it with Filer's current one.

Filer offers a unique data base application that automatically dials any phone number you highlight in a record by pressing the F2 key. While you can't use this option to call CompuServe or an electronic bulletin board, you can use it to make phone calls (you have to set the telecommunications program for voice dialing before you call from Filer, however).

**Telecom**

Telecom, the telecommunications module, is the most advanced of all DeskMate's applications. When accessed from the main menu, Telecom displays a menu of 10 parameters. It supports autodial modems and you can specify the number of times the modem redials a busy number. You select the baud rate from a range of 110-9,600 bits per second, as well as the parameters for word length, number of stop bits, parity, ASCII character and line feed filter options, and XON/XOFF file transfer protocol control. All Telecom lacks is an option to invoke XMODEM transfers from bulletin boards systems.

If you frequently access data bases

**The Star Ratings**

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

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

The stars mean:

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

The ratings terms translate as follows:

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

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

*Bugs:* Did the reviewer encounter any bugs while using the product?

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

## COUNTERPOINT

While some reviewers will question DeskMate's role as a software sampler, others will say, "Don't look a gift horse in the mouth." It's true that compared to Framework or Symphony, DeskMate's pretty bad; but compared to other free software, like Exploring the Apple IIc or PCjr's ROM-based Meet Your Keyboard, it's terrific.

DeskMate is worst when it forgets its modest purpose and assumes it's a program you'll leave on 24 hours a day. Calendar and Alarm work beautifully, but will anyone type in all that appointment data? I don't anticipate many offices using Mail, and I can't envision many people booting up DeskMate, entering the host mode, then leaving on a two-week trip and sending back messages via their Model 100.

But, as a group of genuinely integrated, albeit limited, programs with a consistent user interface, DeskMate is remarkable. Not only will novice 1000 buyers learn what a spreadsheet is and how to set up a data base, they'll learn advanced applications like how to splice spreadsheet rows into a business letter. And once they've bought better programs, they'll still use DeskMate for jaunts outside their specialties.

—Eric Grevstad

DeskMate tries to address the beginner's hoary question, "Now that I have a computer, what do I do with it?" But for experienced users, DeskMate just doesn't offer needed functions.

I bought a 1000 as a home computer. I don't turn it on before I go to work, so the calendar and alarm functions have limited utility for me.

I don't have a modem, so the electronic mail, host, and phone functions aren't particularly useful. Creating a name and address data base with Filer doesn't interest me at all. A desk-bound black book can't supplant the portability of the real thing. And I use a calculator and paper to handle my household finances, so I don't need Worksheet.

That leaves Text. I spent about 10 minutes with it and went looking for a real word processor. It just doesn't

have the features I need for writing.

My primary purpose for Text, editing Basic programs, isn't even mentioned in DeskMate's literature. Tandy probably omitted this for the same reason it didn't include a Basic manual with the 1000, whatever that may be.

I realize that DeskMate wasn't designed for the likes of me: an experienced user with narrow needs. DeskMate is a simple package designed to give inexperienced users a taste of different computer applications. As for curmudgeons like myself, we know what we want before we buy a computer.

—John Mello

The Tandy 1000 is unabashedly promoted as an IBM PC twin. But five minutes into DeskMate had me thinking not of Big Blue, but of the Model 100.

I liked the simple documentation: There's a quick-reference brochure for those who dive into the lake without testing the water, and a simple manual for the more reflective types.

I'm most familiar with the Model 100's text program and while DeskMate is similar, it is also easier to use and more versatile. The most interesting application turns the bottom of the screen into a 21-function calculator, while retaining the text above.

Worksheet is serviceable, and Filer provides a way to store, retrieve, sort, and otherwise juggle information. This may well be DeskMate's strongest point.

An alarm mode that reminds me I'm late for a meeting? A calendar to plan my month? A phone list with a maximum of 78 entries? These are interesting, but not very useful.

DeskMate requires an 80-column monitor, so it's useless without a high-resolution monochrome or color display. If you had planned to avoid the cost of a monitor and use your TV set with your Tandy 1000, you won't be able to escape the 40-character mode. In that case, DeskMate will be useless, even though it's included as part of the 1000 package.

—Richard Ramella

and bulletin boards, you can create auto log-on files that automatically call any entry in your log with just a few keystrokes. You can also preset parameters for favorite bulletin boards and save them to the log-on file. To run Telecom with those parameters directly from the main menu, position the cursor over the desired Telecom log file and press the enter key.

You enter the terminal mode by pressing the F5 key, which displays a blank screen and a new choice of functions for the 1000's function keys. Telecom provides buffer controls and keys for uploading and saving buffer contents, and pressing the alternate and F1 keys list helpful hints. If you find your parameter settings incorrect after you connect with a remote host, hit the F12 key to return to the Telecom menu, change the parameters, then return to the terminal mode to continue telecommunications.

Telecom is comparable to many commercial terminal programs on the market. It's easy to learn and use, and unlike some of DeskMate's other integrated parts, you'll probably never have to replace it with a more powerful program.

### Calendar

The Calendar module is an event scheduler intended as your electronic appointment book. You can record future events with this date and the time. Calendar provides a convenient week-at-a-glance format so you'll know exactly what's going on and when.

As in other applications, the F1 key initiates a search through your calendar for events of particular interest. However, if you want to see what's on tap for a specific date, use the date key (F2) and DeskMate displays information for that date on the screen.

DeskMate's alarm function, which you set from the program's main menu, shows important appointments in the Events for Today window in DeskMate's opening display.

The Calendar program also lets you merge files from other modules. You can select portions of a calendar file and save them as a document file, then merge them into Text or Worksheet with a single keystroke.

I found the best use of this program is its integration with the alarm function. It's easy to lose track of time when you spend hours in front of the

computer. If I set the alarm before working in Text or Worksheet, DeskMate signals me at a preset hour.

**Mail**

Mail acts as a computer-based notepad where people can write messages addressed to a specific person. You could describe it as a local bulletin board without the board.

To leave a message, you hit the F2 key, answer the From prompt and write a brief description of the message. Then enter the name of the recipient and the program goes into the text mode. You can enter as much text as you want, with no restrictions on length. To send the message (i.e., file it for the recipient), you press the F12 key.

You can search through the Mail file by message author, date, or description. You get a display of messages by pressing the F3 key; alternatively, you can print out a message by pressing the F4 key.

Mail has great potential for having some fun, especially if many people use your particular Tandy 1000. On a more practical basis, Mail would be useful as a message center for people in and out of contact with their office who need to receive their messages.

**The Documentation**

One of the pleasant surprises I found with DeskMate is its documentation. It comes with three booklets to help you get the most out of the software. *The DeskMate Reference Manual* is an in-depth booklet that contains all the information you'll need to use the program. It is separated into chapters by program module, so you don't have to rifle through its 82 pages to find how to get back to the main menu from Telecom's terminal mode.

DeskMate also comes with a tutorial guide that holds your hand from the time you open the Tandy 1000 box and hook it up until you're acquainted with all its features. Also, Tandy includes a quick-reference guide for times when you don't need a full explanation. Taken together, DeskMate's documentation is the best I've seen for any Tandy program.

**Conclusion**

It's easy to see why Tandy is so high on their newest computer and its bundled software. DeskMate's a product that hits the mark in every ap-

plication a new user might need. And it's hard to equal as a "comes-with" package—it makes the Tandy 1000 a ready-to-go MS-DOS machine with a variety of applications. ■

**Late-Breaking News**

As this review went to print, Tandy announced an upgraded version of DeskMate, version 1.1. According to Tandy, the new DeskMate provides the following enhancements:

- The alarm beeps eight times instead of three.
- The printer driver form-feeds before printing the next page.
- The Swap function lets you store DeskMate data on drive B.
- The main menu offers improved color selection.
- The spreadsheet stores color definitions for file columns.
- The spreadsheet rounds numbers instead of truncating them.
- You can reset Find criteria without returning to a data base's first record.
- The filer module provides an increase in capacity to 550 records for the 128K Tandy 1000.
- The telecommunications program includes a delay function for slow modems.
- The calendar module offers an expanded buffer that lets you store up to 100 events.
- The calendar's intermittent file input/output errors are corrected.
- You can merge files on two different drives.
- You can overwrite host files.
- The Host mode disconnects a phone line if a user gives an incorrect password three times.
- The printer setup lets you use arrows.
- The Phone feature gives you faster dialing.

You can order DeskMate 1.1 from your local Radio Shack Computer Center; it's free to registered Model 1000 owners. The enhanced DeskMate includes no instructions, but a text file on the disk outlines new procedures.

**A Utilities Grab-Bag For TRSDOS 6.X**  
by Hardin Brothers

★★★★★

LS-Utility Disk runs on the Model 4/4P (64K) and requires TRSDOS 6.X. Logical Systems Inc., 8970 N. 55th Street, P.O. Box 23956, Milwaukee, WI, 53223, 414-355-5454. \$49.

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

I think TRSDOS 6.2 is the best operating system ever developed for 8-bit computers (and maybe for any personal computer). But like any DOS, it may lack the utilities necessary to meet all your computing and programming needs. Logical Systems Inc., the creators of TRSDOS 6.X, fills the utilities gap with their reasonably priced package of eight programs called the LS-Utility Disk.

The utilities include a calculator program, an expanded keystroke multiplier, an input/output device filter, a printer driver, a disk sector analyzer, a program that reads 35- and 40-track disks on an 80-track system, a character filter, and an enhanced job control language file. The programs aren't related to each other in any way, but rather seem to be a collection of utilities LSI decided not to sell separately.

**CALC/FLT**

You install CALC/FLT, a keyboard filter, with the TRSDOS Set and Filter commands. It's a simple calculator program you invoke whenever you press clear/shift-C. It clears (and saves) the top line of the screen, displays a prompt, and waits for a command. This calculator can convert values from decimal to binary or hexadecimal (hex), from binary to hex (but not to decimal), and from hex to binary or decimal. It can also add and subtract hex numbers.

The calculator's range is limited to 8 bits for binary numbers, four digits for hex numbers, and the integer range (-32768-32767 and 0-65535) for decimal numbers. Once you invoke the calculator, you can perform as many base conversions and calculations as you want, then press clear/shift-C to return to your program. CALC/FLT restores the top screen line and the cursor to their former positions.

**KSMPLUS/FLT**

You can use TRSDOS 6.X's key-stroke multiplier (KSM) program for program development, but it has several limitations. KSMPLUS overcomes some of them.

Three different versions of KSMPLUS are available. The simplest is KSMPLUS1, which adds four new special-function keys. You can also define the F1-F3 keys (both shifted and unshifted) as KSM keys, for a total of 32 predefined KSM key-strokes.

With KSMPLUS1, pressing clear/shift-X displays, but doesn't execute, the last DOS command you entered. You can then edit the command. This offers a distinct advantage over TRSDOS 6.X's control-R function, which automatically reruns the last DOS command without giving you the opportunity to change it.

Everyone will find the other three special-function keys useful: clear/shift-T makes KSMPLUS send a Top-of-Form command (CHR\$(12)) to the printer, clear/shift-Z generates the current system date in MM/DD/YY format, and clear/shift-S generates the current system time in HH:MM:SS format.

KSMPLUS2 includes all the KSMPLUS1 features plus one other: you can redefine any KSM key while KSMPLUS is active. Pressing clear/shift-E puts you in a key-edit mode. You can change or add to the definition of any KSMPLUS key (including F1-F3). The only limitation is that you define enough free memory space when you enter KSMPLUS to store the new definitions.

KSMPLUS3 is identical to KSMPLUS2, except that after you define or redefine a KSM key, KSMPLUS3 restores the screen to its condition before you started editing.

**PRCODES/FLT**

If your printer provides true backspacing, PRCODES/FLT adds three functions to the TRSDOS \*PR driver. It prints all zero characters as slashed zeros, and it supports boldface printing and underlining.

You install PRCODES/FLT with up to four optional parameters. The first defines your printer's backspace character. PRCODES/FLT supports printers that require a single backspace character and those that require

a 2-byte command sequence to backspace (for example, ESC-8).

Once installed, you can use a single nonprinting character to toggle bold printing and underlining on and off. PRCODES/FLT creates boldface printing by forcing the printer to backspace and reprint each bold character. One parameter lets you specify how many times you want to print over each character.

Unless otherwise instructed, PRCODES/FLT creates underlining by backspacing and printing an underline character.

If your printer already has slashed zeros, bold-strike, and underlining capability, you may not find this filter useful. On the other hand, if it doesn't have those features, PRCODES/FLT may be a better (and cheaper) alternative to buying a new printer. However, PRCODES/FLT only operates on characters sent through the TRSDOS printer driver. Since many word processors handle printer output directly without using the DOS driver, PRCODES may not operate successfully with your word processing program.

**READ40/CMD**

If you use 5¼-inch, 80-track drives with your Model 4, you know the frustration of not being able to read 40-track disks on those drives. READ40/CMD creates a special driver in high memory that allows an 80-track drive to read a 40- or 35-track disk. You could use it to copy the files on a 40-track disk to another drive, then disable it to return to normal 80-track service.

The driver that READ40/CMD creates is capable only of reading information from a disk; you can't use it to write to that disk or with the TRSDOS Repair command. However, you can use it to read TRSDOS 1.3 disks with the Convert utility included in TRSDOS 6.X. In addition, you can invoke DOS functions like the Directory, Copy, and Back-up commands using the READ40 drive as a source.

Since I don't have an 80-track drive, I was unable to test READ40/CMD. However, one of its functions is to display an informative drive table of all eight possible logical drives. READ40 would do so on my system,

but the documentation fails to indicate what the table means.

**TRAP/FLT**

TRAP/FLT is the simplest program on the LS-Utilities disk. It traps any individual character sent to or from any logical device, and keeps that character from appearing in the input or output stream. For example, you may want to prevent the computer from sending a CHR\$(23) to the display to stop someone from accidentally turning on the expanded (40-) character mode while a program runs. You could do so by filtering the display driver \*DO with a copy of TRAP/FLT to capture and discard all CHR\$(23) bytes sent as output.

TRAP/FLT is capable of trapping only a single character. If you want to use it to trap more than one character, you can either install it several times or use MAXLATE/FLT instead.

**MAXLATE/FLT**

KSMPLUS (and TRSDOS 6.X's KSM/FLT) only filter keyboard input and only respond to a limited range of input characters. MAXLATE/FLT filters any input or output to a logical device (screen, keyboard, printer, RS-232 line, disk file, and so on).

MAXLATE can change any input or output character to any other character or group of characters (or to a null). First, you have to create a translation table either with the TRSDOS Build command or with a text editor. The translation table merely lists the characters you want MAXLATE to intercept, plus the new character or characters to which you want them changed. You can express values in the translation table in either hexadecimal or ASCII format.

For example, if you wanted to create an output filter attached to a printer that translates every zero to the string "0 (zero)" and every letter O to "O (oh)", the translation table would look like this:

```
30 = "0 (zero)"
4F = "O (oh)"
```

You can make more than one copy of MAXLATE active at any one time, with each translating either the input or output of any logical device. The LS-Utilities package includes two predefined MAXLATE files: one changes the Model 4 QWERTY key-

*Continued on p. 110*

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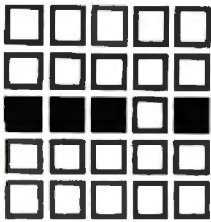
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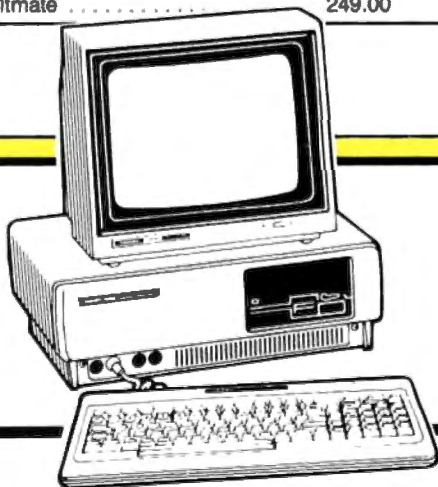
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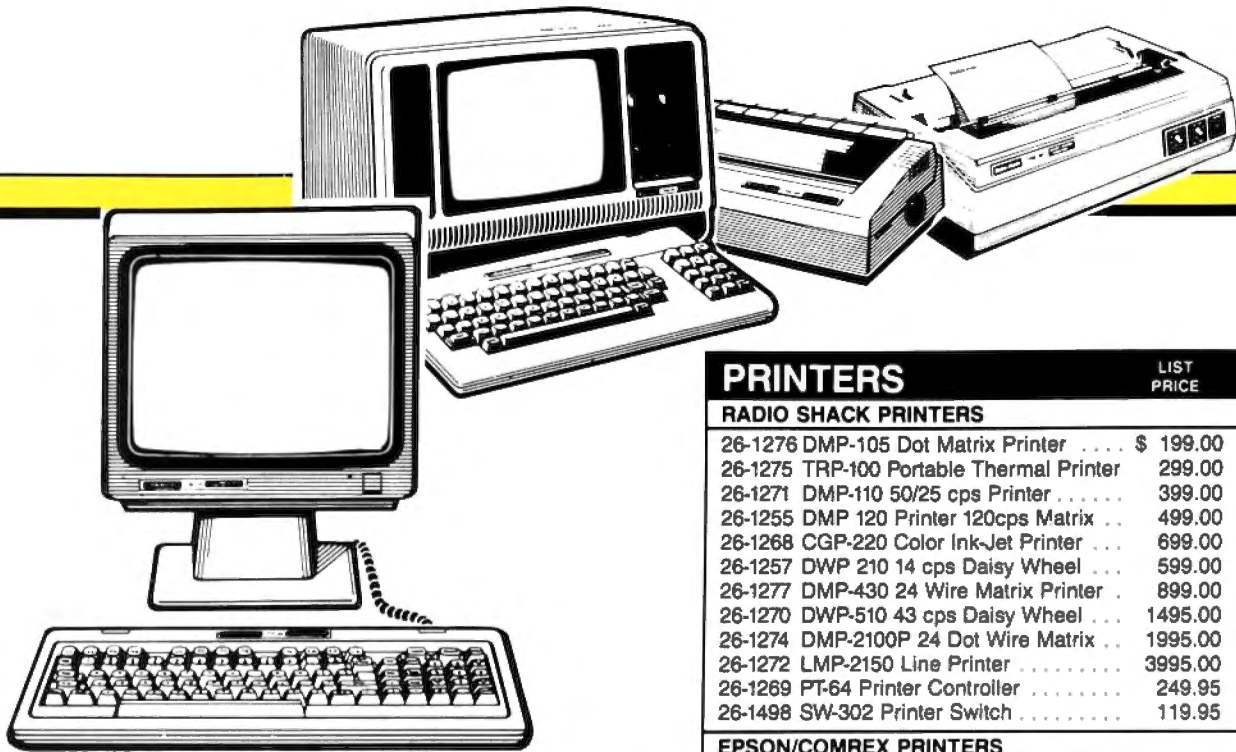
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# FIGHT SIMULATOR



**T**he term “computer simulation” means different things to different people, but in my line of work it means a kind of synthetic experiment.

As an operations analyst with a specialty in computer-based simulations, I’ve designed models of armed combat, surveillance and border patrol operations on the U.S.-Mexico boundary, and air defense. I’ve also simulated procedures for safeguarding nuclear materials. In each simulation, my purpose was to determine how the interactions of random factors affect the real-world process I simulated.

In this article, I’ll explain what a simulation does and how it works. As a sample program, I’ll use a relatively simple Model III combat simulation called *Endgame*.

## The Method

The simulations I design use the Monte Carlo simulation technique, which involves artificially acting out a random process many times, storing data from each repetition, and analyzing that data.

As with any Monte Carlo simulation, you must first create a model of the process you’re simulating. The model is simply your perception of the process’s critical components and how they interact, so opportunities for error are limitless. In fact, most bad simulations are based on an underlying model that’s flaky.

In formulating this model, you need a clear idea of the kind of information you want to get from the simulation; when you plan any kind of experiment, you need a clear understanding of just what it is you’re trying to find out. In *Endgame*, I’m mainly interested in the losses each side incurs, and in which weapon types in the opposing force inflict these losses.

Since the whole point of a simulation is to mimic real-life circumstances complete with chance occurrences, a simulation assigns random values to factors that affect a situation. The values selected depend on a probability curve; some events are likely to happen the same way every time, while others are less predictable. The quality of your model depends on the quality of the probability distributions for the key factors in a simulation.

When I say “random” I mean, of course, pseudorandom values. Most programmers use a congruence algorithm of one sort or another for randomness that yields a series of numbers that behave, for practical purposes, like random numbers. (For more background on Monte Carlo simulation techniques, see “The Business of Planning,” September 1983, p. 74.)

In addition to using a good model, you must replicate the simulation enough times to get valid (stable) results. A simulation’s stability, or reliability, depends on the number of times

you repeat the simulation. This means that fast execution speed is highly desirable, because in some cases you might want to replicate the experiment hundreds of times.

When you see a simulation built on an excessively complex model, it often turns out that the designer included extraneous components in the interest of “realism.” But a simulation isn’t reality and nothing you do can make it real. If you build your model in terms of realism, instead of selecting those components that influence the process, you’re not engaged in an experiment but in imitative magic. This approach creates confusion about what the simulation can and cannot tell you, and results in a slow-running program with abundant crannies in which bugs can hide.

## The *Endgame* Model

*Endgame* is a critical-event-sequenced Monte Carlo simulation; that is, as time passes, the program sees that specified events occur in a certain order.

*Endgame* simulates the passage of time by seeding random values in its event clocks, which the main routine

---

### System Requirements

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



**A professional simulation engineer describes  
the design and implementation of a  
Model III/4 combat simulator.**

**by Joe R. Capps**



Variable	Description
IC(60)	Event clocks (starting with Blue)
IG(60)	Target
IL(60)	Status flag (a1 = Alive, 0 = defunct)
IR(60)	Range to target
IV(4)	Projectile velocity
JB(60)	Random dithering bias on X coordinate
JL(4)	Time to aim weapon
KD(4)	Mean time to detect (seconds)
LP(32)	Target priority
LT(60)	Weapon/target type
MF(8)	Rounds fired accumulator
MX(32)	Killer/victim accumulator
NP(2)	Number of elements per side (1 = Blue, 2 = Red)
PA(4)	Presented area of target (square meters)
PV(4)	Average projectile velocity (meters/second)
PZ(16)	Conditional kill probability, point blank range
PI(16)	Conditional kill probability, 2000 meters
QF(8)	Accumulates sums of squares from MF
QL(32)	Accumulates sums of squares from MX
XM(4)	Mil error of weapon
ZF(8)	Accumulates MF each replication
ZL(32)	Accumulates MX each replication
IX	Side (1 = Blue, 2 = Red)
IZ	Side (IZ = 3 - IX)
JX	Serial ID of acting element
JY	Serial ID of target element
KX	Basic event code
LX	Event clock index of acting element
LZ	Event clock index of target element
JT	Elapsed time
IS	18 (time resolution is 18 counts/second)
KL	18 (one second)
IT	32,400 (infinity)
MB	High memory address where number of Blue resides
MR	High memory address where number of Red resides
MT	High memory address where number of Blue + Red resides
IE	Address - 1 of IE in high memory
IH	Address - 1 of IH in high memory
IK	Address - 1 of IK in high memory
IO	Address - 1 of IO in high memory
JR	Address - 1 of JR in high memory
LO	Address of event code of acting element
KG	Maximum game time
KF	Flag to trigger postprocessing
JH	Flag for printout
GT	Elapsed time accumulator
QB	Blue losses accumulator (sums of squares)
QR	Red losses accumulator (sums of squares)
QT	Elapsed time accumulator for sample mean
TB	Blue losses accumulator for sample mean
TR	Red losses accumulator for sample mean

Table 1. Endgame's principal variables.

Variable	Description
IE (255 bytes)	Exponential structure
IH (480 bytes)	Probability of hit versus range
IK (480 bytes)	Conditional kill probability versus range
IO (60 bytes)	Event codes corresponding to event clocks
JC (60 bytes)	X coordinates
JR (250 bytes)	Range look-up table
KC (60 bytes)	Y coordinates

Table 2. Data blocks in high memory.



scans for the lowest value, called a low clock. The time in the low clock is the present; the values in the other clocks represent the future. As the value of the low clock changes, time progresses.

Endgame recognizes five critical events in the combat simulation: Initiate Search for Target, Select Target, Fire at Target, Assess Result of Fire, and End of Battle. These events and their interactions, together with user inputs and the probability distributions associated with them, constitute my model of a fire fight.

Although many analysts would consider my model woefully lacking in realism, I think that for the limited type of engagement it represents, it's quite adequate. It makes sense to expand a model only if the added factors significantly influence the simulation's outcome.

### Survival of the Fittest

Of all the warlike simulations designed during the past three decades, none has seen more use than the Endgame simulation, which involves a small-unit, direct-fire ground battle, typically dominated by armored fighting vehicles.

Governments use this kind of simulation in selecting new designs for fighting vehicles, whether they be tanks, infantry fighting vehicles, or mobile assault guns.

Three factors characterize such designs: power train and on-board fuel capacity, the weapons system proper, and armor protection. Any concession, in terms of weight or volume, to one of these features comes at the expense of the other two.

Analyzing and testing of weapons systems provides information on a vehicle's mobility, weapons performance, and armor protection. But the operations analyst looks for more than isolated performance trials of these systems. He wants to know what combination of major design features will best help the vehicle survive and fight effectively under

**In the Endgame scenario, Red and Blue forces face each other on a battlefield. The individual fighting units are weapons, not men.**

various threats in an attrition environment. (When an operations analyst speaks of "attrition environment," he means approximately, "A guy could get killed in a place like this.")

Endgame is an example of this kind of design testing. True, it's a limited example; the elements can't move, and the maximum size of the forces is on the small side. But my objective was a program that could easily fit in a 32K system.

Program Listing 1 is the main program. Program Listing 2 is the clock scan routine's source code. Table 1 lists the program's principal variables; Table 2 describes data blocks in high memory. Tables 3 and 4 show modifications for the Models 4 and 1000, respectively.

## The Players

In the Endgame scenario, Red and Blue forces face each other on a battlefield extending 2,500 meters east and west and 1,000 meters north and south. The Blue line of battle is the extreme western edge of the field. The engagement range, a user input, determines the nominal position of Red's battle line.

The program uses a range resolution of 100 meters to calculate the probability of a hit or kill and a round's flight time. So you can think of the battlefield as a neat grid of 100-meter squares.

The program's individual fighting units are weapons, not men. I loaded the program with data describing four types of armored fighting vehicles; they're the same for the Red and Blue sides.

Although these weapon systems are hypothetical (in the interest of keeping me out of jail), you can make some assumptions based on the data describing each one. Type 1 is almost certainly a heavy battle tank. It probably weighs in at close to 60 tons and fires a flat-trajectory, kinetic-energy round that would penetrate just about anything on the battlefield.

Type 2 is a light tank that fires a

SET HIMEM AT 61000.

Replace corresponding lines in Program Listing 1 with the following:

```
1000 CLEAR :DEFINT I-N:GOTO 2500 : 'This is ENDGAME/BAS
2330 CLS:PRINT CHR$(23):PRINT@498,"KILLER/VICTIM MATRIX"
2810 DEF USR0=&HF000:DEF USR1=&HF00D:PP$="POSTPROCESSING"
2820 JR=&HF5D8-1:IE=&HF4D9-1:IH=&HF119-1:IK=&HF2F9-1
2830 IO=&HF0DD-1:MB=&HF0DB:MR=&HF0DC:MT=&HF0DB
2840 JC=&HF6D2-1:NB=NP(1):NR=NP(2):NT=NB+NR:KC=JC+60
4190 IF LM=1 THEN PRINT@670,MS; ELSE PRINT@670,BL$;
4210 FOR I=-4096 TO -3083:READ J:POKE I,J:NEXT I:RETURN
4221 DATA 229,221,225,221,110,0,221,102,1,34,214
4226 DATA 240,201,229,221,225,221,110,0,221,102,1
4230 DATA 34,75,247,58,74,183,254,1,40,7
4240 DATA 62,1,50,74,247,24,4,175,50,74
4250 DATA 247,221,42,75,247,253,33,221,240,14
4260 DATA 1,50,74,247,254,1,40,14,58,216
4270 DATA 240,79,61,22,0,95,253,25,221,25
4280 DATA 221,25,58,216,240,71,33,255,255,34
4290 DATA 81,247,237,91,81,247,221,102,1,221
4300 DATA 110,0,183,237,82,40,18,25,34,81
4310 DATA 247,221,34,217,240,121,50,80,247,253
4320 DATA 126,0,50,79,247,58,74,247,254,1
4330 DATA 32,9,221,35,221,35,253,35,12,24
4340 DATA 7,221,43,221,43,253,43,13,16,198
4350 DATA 50,80,247,79,58,219,240,183,185,56
4360 DATA 13,62,1,50,77,247,58,80,247,50
4370 DATA 78,247,24,17,62,2,50,77,247,58
4380 DATA 219,240,79,58,80,247,183,153,50,78
4390 DATA 247,33,77,247,17,6,0,6,4,221
4400 DATA 42,214,240,126,35,221,119,0,221,25
4410 DATA 16,247,126,35,221,119,0,126,221,119
4420 DATA 1,201
```

Also, replace the Model III | character with ^ in lines 1600, 1720, 1730, 1760, 1790, 1800, 1810, 1860, 1890, 3950, and 4000.

Table 3. Endgame modifications for the Model 4.

Set HIMEM at 45000.

Replace corresponding lines in Program Listing 1 with the following:

```
1000 CLEAR :DEFINT I-N:GOTO 2500 : 'This is ENDGAME/BAS
1660 NX=NX+1:KF=0:IF NX=NE THEN KP=1:CLS:LOCATE 5,17:PRINT "ENDGAME";
2330 CLS:LOCATE 9,13:PRINT "KILLER/VICTIM MATRIX"
2620 CLS:GOSUB 2670 :GOSUB 3020 :LOCATE 5,17:PRINT "ENDGAME";:GOSUB 3780
4190 IF LM=1 THEN LOCATE 9,26:PRINT MS; ELSE LOCATE 9,26:PRINT BL$:
4210 FOR I=-20480 TO -20305:READ J:POKE I,J:NEXT I:RETURN
4220 DATA 139,7,163,214,176,203,144,144,144,144
4230 DATA 144,144,144,160,74,183,60,1,116,7
4240 DATA 176,1,162,74,183,235,5,176,0,162
4250 DATA 74,183,139,55,191,221,176,181,0,138
4260 DATA 14,216,176,178,1,160,74,183,60,1
4270 DATA 116,16,138,22,216,176,180,0,136,208
4280 DATA 254,200,1,198,1,198,1,199,184,255
4290 DATA 255,163,81,183,161,81,183,139,28,57
4300 DATA 195,115,18,137,30,81,183,137,54,217
4310 DATA 176,136,22,80,183,138,53,136,54,79
4320 DATA 183,160,74,183,60,1,117,7,70,70
4330 DATA 71,254,194,235,5,78,78,79,254,202
4340 DATA 226,208,160,80,183,136,196,138,30,219
4350 DATA 176,183,0,40,216,126,4,136,196,183
4360 DATA 1,254,199,136,62,77,183,136,30,78
4370 DATA 183,190,77,183,139,62,214,176,185,4
4380 DATA 0,138,4,136,5,70,131,199,6,226
4390 DATA 246,139,4,137,5,203
```

Delete lines 4400 to end.

Also, replace the Model III | character with ^ in lines 1600, 1720, 1730, 1760, 1790, 1800, 1810, 1860, 1890, 3950, and 4000.

Table 4. Endgame modifications for the Model 1000.

## Program Listing 1. Endgame/BAS.

```
1000 CLEAR 768:DEFINT I-N:GOTO 2500 : 'This is ENDGAME/BAS
1010 'MEMORY SIZE?=45000:MOD I,MOD III. 20 JAN. 1985
1020 IF IL(LX)<1 THEN IC(LX)=IT:KX=0:RETURN
1030 POKE LO,2:IC(LX)=JT+PEEK(IE+INT(RND(.1)*MM)+1)*KD(L):RETURN
1040 KX=5:KB=(I2-1)*NP(IX)+1:KE=KB+NP(I2)-1:K=INT(RND(.1)*NP(I2))+
1+KB-1
1050 M=(IX-1)*I6+(L-1)*I4:FOR I=1 TO I4:MP=M+I
1060 FOR J=1 TO NP(I2):K=K+1:IF K>KE THEN K=KB
1070 IF IL(K)=0 THEN 1090
1080 LZ=K:IF LT(K)=LP(MP) THEN IG(LX)=K:J=NP(I2):I=I4:KX=2
```

Listing 1 continued on p. 46

kinetic-energy round. Type 3 is a little murky, but may fire a shaped-charge round and depend on a pulsed laser for good range information.

Type 4 is probably some sort of armored personnel carrier, judging from its huge profile. Its weapon appears to be some sort of guided missile, probably controlled by a joystick.

### The Simulation

After you type in Listing 1 and save it to disk, you must set high memory before loading and running Endgame. To do so, re-enter Basic, typing in

45,000 at the memory size prompt.

When you load and run Endgame, it issues a series of prompts:

Order of Battle?  
Target Priorities?  
Engagement Range?  
Max. Game Time?  
How Many Replications?  
How Many Event Histories?  
Will You Want Hard Copy?

If you respond to each prompt by pressing the enter key, Endgame simulates a default game. The first two prompts require fairly detailed inputs if

your response is anything except pressing the enter key or typing in N; the other prompts require only a single entry.

"Order of battle" is military jargon for the number and types of units in the opposing forces. The default gives Red and Blue identical forces: 12 fighting vehicles, three each of the four weapons types described above.

If you want a different order of battle, type in Y and the program prompts you for the total number of elements on each side and also for the number of each type. The program doesn't check for contradictory input, so if you

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Compiled by Dave Rowell

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Business management simulation that you can play as one or several bank CEOs. Simulates four bank types. Tandy 1000/1200 (128K, one drive). Machine language. \$74.95. Lewis Lee Corp., P.O. Box 51831, Palo Alto, CA 94303. 415-853-1220.

### Chemical Engineering Simulation (Microchess)

Generates steady-state heat and material balances for industrial chemical processes. Allows a large number of equipment and reaction setups. Tandy 1200 and 2000 (256K, Intel math coprocessor). Compiled Basic or Fortran. \$2,300. COADE, 8552 Katy Freeway, Suite 320, Houston, TX 77024. 713-973-9060.

### Flight Simulator

Sublogic's classic, licensed to Microsoft. This is the version that almost qualifies as flight trainer. Simulates single-engine plane and many U.S. airports, plus a World War I biplane fighter. Tandy 1000/1200 (128K, one drive). Machine language, \$49.95 Microsoft, 10700 Northrup Way, Bellevue, WA 98004. 206-828-8088.

### Forest Fire Dispatcher

Simulates the responsibilities of a forest fire dispatcher in southeast Kentucky. Allocate money and resources to minimize forest fire damage within budget constraints. (More educational than game.)

Models I and III (32K disk, 16K cassette). Basic with machine-language subroutines. Disk: \$29.50. Cassette: \$24.95 Sublogic Communications Corp., 713 Edgebrook Drive, Champaign, IL 61820. 217-359-8482.

### Microcosm

Population biology of microbes; a game of life where you can modify the rules of interaction including mutation. Tandy 1000/(128K, one drive, DOS KEYCNVRT.SYS driver). GW-Basic with machine-language subroutines. \$39.95. Aeon Concepts, Computer Products Division, 1657 Red Mill, Pittsburgh, PA 15241. 412-831-5352.

### Millionaire: The Stock Market Simulation

### Tycoon: The Commodity Market Simulation

### Baron: The Real Estate Simulation

### Squire: The Financial Planning Simulation

Realistic business simulations you can play as games. Tandy 1000/1200 (128). \$59.95 (Squire is \$69.95). Blue Chip Software, 6744 Eton Ave., Canoga Park, CA 91303. 818-346-0730.

### Monte Carlo Simulation

Business program uses Monte Carlo technique to forecast trends from past data or events. (Several other programs available from this company use similar methods for a variety of purposes.) Models III, 4 (with CP/M), and 1000/1200. Compiled Basic. Disk: \$125. Lionheart, P.O.

Box 379, Alburg, VT 05440. 514-933-4918.

### Population Dynamics

Two ecological simulations, one with intraspecies individuals competing for food and other limited resources, the other pits two species against each other. You control conditions of competition. Model III (32K). Basic. Disk: \$45. Queue Inc., 5 Chapel Hill Drive, Fairfield, CT 06432. 203-335-0906.

### Supreme Ruler Plus

Economic simulation. Game modeled on past performance of U.S. economy. Models I and III (48K). Basic. Cassette or disk: \$26.50. JMG Software International, 710 Upper James St., Hamilton, Ontario L9C 2Z8, Canada. 416-389-6086.

### T80-FS1 Flight Simulator

Simulates flight of small plane. Shows view from cockpit. Models I and III (16K). Machine language. Cassette: \$25; enhanced disk version: \$33.50. Sublogic Communications Corp., 713 Edgebrook Drive, Champaign, IL 61820. 217-359-8482.

### TModel—Transportation Modeling System

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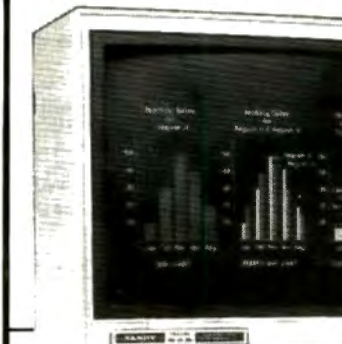


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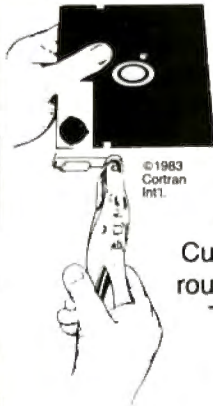
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```

1090 NEXT J:NEXT I:IC(LX)=JT+JL(L)+INT(RND(.1)*KL)+1:POKE LO,3:RET
URN
1100 IF IL(LZ)=0 THEN IC(LX)=JT+INT(RND(.1)*KL)+1:KX=0:POKE LO,11:
RETURN
1110 JD=ABS(PEEK(JC+LX)-PEEK(JC+LZ)):POKE LO,4
1120 KD=ABS(PEEK(KC+LX)-PEEK(KC+LZ)):IM=1
1130 M=PEEK(JR+((JD-1)*I0)+KD):IC(LX)=JT+(M*1800)/IV(L)
1140 K=(IX-1)*I4+L:MF(K)=MF(K)+1:IR(LX)=M:RETURN
1150 IF IL(LX)=0 THEN IC(LX)=IT ELSE IC(LX)=JT+JL(L)+INT(RND(.1)*K
L)+1
1160 IF IL(LZ)=0 THEN IC(LX)=JT+INT(RND(.1)*KL)+1:KX=0:POKE LO,1:R
ETURN
1170 M=IR(LX):N=(M-1)*I6+(L-1)*I4+LT(LZ):POKE LO,3
1180 IJ=1:IF (INT(RND(.1)*MM)+1)>PEEK(IH+N) THEN RETURN
1190 IJ=2:IF (INT(RND(.1)*MM)+1)>PEEK(IK+N) THEN RETURN
1200 IL(LZ)=0:IF PEEK(IO+LZ)<I4 THEN POKE IO+LZ,1:IC(LZ)=IT
1210 IJ=3:IF LT(LZ)=4 THEN IC(LZ)=IT:POKE IO+LZ,1
1220 N=(IX-1)*I6+(L-1)*4+LT(LZ):MX(N)=MX(N)+1:POKE LO,11
1225 IF IL(LX)<1 THEN IC(LX)=IT ELSE IC(LX)=JT+INT(RND(.1)*KL)+1
1230 RETURN
1240 KJ=USRL(VARPTR(IC(1)))
1250 IZ=3-IX:LZ=IG(LX):L=LT(LX):IJ=0:LO=LX+IO:IM=0
1280 IF JT>KG THEN KX=5
1290 IF KX<5 THEN 1330
1300 IF JT=>IT THEN JT=KG
1310 GOSUB 1660 :IF KF=1 THEN RETURN
1320 GOSUB 1580 :GOTO 1240
1330 ON KX GOSUB 1020,1040,1100,1150
1340 IF KX=0 THEN 1240
1350 IF KX=4 AND IJ=0 THEN 1240
1360 IF KX=3 AND IM=0 THEN 1240
1370 IF KX<5 THEN 1410
1380 IF JT=>IT THEN JT=KG
1390 GOSUB 1660 :IF KF=1 THEN RETURN
1400 GOSUB 1580 :GOTO 1240
1410 IF IW<I1 THEN 1240 ELSE JZ=LZ+(IX-1)*NP(1)
1420 IF JH=1 THEN LPRINT USING F$;JT/IS;:LPRINT S$(IX);JX;
1430 PRINT USING F$;JT/IS;:PRINT S$(IX);JX;
1440 IF KX<>I1 THEN 1470
1450 IF JH=1 THEN LPRINT"Initiates Search"
1460 PRINT"Initiates Search":GOTO 1240
1470 IF KX<>I2 THEN 1500
1480 IF JH=1 THEN LPRINT"Targets ";S$(IZ);JZ
1490 PRINT"Targets ";S$(IZ);JZ:GOTO 1240
1500 IF KX>I3 THEN 1550
1510 IF JH=1 THEN LPRINT"Fires at ";S$(IZ);JZ;
1520 IF JH=1 THEN LPRINT"Range";IR(LX)*I00+JB(LX)+JB(LZ)
1530 PRINT"Fires at "S$(IZ);JZ;" Range";
1540 PRINT IR(LX)*I00+JB(LX)+JB(LZ):GOTO 1240
1550 IF JH<1 THEN 1570
1560 LPRINT" vs ";S$(IZ);JZ;" Assess ";R$(IJ)
1570 PRINT" vs ";S$(IZ);JZ;" Assess ";R$(IJ):GOTO 1240
1580 J5=IO:NT=NP(1)+NP(2):FOR I=1 TO NT:IC(I)=INT(RND(.1)*36)+1
1590 J5=J5+1:POKE J5,1
1600 IL(I)=1:NEXT I:PRINT"Replication #";NX+1
1610 IF JH<1 THEN RETURN ELSE IF IW<1 THEN RETURN
1620 LPRINT CHR$(12)
1630 LPRINT"Event History, Replication # ";NX+1
1640 LPRINT" "
1650 RETURN
1660 NX=NX+1:KF=0:IF NX=NE THEN KF=1:CLS:PRINT@272,L$;
1670 MJ=0:MK=0:IF KF=1 THEN GOSUB 4180
1680 FOR I=1 TO 32:ZL(I)=ZL(I)+MX(I):QL(I)=QL(I)+MX(I)[2
1690 IF I<17 THEN MK=MK+MX(I) ELSE MJ=MJ+MX(I)
1700 IF KF=1 THEN GOSUB 4180
1710 MX(I)=0:NEXT I:IW=IW-1
1720 TB=TB+MJ:QB=QB+MJ[2:TR=TR+MK:QR=QR+MK[2
1730 GT=GT+JT/IS:QT=QT+(JT/IS)[2
1740 FOR I=1 TO 8:ZF(I)=ZF(I)+MF(I)
1750 IF KF=1 THEN GOSUB 4180
1760 QF(I)=QF(I)+MF(I)[2:MP(I)=0:NEXT I
1770 IF KF=0 THEN RETURN ELSE M$=PP$:GOSUB 4180
1780 IF JH>0 THEN LPRINT CHR$(12)
1790 ZE=NE:GT=GT/ZE:QT=(QT/ZE)-GT[2
1800 TB=TB/ZE:TR=TR/ZE:VB=(QB/ZE)-TB[2
1810 VR=(QR/ZE)-TR[2:IF VR<EPS THEN VR=0
1820 IF VB< EPS THEN VB=0
1830 VB=SQR(VB):VR=SQR(VR)
1840 GOSUB 4180 :IF QT<EPS THEN QT=0
1850 QT=SQR(QT):FOR I=1 TO 32:GOSUB 4180
1860 V=(QL(I)/ZE)-(ZL(I)/ZE)[2:IF V<EPS THEN V=0
1870 ZL(I)=ZL(I)/ZE:QL(I)=SQR(V*(ZE/(ZE-1))):NEXT I
1880 FOR I=1 TO 8:GOSUB 4180
1890 V=(QF(I)/ZE)-(ZF(I)/ZE)[2:IF V<EPS THEN V=0
1900 ZF(I)=ZF(I)/ZE:QF(I)=SQR(V*(ZE/(ZE-1))):NEXT I

```

Listing 1 continued



specify a total Blue force of 30 elements and also specify 16 heavy tanks and 18 armored personnel carriers, you're in for a sick, sick simulation.

The maximum number of total elements in a game is 60; the only restriction on Red or Blue force sizes is that their sum can't exceed 60.

Blue's default target priorities are, from highest to lowest, Red type 4, type 3, type 2, and type 1. Red's default target priorities are Blue type 1, type 2, type 3, and type 4.

If you specify different target priorities, the program prompts you for 32 inputs: first through fourth Red target priorities for each of four Blue weapon types, and Blue target priorities for each Red weapon type.

The default engagement range value is 500 meters. You can specify values from 100-2,500 meters. When the program assigns coordinates to weapons, it puts the first element in a force in the southernmost square, the next in the square immediately to the north, and so on. If the force has more than 10 elements, the program recycles to the southernmost square.

With a nominal engagement range of, say, 500 meters, some of the actual element-to-element engagement ranges may well be more than 1,000 meters.

The default game time is 60 seconds. When you run the program, you'll see that a lot can happen in 60 seconds. Endgame thinks of infinity as 1,800 seconds, a half-hour.

You're free to select any game time within this infinity, but a word of caution: A long game time can combine with a long target-detect time to overflow an event clock and blow up the program, because detect time uses an exponential distribution.

The default number of replications is 12. You shouldn't specify fewer than two replications; otherwise, the program bombs in the postprocessor, since it uses the  $N-1$  statistic to calculate variance.



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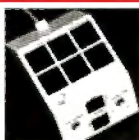
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Listing 1 continued

```
1910 CLS:PRINT"OUTPUT SUMMARY FOR ";NE;" REPLICATIONS
1920 IF JH>0 THEN LPRINT"OUTPUT SUMMARY FOR ";NE;"REPLICATIONS"
1930 PRINT:IF JH>0 THEN LPRINT" "
1940 PRINT"ELAPSED TIME (Sec) = ";
1950 PRINT USING FO$;GT;:PRINT USING FP$;QT
1960 IF JH<1 THEN 1990
1970 LPRINT"ELAPSED TIME (Sec.) = ";
1980 LPRINT USING FO$;GT;:LPRINT USING FP$;QT
1990 PRINT:IF JH>0 THEN LPRINT" "
2000 PRINT"TOTAL LOSSES"
2010 IF JH>0 THEN LPRINT "TOTAL LOSSES":LPRINT" "
```

Listing 1 continued



```
T = 25.94 Seconds:Blue 2 vs Red 1 Assess KILL
T = 26.06 Seconds:Blue 8 Initiates Search
T = 26.11 Seconds:Blue 10 Fires at Red 7 Range 483
T = 26.39 Seconds:Blue 4 Initiates Search
T = 26.44 Seconds:Blue 1 Fires at Red 4 Range 731
T = 26.56 Seconds: Red 3 Targets Blue 11
T = 26.89 Seconds: Red 5 Targets Blue 11
T = 26.94 Seconds:Blue 5 Fires at Red 4 Range 518
T = 27.11 Seconds: Red 11 Fires at Blue 6 Range 632
T = 27.28 Seconds:Blue 1 vs Red 4 Assess MISS
T = 27.33 Seconds: Red 10 Targets Blue 11
T = 27.39 Seconds:Blue 6 Initiates Search
T = 27.83 Seconds: Red 11 vs Blue 6 Assess MISS
T = 27.94 Seconds: Red 8 Targets Blue 1
T = 28.22 Seconds:Blue 1 Fires at Red 4 Range 731
```

Photo. An Endgame event history.

```
OUTPUT SUMMARY FOR 12 REPLICATIONS
ELAPSED TIME (Sec.) = 60.63( 0.56)

TOTAL LOSSES
Blue: 6.58( 1.19)
Red: 6.75( 0.92)

ROUNDS FIRED

                Blue                Red
Type 1          1.25( 0.87)          5.92( 1.88)
Type 2          3.08( 1.44)          5.17( 1.80)
Type 3          5.50( 2.11)          2.08( 1.56)
Type 4          6.58( 1.78)          1.17( 0.72)
```

Figure 1. Screen dump of Endgame's output summary.

#### KILLER/VICTIM MATRIX

Blue Weapons		Red Targets			
	TYPE 1	TYPE 2	TYPE 3	TYPE 4	
TYPE 1	0.00( 0.00)	0.00( 0.00)	0.08( 0.29)	0.83( 0.72)	
TYPE 2	0.00( 0.00)	0.08( 0.29)	0.75( 0.75)	1.00( 0.51)	
TYPE 3	0.00( 0.00)	0.17( 0.39)	1.33( 0.89)	0.58( 0.67)	
TYPE 4	0.00( 0.00)	0.50( 0.80)	0.83( 0.58)	0.50( 0.67)	

Red Weapons		Blue Targets			
	TYPE 1	TYPE 2	TYPE 3	TYPE 4	
TYPE 1	1.00( 0.85)	1.75( 0.75)	0.33( 0.49)	0.00( 0.00)	
TYPE 2	1.42( 1.08)	0.75( 0.97)	0.33( 0.65)	0.00( 0.00)	
TYPE 3	0.42( 0.67)	0.33( 0.49)	0.08( 0.29)	0.00( 0.00)	
TYPE 4	0.17( 0.39)	0.00( 0.00)	0.00( 0.00)	0.00( 0.00)	

Figure 2. Screen dump of Endgame's killer/victim matrix.

Generally, the more replications you run, the more stable your output.

The event history is a screen text display of every event in the battle as it happens (see the Photo). The default value is 1; so, in the default simulation, you'll see an event history on the screen for the first cycle only. A replication runs slightly faster if you don't call for an event history. You can specify any number of event histories up to the number of replications you select.

If you answer the hard copy prompt by pressing the enter key or by typing in N, you'll get no printout. Any other response produces a screen dump.

Once you've answered the prompts, the program displays a summary of your inputs. If you're ready to start the simulation, press the enter key; if you press any other key, the program returns you to the beginning of the input prompts for changes.

After the input, the program displays the order of battle. The value on the left is an individual weapon's serial identification (ID) within its force; in the event history, "Blue 6" or "Red 9" refers to this serial ID. The number in parentheses is the weapon's type, and the four numbers to the right show the weapon's target priorities.

The program now begins preprocessing, which takes about five minutes if your computer runs a 2 MHz clock, and about half that at 4 MHz.

After preprocessing, the actual simulation begins. If you specify one or more event histories, a running account of the battle appears on the screen.

Endgame runs the specified number of replications and prepares a statistical analysis. After a minute or two of post-processing, the screen displays the number of rounds fired and the number of killed for each side (see Fig. 1). When you continue to the next page, you'll see the killer/victim matrix, a weapon-by-weapon breakdown of the simulation's results (see Fig. 2).

**The clock scan alternates between first Blue weapon to last Red and last Red to first Blue. This alternating scan direction avoids bias.**

The first statistic in each category is the mean value for all repetitions. The second, shown in parentheses, is the standard deviation, which measures the outcomes' spread.

After viewing this data, you can return to the input routine. This time, the default game is the one you specified previously. On repeat runs, Endgame does not go through preprocessing.

### The Game Loops

In execution, Endgame is a monotonous loop. The program repeatedly scans the array containing event clocks for each weapon to find the low clock, which is associated with an event code specifying one of the model's five critical events. Endgame then calls a routine to execute this event, loads new values into event codes and event clocks if necessary, and scans the event clocks again.

This loop continues until the event code indicates an end of battle, at which point the program calls the output processing routine to store pertinent data from this cycle, restores initial battle conditions, and goes back to the idiot loop of scanning, processing, loading, scanning, and so on.

The preprocessing and postprocessing routines are vital parts of the program, but they probably won't make sense until you know what goes on in the inner game loops. So I'll start my discussion of the program in the middle and work from there toward the beginning and the end.

The main routine, lines 2580-2660, dimensions a few variables and begins calling subroutines. I'll pick up the action where the program calls the subroutine at line 1240.

Since line 1240 calls the Event Clock Scan routine (see Listing 2), I'll briefly explain what's going on up there in high memory. The routine scans the event clocks and selects the low clock.

The routine knows the number of Blue weapons in the battle (NB), the

Listing 1 continued

```

2020 PRINT S$(1);":":PRINT USING FO$;TB;
2030 PRINT USING FP$;VB
2040 IF JH<1 THEN 2070
2050 LPRINT S$(1);":":LPRINT USING FO$;TB;
2060 LPRINT USING FP$;VB
2070 PRINT S$(2);":":PRINT USING FO$;TR;
2080 PRINT USING FP$;VR
2090 IF JH<1 THEN 2120
2100 LPRINT S$(2);":":LPRINT USING FO$;TR;
2110 LPRINT USING FP$;VR:LPRINT " ":LPRINT " "
2120 PRINT:PRINT"ROUNDS FIRED"
2130 IF JH>0 THEN LPRINT"ROUNDS FIRED":LPRINT " "
2140 A$=" Blue Red"
2150 PRINT A$:IF JH>0 THEN LPRINT A$:LPRINT " "
2160 FOR I=1 TO 4:PRINT"Type ";I;" ";
2170 IF JH>0 THEN LPRINT"Type ";I;" ";
2180 PRINT USING FO$;ZF(I);:PRINT USING FP$;QF(I);
2190 PRINT " ";
2200 IF JH<1 THEN 2230
2210 LPRINT USING FO$;ZF(I);
2220 LPRINT USING FP$;QF(I);:LPRINT " ";
2230 PRINT USING FO$;ZF(I+4);
2240 PRINT USING FP$;QF(I+4)
2250 IF JH<1 THEN 2280
2260 LPRINT USING FO$;ZF(I+4);
2270 LPRINT USING FP$;QF(I+4)
2280 NEXT I:PRINT"Press <ENTER> to Continue"
2290 G$=INKEY$:IF G$="" THEN 2290
2300 A$="KILLER/VICTIM MATRIX"
2310 REM:PRINT A$
2320 IF JH>0 THEN LPRINT " ":LPRINT " ":LPRINT A$:LPRINT " "
2330 CLS:PRINT CHR$(23):PRINT$524,"KILLER/VICTIM MATRIX"
2340 FOR L=1 TO 300:NEXT L:CLS
2350 FOR I=1 TO 2:IZ=3-I:PRINT
2360 A$=" "+S$(I)+" " " "+S$(IZ)+" Targets"
2370 PRINT A$:IF JH>0 THEN LPRINT A$
2380 A$="Weapons TYPE 1 TYPE 2 TYPE 3 TYPE
4"
2390 PRINT A$:IF JH>0 THEN LPRINT A$
2400 REM:IF JH>0 THEN LPRINT A$:LPRINT"Weapons";
2410 FOR J=1 TO 4
2420 IF JH>0 THEN LPRINT"TYPE";J;
2430 L=(J-1)*4+(I-1)*16:PRINT"TYPE";J;:FOR K=1 TO 4:L=L+1
2440 PRINT " ":PRINT USING FO$;ZL(L);:PRINT USING FP$;QL(L);
2450 IF JH>0 THEN LPRINT " ":LPRINT USING FO$;ZL(L);
2460 IF JH>0 THEN LPRINT USING FP$;QL(L);
2470 NEXT K:PRINT:IF JH>0 THEN LPRINT " "
2480 NEXT J
2490 IF JH>0 THEN LPRINT " "
2500 NEXT I
2510 PRINT"Press <ENTER> to continue"
2520 G$=INKEY$:IF G$="" THEN 2520
2530 CLS:RETURN
2540 FOR I=1 TO 32:ZL(I)=0:QL(I)=0:MX(I)=0:NEXT I
2550 NX=0:TB=0:TR=0:QB=0:QR=0:TM=0:TV=0:GT=0:QT=0
2560 FOR I=1 TO 8:ZF(I)=0:QF(I)=0:MF(I)=0:NEXT I
2570 RETURN
2580 DIM IC(61),LT(60),LP(32),KD(4),MX(32),MF(8),IL(60)
2590 DIM JB(60),NP(2),IP(32),IR(60),IG(60)
2600 DIM ZL(32),QL(32),ZF(8),QF(8),PZ(16),P1(16)
2610 DIM S$(2),NL(10),PA(4),DT(4),XM(4),PV(4)
2620 CLS:GOSUB 2670 :GOSUB 3020 :PRINT@272,L$;:GOSUB 3780
2630 GOSUB 4210
2640 KJ=USR(VARPTR(IX)):GOSUB 1580
2650 POKE MB,NB:POKE MR,NR:POKE MT,NT
2660 GOSUB 1240 :GOSUB 2540 :GOSUB 3020 :GOSUB 1580 :GOTO 2660
2670 IX=0:JX=0:KX=0:LX=0:JT=0
2680 PI=3.14159:TP=2*PI:S$(1)="Blue":S$(2)="Red"
2690 W$(1)="First":W$(2)="Second":W$(3)="Third"
2700 W$(4)="Fourth":R$(1)="MISS":R$(2)="HIT":E$=CHR$(13)
2710 R$(3)="KILL":MM=255:IS=18:IT=32400:KL=IS
2720 DATA 4,3,2,1,4,3,2,1,4,3,2,1,4,3,2,1:'Blue
2730 DATA 1,2,3,4,1,2,3,4,1,2,3,4,1,2,3,4:'Red
2740 FOR I=1 TO 32:READ LP(I):NEXT I:KG=1080
2750 NP(1)=12:NP(2)=12:NB=NP(1):NR=NP(2):NT=NB+NR
2760 DATA 1,1,1,2,2,2,3,3,3,4,4,4,4:'Blue OB
2770 DATA 1,1,1,2,2,2,3,3,3,4,4,4,4:'Red OB
2780 FOR I=1 TO NT:READ LT(I):NEXT I:BL$=" "
2790 KO=1:LJ=5:NE=12:IW=1:PR$=" PREPROCESSING":GG$=CHR$(13)
2800 FO$="###.###":FP$="(###.###)":F$="T =###.### Seconds:"
2810 DEF USR0=&HB000:DEF USR1=&HB00D:PP$="POSTPROCESSING"
2820 JR=&HB5D8-1:IE=&HB4D9-1:IH=&HB119-1:IK=&HB2F9-1
2830 IO=&HB0DD-1:MB=&HB0DB:MR=&HB0DC:MT=&HB0D8
2840 JC=&HB6D2-1:NB=NP(1):NR=NP(2):NT=NB+NR:KC=JC+60
2850 I1=1:I2=2:I3=3:I4=4:I0=10:I6=16:JF=0
2860 L$="":FOR I=1 TO 3:FOR J=1 TO 34

```

Listing 1 continued

```

2870 READ K:L$=L$+CHR$(K):NEXT J
2880 IF I<3 THEN L$=L$+STRING$(34,24)+CHR$(26)
2890 NEXT I:CLS
2900 DATA 191,131,131,131,128,191,164,128,191,128
2910 DATA 191,131,131,169,128,190,131,131,131,128
2920 DATA 128,182,185,128,128,191,164,152,191,128
2930 DATA 191,131,131,131,191,140,128,128,128,191
2940 DATA 128,137,191,128,191,128,128,170,128,191
2950 DATA 128,128,128,128,191,128,128,191,128,191
2960 DATA 128,128,191,128,191,140,128,128,191,176
2970 DATA 176,176,128,191,128,128,191,128,191,176
2980 DATA 176,154,128,175,176,176,187,128,191,128
2990 DATA 128,191,128,191,128,128,191,128,191,176
3000 DATA 176,176
3010 RETURN
3020 N$="N":INPUT"Order of Battle";N$:IF N$="N" OR N$=CHR$(110) OR
N$="" THEN 3090
3030 N=0:FOR K=1 TO 2:PRINT "How many ";S$(K);:INPUT NP(K)
3040 FOR J=1 TO 4:PRINT"How many type ";J;:INPUT M
3050 IF M=0 THEN 3070
3060 FOR L=1 TO M:N=N+1:LT(N)=J:NEXT L
3070 NEXT J:NEXT K:NB=NP(1):NR=NP(2):NT=NB+NR
3080 POKE MB,NB:POKE MR,NR:POKE MT,NT
3090 P$="N":INPUT"Target Priorities";P$:IF P$="N" OR P$=CHR$(110)
OR P$="" THEN 3150
3100 N=0:FOR I=1 TO 2:IZ=3-I:CLS
3110 FOR J=1 TO 4:FOR K=1 TO 4:N=N+1
3120 PRINT S$(I);" WPN TYPE ";J;" ";WS$(K);" PRIORITY ";
3130 PRINT S$(IZ);" Target Type";:INPUT LP(N)
3140 NEXT K:PRINT:NEXT J,I:CLS:LJ$="N"
3150 LJ$="N":INPUT"Engagement Range (200 - 2500 meters)";LJ$
3160 IF LJ$="N" OR LJ$=CHR$(110) OR LJ$="" THEN 3170 ELSE LJ=VAL(L
J$)/100
3170 KG$="N":INPUT"Maximum Game Time (Seconds)";KG$
3180 IF KG$="N" OR KG$=CHR$(110) OR KG$="" THEN 3190 ELSE KG=VAL(K
G$)*IS
3190 NE$="N":INPUT"How Many Replications";NE$
3200 IF NE$="N" OR NE$=CHR$(110) OR NE$="" THEN 3210 ELSE NE=VAL(N
E$)
3210 IW$="N":INPUT"How Many Event Histories";IW$
3220 IF IW$="N" OR IW$=CHR$(110) OR IW$="" THEN IW=KO ELSE IW=VAL(
IW$):KO=IW
3225 IF IW>NE THEN IW=NE
3230 JH$="N":INPUT"Will You Want Hard Copy";JH$
3240 JH=0:IF JH$<>"N" AND JH$<CHR$(110) AND JH$<>" THEN JH=1
3250 CLS:POKE MB,NB:POKE MR,NR:POKE MT,NT
3260 FOR I=1 TO 2:L=NP(1)*(I=2):FOR J=1 TO NP(I)
3270 K=INT(RND(.1)*NP(I))+1-L:N=LT(K):KH=K;K=INT(RND(.1)*NP(I))+1-
L
3280 LT(KH)=LT(K):LT(K)=N:NEXT J:NEXT I
3290 PRINT"SUMMARY OF USER INPUTS"
3300 IF JH>0 THEN LPRINT"SUMMARY OF USER INPUTS"
3310 PRINT:IF JH>0 THEN LPRINT " :REM:A$:LPRINT "
3320 K=KG/IS:PRINT"Max Game Time = ";K;" Seconds"
3330 IF JH=1 THEN LPRINT"Max Game Time = ";K;" Seconds"
3340 L=LJ*100:PRINT"Engagement Range = ";L;" Meters"
3350 IF JH>0 THEN LPRINT"Engagement Range = ";L;" Meters"
3360 PRINT"Number of Replications = ";NE
3370 IF JH>0 THEN LPRINT"Number of Replications = ";NE
3380 IF IW<1 THEN IW=0
3390 PRINT"Number of Event Histories =";IW
3400 IF JH>0 THEN LPRINT"Number of Event Histories =";IW
3410 IF JH>0 THEN PRINT"Hard Copy Output"
3420 IF JH<1 THEN PRINT"No Hard Copy"
3430 IF JH<1 THEN 3450
3440 LPRINT"Hard Copy Output":LPRINT "
3450 PRINT"Press <ENTER> to Continue"
3460 G$=INKEY$:IF G$="" THEN 3460
3470 IF G$<>GG$ THEN CLS:GOTO 3020
3480 CLS:N=0:FOR I=1 TO 2:J=0:JJ=0
3490 PRINT S$(I);" Order of Battle":PRINT
3500 IF JH>0 THEN LPRINT "
3510 IF JH>0 THEN LPRINT S$(I);" Order of Battle":LPRINT "
3520 J=J+1:N=N+1:JJ=JJ+1:K=LT(N):L=(I-1)*16+(K-1)*4
3530 IF J>9 THEN 3550
3540 PRINT " ";:IF JH>0 THEN LPRINT " ";
3550 PRINT J;" (";K;")
3560 IF JH>0 THEN LPRINT J;" (";K;") ";
3570 FOR M=1 TO 4:L=L+1:PRINT LP(L);" ";
3580 IF JH>0 THEN LPRINT LP(L);" ";
3590 NEXT M
3600 PRINT:IF JH>0 THEN LPRINT "
3610 IF J=NP(I) THEN 3630 ELSE IF JJ=12 THEN 3630
3620 GOTO 3520
3630 JJ=0:PRINT"Press <ENTER> to Continue"

```

Listing 1 continued



number of Red weapons (NR), and the total number of elements (NT). So when it selects the low clock it knows which side that clock belongs to (IV), the serial ID of the weapon on that side (JX), and the event clock index (LX). Since it scans the event codes (in data block IO), it also knows which event code is associated with the low clock. Finally, since this is a critical-event-sequenced simulation, the routine knows that JT, the value in the low clock, is by definition the current time.

Note that this clock scan alternates between first Blue weapon to last Red weapon and last Red to first Blue. This alternating scan direction avoids bias. When events cluster densely in a simulation like Endgame, more than one clock may contain the low clock value. By alternating the direction of scan, Endgame ties are settled alternately in favor of Blue and Red.

Line 1240 and the machine-language subroutine it calls in high memory are the workaholics of the simulation. When the program invokes line 1240 it's saying, in effect, "Take a look at the event clocks and tell us what happens next."

This USR call at line 1240 returns values for five integer variables, IX, JX, KX, LX, and JT. (If the Z80 knew I was using IX it would probably have a fit. One of its index registers has this name, so I've cleverly called this variable "IV" in the Assembly-language routine.)

IX tells you which side is acting: Blue if IX's value is 1, Red if it's 2. IZ, the side being acted on, is naturally defined as 3-IX. JX is the serial ID, within the Blue or Red force, of the active element.

KX, the event code, indicates what kind of event begins or culminates at this instant. LX is the clock index of the active element and also its valid subscript in the Basic arrays IC, IG, IL, IR, and JB. Thus, the clock index of the element acted on (LZ) is IG(LX), so you can readily find this element's serial ID within its own force.

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The fifth variable the USR call returns, JT, indicates the time.

The link between the Basic program and the machine-language subroutine is easily apparent; I've actually sent VARPTR(IC(1)) along in the USR call at line 1240. The call to GETHL at the

second entry point in Listing 2 loads the address of the event clocks into the HL register and we're on our way.

But what about communications in the other direction, from object module to Basic? Look at line 2640 in the main routine. This USR call passes VARP-

TR(IX) to the machine-language subroutine. Now look at line 2670, where IX, JX, KX, LX, and JT appear in the program for the first time. These five variables will stay where they are, side by side, no matter what.

Furthermore, if you know the address of IX's least significant byte (LSB), all you have to do is add 5 to it to get the address of JX's LSB. So, in that first call to the USR routine, I sent along the address of IX; the routine called GETHL and stored IX's address in K0. Each time the clock scan routine returns to Basic from subsequent calls, it dumps the values in IV, JX, KX, LX, and JT into the Basic variables IX, JX, KX, LX, and JT.

## The Critical-Event Routines

My model has only five critical events: Search for Target, Select Target, Fire at Target, Assess Results of Fire, and End of Battle. These five events correspond to the five values (1-5) that KX, the event code, can assume. When KX is less than 5, Endgame calls the appropriate routine from line 1330. If KX equals 1, the Search for Target event code, the program calls the routine at line 1020.

The program defined LO immediately after the USR call in line 1240 as the sum of LX and IO. In the object module (see Listing 2), IO is the label of a 60-byte block where the clock scan routine finds the value of KX corresponding to the index of the low clock.

In the Basic program, IO contains the starting address, minus 1, of that block in high memory. So when Endgame adds LX to IO to get LO, it's pointing to the memory address where Endgame stores the event code for this particular element. When Endgame POKES a 2 into this address, it's setting the next event for this weapon to select target.

Now you're into that deadly monotony; since the program has loaded the event code, it must now load the corresponding event clock. IE in the Basic program contains the starting address, minus 1, of a 255-byte block in high memory. The preprocessing routine has loaded this block so that entering it with a uniformly distributed (1-255) random index returns a value from an exponentially distributed random variable whose expected value is one scaled second. The program multiplies this value by the mean-time-to-detect for this weapon system type (KD(L)), adds the product to the current time (JT) and loads it into the LXth event clock.

The Select Target routine is at lines 1040-1090. This routine also detects

### Listing 1 continued

```
3640 G$=INKEY$:IF G$="" THEN 3640
3650 IF G$<>GG$ THEN CLS:GOTO 3020
3660 IF J=NP(I) THEN CLS:GOTO 3710
3670 CLS:PRINT S$(I);" Order of Battle (contd.)":PRINT
3680 IF JH<1 THEN 3520
3690 LPRINT S$(I);" Order of Battle (contd.)":LPRINT "
3700 GOTO 3520
3710 NEXT I
3720 J7=JC:N=0:FOR I=1 TO 2:IF I=1 THEN J=0 ELSE J=LJ
3730 K=0:FOR L=1 TO NP(I):N=N+1:JB(N)=30-INT(RND(.1)*50)+1
3740 K=K+1:IF K>10 THEN K=1
3750 J7=J7+1:POKE J7,J:POKE J7+60,K
3760 NEXT L:K=0:NEXT I:M$=PP$:NX=0:CLS
3770 RETURN
3780 DATA .9,.9,1.3,.3:M$=PR$
3790 FOR K=1 TO 4:READ XM(K):NEXT K
3800 DATA 5,4,7,18
3810 FOR K=1 TO 4:READ PA(K):NEXT K
3820 DATA 11,8,5,2
3830 FOR K=1 TO 4:READ PV(K):IV(K)=PV(K)*100:NEXT K
3840 DATA 10,10,10,10
3850 FOR K=1 TO 4:READ KD(K):NEXT K
3860 DATA 90,90,90,90
3870 FOR K=1 TO 4:READ JL(K):NEXT K
3880 DATA .8,.9,.9,1,.6,.7,.7,.9,.7,.7,.7,.7,.7,.7,.7
3890 FOR K=1 TO 16:READ PZ(K):NEXT K
3900 DATA .5,.8,.8,1,.4,.6,.6,.8,.7,.7,.7,.7,.7,.7,.7
3910 FOR K=1 TO 16:READ P1(K):NEXT K
3920 J1=JR:J2=IH:J3=IK:J4=IE:J5=IO:J7=JC
3930 FOR J=1 TO 25
3940 FOR K=1 TO 10
3950 N=SQR(J[2+K[2]+.5
3960 GOSUB 4180
3970 J1=J1+1:POKE J1,N
3980 NEXT K,J
3990 FOR I=1 TO 30:J6=0:R=I*100
4000 FOR J=1 TO 4:X=XM(J):S={(R/1000)*X}[2:V=S*TP
4010 FOR K=1 TO 4:A=PA(K)
4020 N=(1-EXP(-A/V))*MM:J2=J2+1:POKE J2,N
4030 J6=J6+1:D=(PZ(J6)-P1(J6))/20:P=PZ(J6)-D
4040 N=P*MM:J3=J3+1:POKE J3,N
4050 NEXT K,J:GOSUB 4180
4060 NEXT I
4070 Z=1/255:DZ=Z:FOR I=1 TO MM
4080 KT=KT+1:IF KT=10 THEN KT=0
4090 N=ABS(LOG(Z))*18+1:J4=J4+1:POKE J4,N
4100 Z=Z+DZ:IF KT=0 THEN GOSUB 4180
4110 NEXT I
4120 M$=PP$:CLS:RETURN
4180 IF LM=0 THEN LM=1 ELSE LM=0
4190 IF LM=1 THEN PRINT@537,M$: ELSE PRINT@537,BL$:
4200 RETURN
4210 FOR I=-20480 TO -20267:READ J:POKE I,J:NEXT I:RETURN
4220 DATA 205,127,10,0,0,0,0,0,0,0
4225 DATA 34,214,176,201,205,127,10,0,0,0,0,0,0
4230 DATA 34,75,183,58,74,183,254,1,40,7
4240 DATA 62,1,50,74,183,24,4,175,50,74
4250 DATA 183,221,42,75,183,253,33,221,176,14
4260 DATA 1,58,74,183,254,1,40,14,50,216
4270 DATA 176,79,61,22,0,95,253,25,221,25
4280 DATA 221,25,58,216,176,71,33,255,255,34
4290 DATA 81,183,237,91,81,183,221,102,1,221
4300 DATA 110,0,183,237,82,48,18,25,34,81
4310 DATA 183,221,34,217,176,121,50,80,183,253
4320 DATA 126,0,50,79,183,58,74,183,254,1
4330 DATA 32,9,221,35,221,35,253,35,12,24
4340 DATA 7,221,43,221,43,253,43,13,16,190
4350 DATA 58,80,183,79,58,219,176,183,185,56
4360 DATA 13,62,1,50,77,183,50,80,183,50
4370 DATA 78,183,24,17,62,2,50,77,183,58
4380 DATA 219,176,79,58,80,183,183,153,50,78
4390 DATA 183,33,77,183,17,5,0,6,4,221
4400 DATA 42,214,176,126,35,221,119,0,221,25
4410 DATA 16,247,126,35,221,119,0,126,221,119
4420 DATA 1,201
```

End

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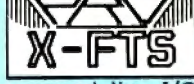
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when one side wipes out the other. That's why it sets KX equal to 5 (end of battle) and only sets KX to 2 when it finds a living target in the opposing force.

This routine seeks the highest priority target for the LXth element; it may cycle through the opposing force's order of battle as many as four times. When it selects the highest possible priority target, the routine loads the clock index of that target (LZ) into IG(LX). The routine loads the event code with 3 (fire at target) and loads the event clock with the current time plus time to lay the weapon (JL(L)) plus a random fraction of a second.

Lines 1100-1140 represent the firing routine. Here again, the program uses an elaborate structure of values POKED into high memory by the Basic preprocessing routine. This time the job is to

find the range to target without doing any dirty (floating-point) arithmetic.

The routine uses JD, the absolute difference between a weapon's X coordinate and its target's Y coordinate, and KD, the absolute difference between their Y coordinates, to enter the look-up table and get the range, at 100-meter resolution.

The routine then uses this distance and the round's speed, IV(L), to calculate time of flight. It loads the event clock with the current time plus this time of flight, and sets the event code to 4, assess result of fire. It accumulates in array MF the number of rounds fired by side and type for the output processor. The routine also saves the range to target in IR(LX) before it returns, since the assessment routine needs this value to determine the result of firing.

The assessment routine, lines 1150-

1230, first checks whether the weapon that fired has been killed in the meantime. Weapon types 1, 2, and 3 are treated as fire and forget, that is, once a round is fired, the effectiveness of the round doesn't depend on the firer's being alive. Weapon Type 4's missile aborts if its firer is killed before it reaches the target.

If the firer has been killed, the routine loads its event clock with infinity. Otherwise, it loads the event clock with the current time plus time required to lay the weapon (JL(L)) plus a random fraction of a second. Then the routine checks to see if the target has been killed already. If so, it loads the event clock with the current time plus a random fraction of a second, sets the event code to 1 (search for target), sets KX to zero to prevent an entry in the event history, and returns.

Program Listing 2. Source code for machine-language subroutine.

```

01000      ORG      $B000H;SCAN3/SRC (Feb. 6, 1985)
01010      GETHL   EQU 2687
01020      RETHL   EQU 2714
01030      FIRST  CALL  GETHL; FIRST  PUSH  HL
01040      NOP      ;
01050      NOP      ; POP      IX
01060      NOP      ; LD  L,(IX)
01070      NOP      ;
01080      NOP      ; LD  H,(IX+1)
01090      NOP
01100      LD      (K0),HL
01110      RET
01120      THEN  CALL  GETHL; THEN    PUSH  HL
01130      NOP      ;
01140      NOP      ; LD  L,(IX)
01150      NOP      ; LD  H,(IX+1)
01160      NOP
01170      NOP
01180      NOP
01190      LD      (IC),HL
01200      LD      A,(SW)
01210      CP      1
01220      JR      Z,ZERO
01230      LD      A,1
01240      LD      (SW),A
01250      JR      SCAN
01260      ZERO  XOR  A
01270      LD      (SW),A
01280      SCAN  LD      IX,(IC)
01290      LD      IX,IO
01300      LD      C,1
01310      LD      A,(SW)
01320      CP      1
01330      JR      Z,LDB
01340      LD      A,(NT)
01350      LD      C,A
01360      DEC  A
01370      LD      D,0
01380      LD      E,A
01390      ADD  IX,DE
01400      ADD  IX,DE
01410      ADD  IX,DE
01420      LDB   LD      A,(NT)
01430      LD      B,A
01440      LD      HL,$FFFFH
01450      LD      (JT),HL
01460      L1    LD      DE,(JT)
01470      LD      H,(IX+1)
01480      LD      L,(IX)
01490      OR      A
01500      SBC  HL,DE
01510      JR      NC,L2
01520      ADD  HL,DE
01530      LD      (JT),HL
01540      LD      (LOA),IX
01550      LD      A,C
01560      LD      (LX),A
01570      LD      A,(IX)
01580      LD      (KX),A
01590      L2    LD      A,(SW)
01600      CP      1
01610      JR      NZ,DECR
01620      INC  IX

01630      INC  IX
01640      INC  IX
01650      INC  C
01660      JR      JUMP
01670      DECR  DEC  IX
01680      DEC  IX
01690      DEC  IX
01700      DEC  C
01710      JUMP  DJNZ  L1
01720      LD      A,(LX)
01730      LD      C,A
01740      LD      A,(NB)
01750      OR      A
01760      CP      C
01770      JR      C,L3
01780      LD      A,1
01790      LD      (IV),A
01800      LD      A,(LX)
01810      LD      (JX),A
01820      JR      GO
01830      L3    LD      A,2
01840      LD      (IV),A
01850      LD      A,(NB)
01860      LD      C,A
01870      LD      A,(LX)
01880      OR      A
01890      SBC  A,C
01900      LD      (JX),A
01910      GO    LD      HL,IV
01920      LD      DE,5
01930      LD      B,4
01940      LD      IX,(K0)
01950      LEAP  LD      A,(HL)
01960      INC  HL
01970      LD      (IX),A
01980      ADD  IX,DE
01990      DJNZ  LEAP
02000      LD      A,(HL)
02010      INC  HL
02020      LD      (IX),A
02030      LD      A,(HL)
02040      LD      (IX+1),A
02050      RET
02060      K0   DEFS  2 ;CONTAINS ADDRESS OF BASIC VARIABLE IX
02070      NT   DEFS  1 ;TOTAL NUMBER ELEMENTS (Blue + Red)
02080      LOA  DEFS  2 ;CONTAINS ADDRESS OF LOW CLOCK
02090      NB   DEFS  1 ;NUMBER OF Blue ELEMENTS
02100      NR   DEFS  1 ;NUMBER OF Red ELEMENTS
02110      IO   DEFS  60 ;EVENT CODES
02120      IH   DEFS  480;P(H), SCALED 1=255
02130      IK   DEFS  480;P(K/H), SCALED 1=255
02140      IE   DEFS  255;EXPONENTIAL STRUCTURE
02150      JR   DEFS  250;RANGE LOOK-UP TABLE
02160      JC   DEFS  60 ;X COORDINATES
02170      KC   DEFS  60 ;Y COORDINATES
02180      SW   DEFS  1
02190      IC   DEFS  2 ;ADDRESS OF EVENT CLOCKS
02200      IV   DEFS  1 ;BASIC VARIABLE IX
02210      JX   DEFS  1 ;BASIC VARIABLE JX
02220      KX   DEFS  1 ;BASIC VARIABLE KX
02230      LX   DEFS  1 ;BASIC VARIABLE LX
02240      JT   DEFS  2 ;BASIC VARIABLE JT
02250      END

```

End



Using range to target (stored in IR(LX)), weapon type code, and target type code, the routine calculates an index that's added to IH and IK to find the scaled probability of hit and the scaled conditional kill probability. The routine first checks for a hit. If this fails, the routine simply returns, since it has already loaded the event clock and event code with fire again data.

Note that IJ keeps tabs on whether a strike is a miss, a hit, or a kill. Given a hit, the routine checks for a kill. If this fails, the routine returns. If the weapon scores a kill, the routine sets IL(LZ) to zero. If the target is type 4, or if the target's event code is less than four, the routine sets the target event clock to infinity.

The routine then calculates an index from side, weapon code, and target code, and accumulates data for the output processor to use in the killer/victim matrix. The routine loads the firing weapon's event clock with the current time plus a random fraction of a second, sets its event code to 1, and returns.

Lines 1280 and 1370 detect the end of battle. When the event code becomes 5, the postprocessing routine at lines 1660-2530 accumulates data collected during the replication. The program increments the replication index, NX, and checks whether NX equals NE, the number of replications specified. If this turns out to be the final replication, the program sets the flag KF and continues postprocessing.

Otherwise, the program stores data about the replication for later statistical analysis. The routine returns and the program calls the initiation routine in line 1580. This routine resurrects the dead, sets all event codes to search for target, seeds the event clocks with random values not greater than two seconds, sets all else to zero, and returns. And you're back in the same old wearisome grind again.

## Other Matters

So much for the game loops. The postprocessing routine simply calculates sample means and standard deviations, displays this information on the screen, and writes to the printer if necessary.

Except for the preprocessing routine, the earlier parts of the program are fairly commonplace. The subroutine at lines 2670-3010 reads and defines constants. The one at lines 3020-3770 is an interactive user input routine. The subroutine at lines 4210-4360 reads the object module for the clock scan routine and POKEs it into high memory. The



subroutine at lines 2540-2570 initializes the output processor accumulators at the beginning of a simulation.

The routine at lines 3780-4170 reads inputs and also does the preprocessing. This latter function begins at line 3920. Preprocessing is an important part of this kind of simulation, especially when you're using a microprocessor with an 8-bit data bus. While preprocessing is done only once, the game loops use its output thousands and thousands of times.

Of particular concern in preprocessing is to make it unnecessary for the game loops to do any floating-point (known in the trade as dirty) arithmetic.

Line 3920 equates J1-J7 with addresses in high memory where the program will POKE data in a convenient form for the game loops. Lines 3930-3980 build the range look-up table in high memory. Since the range resolution of the simulation is 100 meters, this scheme can handle delta X and delta Y values up to 25,500 meters.

Lines 3990-4060 build the hit and conditional kill probability tables in high memory. The lines 4070-4110 build the exponential data structure used in the game loops when KX equals 1, search for target. Search time is determined by mean time to detect, plus a random entry.

Lines 4180-4200 blink a message on and off during pre- and postprocessing to reassure the user that the program hasn't gone into the high fantods.

## In Defense of Micros

It's commonly assumed that it takes a mainframe to handle a computer simulation, but that's not so. I think interpreted Basic is more of a limitation than the microprocessor itself, and I find a compiler essential.

I kept Endgame simple so it would run on a 32K machine; a 48K computer should be able to handle 200 or more elements, a larger battlefield, and more complex weapon/target combinations. Mainframes or no mainframes, I expect to be using my Models 4 and 4P for simulation work for some time to come. ■

*Joe R. Capps is an operations analyst who specializes in simulations of armed combat. Recently, he's been applying artificial intelligence techniques to combat simulations. You can write to him at 3052 Holmes Run Road, Falls Church, VA 22042.*

## Related Articles

- Anderson, John M., "Line Up!," March 1980, p. 174. A Model I queueing simulation.
- Cangro, Ronald A., "The Business of Planning," September 1983, p. 74. A Model I/III tutorial about Monte Carlo simulation techniques.
- Neibauer, Alan, "Queue Theory," December 1981, p. 368. How queueing simulations work.

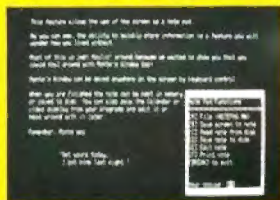


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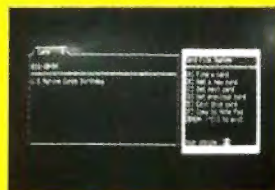


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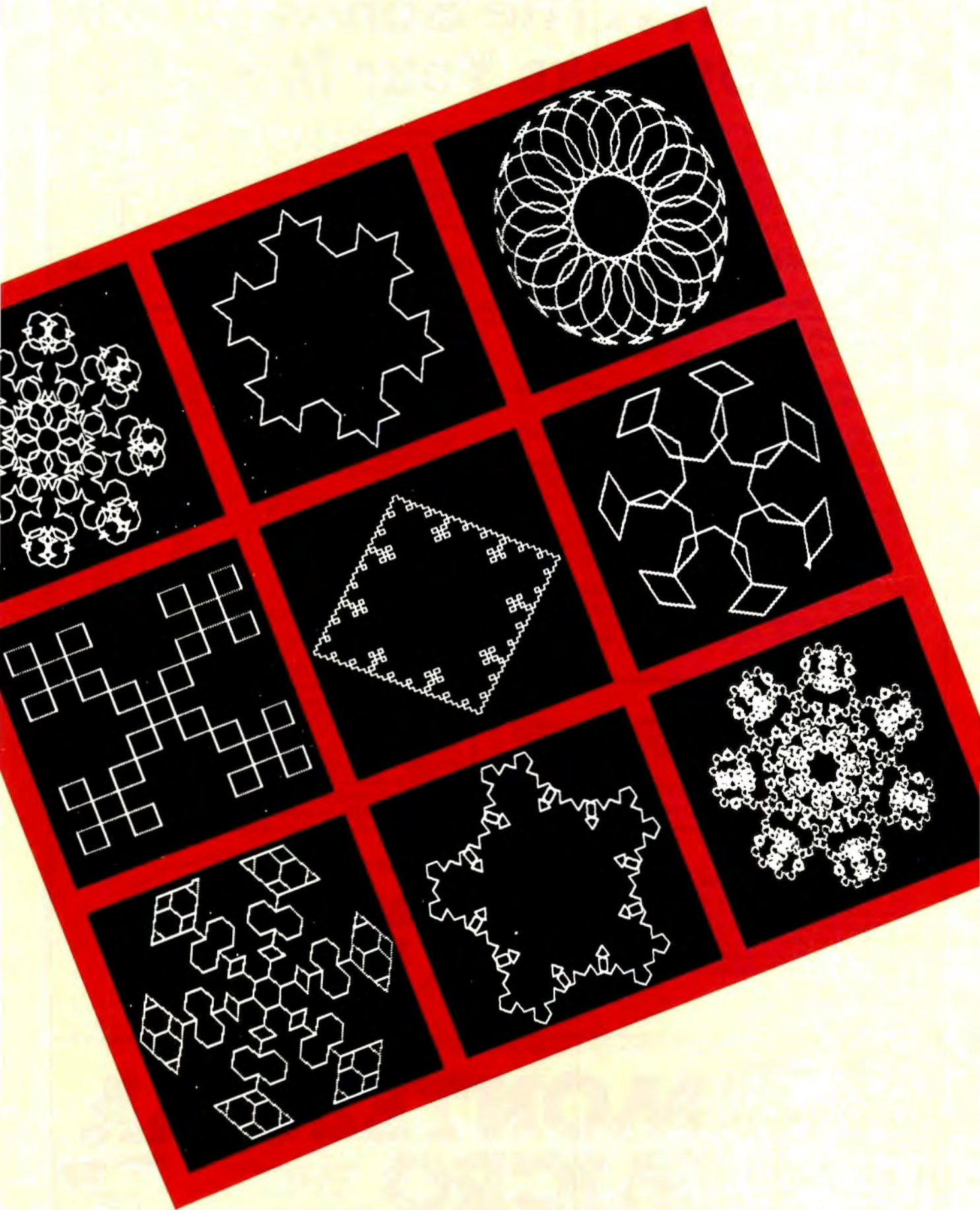


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**W**hen it comes to drawing fractals, the more detail you can get the better. That's because, by definition, fractals are geometric shapes with infinite detail. I've modified Michiel van de Panne's Model III fractals program (December 1984, p. 114) for systems equipped with high-resolution graphics. Increased screen resolution means you can now create more detailed, complex versions of van de Panne's fractals.

The modified program runs on the Models III and 4 with high-resolution boards. With the changes listed in the Table, it also works on the Tandy 1000 and 1200 (see the Photos). I've also added an option that lets you print the fractals, provided you have a graphics printer.

### The Fractals Phenomenon

The December article explained the theory of fractals, so I'll keep my explanation brief. Fractal is a term mathematicians use to describe a kind of shape that occurs in nature. Fractals have detail that multiplies as it gets smaller, like a tree with a single trunk, several branches, and thousands of twigs. In true fractals, this detail is infinite. Another characteristic is that the smaller parts' shapes are similar to the outline of the object as a whole.

In nature, mountains and coastlines, crystals, and even broccoli can be fractals. In these cases, the detail isn't neces-

sarily a perfect copy of the whole. However, in regular, or geometric, fractals, all parts are exactly the same.

The geometric fractal in Fig. 1, for example, begins with an equilateral triangle. Each side of the large triangle sprouts a smaller triangle, each side of which sprouts a smaller triangle, each side of which sprouts a still smaller triangle.

### A Wealth of Forms

My modified version of van de Panne's program (Program Listing 1) draws regular fractals like those in Fig. 1. Three specifications determine the fractal's shape. The first is the number of sides of the basic shape: Fig. 1 has three, Fig. 2 four.

Second, you must specify whether the program adds or subtracts smaller shapes. When the program subtracts volume from the basic shape, as in Fig. 2, you get what's called an inverse fractal. If the program adds volume, as in Fig. 1, the fractal is noninverse.

The third factor is the number of levels, that is, the number of times the program adds or subtracts smaller shapes. As the number of levels increases, the complexity of the fractal also increases. Even with high-resolution graphics, four levels is about as high as you can go.

When you type in and run the Listing, the program prompts you for the number of sides, inverse (type in Y) or

noninverse (type in N), and the number of levels. Then the program starts drawing the fractal. Don't expect complex fractals in seconds; when you get up to four levels, it can take well over an hour to finish a fractal.

The Listing's drawing algorithm is the same as van de Panne's, except for line 350, which uses the Line command to draw lines.

Line 20 establishes screen pixel size; you can easily modify the program to accommodate different screen resolutions.

I changed lines 230-250 to simplify the scaling necessary for multiple levels.


The printout routine at the end of the program uses the graphics utility GPRT2. Because I found that the printer's vertical and horizontal scales weren't equal, I adjusted line 340 accordingly. ■

---

*You can write to Steve Justice at 128 Joann Drive, Moses Lake, WA 98837.*

---

### System Requirements

Models III and 4 with   
High-Resolution board, Basic G  
Models 1000 and 1200, Basic  
32K RAM  
Printer optional

---

# Fractals in Focus

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by Steve Justice

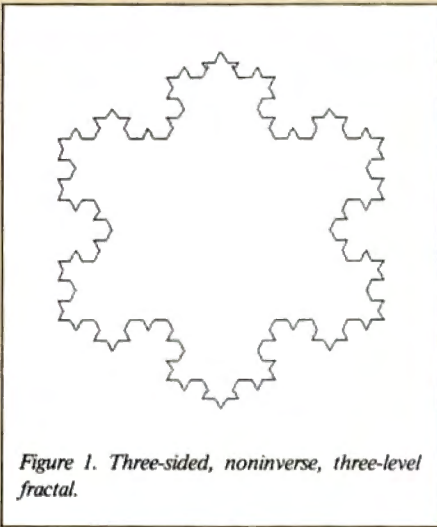


Figure 1. Three-sided, noninverse, three-level fractal.

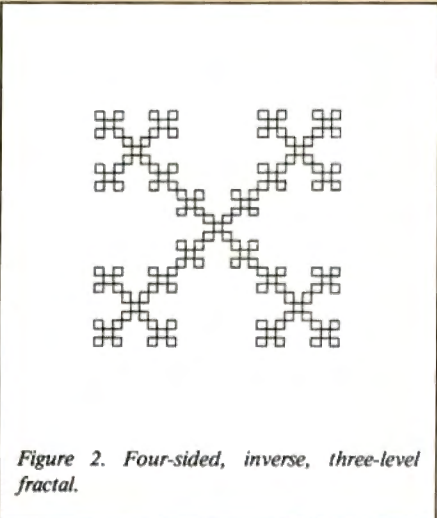


Figure 2. Four-sided, inverse, three-level fractal.

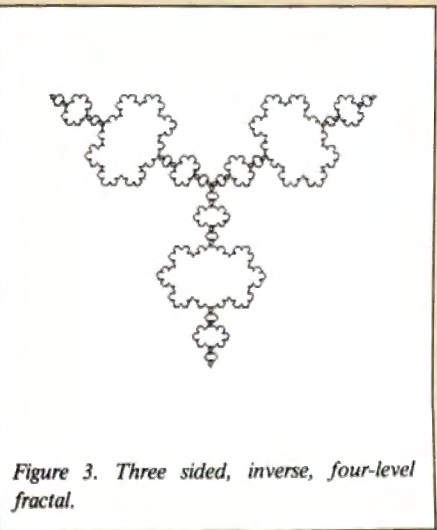


Figure 3. Three sided, inverse, four-level fractal.

```

10 KEY OFF : SCREEN 2
25 SF=.8
260 CLS : PSET (X2,Y2)
30 INPUT "NUMBER OF SIDES";S
35 REM BEGINNING X AND Y (SCALED TO SCREEN SIZE )
40 CX=MX*.7:CY=MY*.8:X2=CX:Y2=MY+1-CY
60 INPUT"INVERSE";I$:I$=LEFT$(I$,1)
70 REM ANGLES TO TURN RIGHT AND LEFT
80 R=-360/S:L=R+180
90 IFI$="Y" OR I$="y" THEN C$="A":W=R:R=-L:L=-W ELSE C$="R"
100 A$=C$
110 IF I$<>"Y" AND I$<>"y" THEN 140
120 A1$="R":S1=S-2:FOR N=1 TO S1:A1$=A1$+"L":NEXT N:A1$=A1$+"R"
130 GOTO 160
140 A1$="L":S1=S-2:FOR N=1 TO S1:A1$=A1$+"R":NEXT N
150 A1$=A1$+"L"
160 INPUT"NUMBER OF LEVELS";LE:IF LE=1 THEN 230
170 REM EXPAND STRING FOR MULTIPLE LEVELS
190 FOR N=2 TO LE:LN=LEN(A$)
200 FOR N1=1 TO LN:B$=B$+MID$(A$,N1,1)+A1$:NEXT N1
210 A$=B$:B$="":NEXT N
230 REM SCALE SIZE OF DIAGRAM TO FIT ON SCREEN
240 LL=MX*1.25/(S*3(LE))
250 REM CLEAR GRAPHICS SCREEN AND SET TO STARTING X,Y
260 CLR:GLOCATE (X2,Y2),0:SCREEN 0
265 REM START DRAWING FIGURE
270 FOR Z=1 TO S
280 FOR N=1 TO LEN(A$)
290 B1$=MID$(A$,N,1)+A1$
300 FOR N1=1 TO LEN(B1$):B$=MID$(B1$,N1,1)
310 IF B$="A" THEN A=A+W:GOTO 330
320 IF B$="L" THEN A=A+L ELSE A=A+R
330 A1=A*CF
340 X=X+LL*COS(A1):Y=Y+LL*SIN(A1)
350 XP=INT(X):YP=INT(Y):X1=XP+CX:Y1=241-(YP/2+CY):LINE (X2,Y2)-(X1,Y1)
360 X2=X1:Y2=Y1
370 NEXT N1:NEXT N:NEXT Z
380 REM END OF FIGURE
390 REM
400 A$=""
410 A$=INKEY$: IF A$="" THEN 410
420 SCREEN 1:CLS:PRINT "SEND TO PRINTER?";:Y$=""
430 Y$=INKEY$:IF Y$="" THEN 430
435 REM SEND TO PRINTER - GRAPHICS UTILITY
440 IF Y$="Y" OR Y$="y" THEN SYSTEM "GPRT2"
445 REM
450 PRINT:PRINT "Another diagram?";:Y$=""
460 Y$=INKEY$: IF Y$="" THEN 460
470 IF Y$="Y" OR Y$="y" THEN RUN
480 CLS:END

```

Table. Modifications to the Listing for the Tandy 1000/1200.

*Program Listing. High-resolution fractals program.*

```

10 REM FRACTALS FOR THE MODEL 3/4 WITH HIGH RESOLUTION
12 REM
15 REM SCREEN PIXEL SIZES
20 CLEAR 2000 :CLS :CF=3.14159/180 :MX=620 :MY=240
30 INPUT "NUMBER OF SIDES";S
35 REM BEGINNING X AND Y (SCALED TO SCREEN SIZE )
40 CX=MX*.7:CY=MY*.8:X2=CX:Y2=MY+1-CY
60 INPUT"INVERSE";I$:I$=LEFT$(I$,1)
70 REM ANGLES TO TURN RIGHT AND LEFT
80 R=-360/S:L=R+180
90 IFI$="Y" OR I$="y" THEN C$="A":W=R:R=-L:L=-W ELSE C$="R"
100 A$=C$
110 IF I$<>"Y" AND I$<>"y" THEN 140
120 A1$="R":S1=S-2:FOR N=1 TO S1:A1$=A1$+"L":NEXT N:A1$=A1$+"R"
130 GOTO 160
140 A1$="L":S1=S-2:FOR N=1 TO S1:A1$=A1$+"R":NEXT N
150 A1$=A1$+"L"
160 INPUT"NUMBER OF LEVELS";LE:IF LE=1 THEN 230
170 REM EXPAND STRING FOR MULTIPLE LEVELS
190 FOR N=2 TO LE:LN=LEN(A$)
200 FOR N1=1 TO LN:B$=B$+MID$(A$,N1,1)+A1$:NEXT N1
210 A$=B$:B$="":NEXT N
230 REM SCALE SIZE OF DIAGRAM TO FIT ON SCREEN
240 LL=MX*1.25/(S*3(LE))
250 REM CLEAR GRAPHICS SCREEN AND SET TO STARTING X,Y
260 CLR:GLOCATE (X2,Y2),0:SCREEN 0
265 REM START DRAWING FIGURE
270 FOR Z=1 TO S
280 FOR N=1 TO LEN(A$)
290 B1$=MID$(A$,N,1)+A1$
300 FOR N1=1 TO LEN(B1$):B$=MID$(B1$,N1,1)
310 IF B$="A" THEN A=A+W:GOTO 330
320 IF B$="L" THEN A=A+L ELSE A=A+R
330 A1=A*CF
340 X=X+LL*COS(A1):Y=Y+LL*SIN(A1)
350 XP=INT(X):YP=INT(Y):X1=XP+CX:Y1=241-(YP/2+CY):LINE (X2,Y2)-(X1,Y1)
360 X2=X1:Y2=Y1
370 NEXT N1:NEXT N:NEXT Z
380 REM END OF FIGURE
390 REM
400 A$=""
410 A$=INKEY$: IF A$="" THEN 410
420 SCREEN 1:CLS:PRINT "SEND TO PRINTER?";:Y$=""
430 Y$=INKEY$:IF Y$="" THEN 430
435 REM SEND TO PRINTER - GRAPHICS UTILITY
440 IF Y$="Y" OR Y$="y" THEN SYSTEM "GPRT2"
445 REM
450 PRINT:PRINT "Another diagram?";:Y$=""
460 Y$=INKEY$: IF Y$="" THEN 460
470 IF Y$="Y" OR Y$="y" THEN RUN
480 CLS:END

```

End



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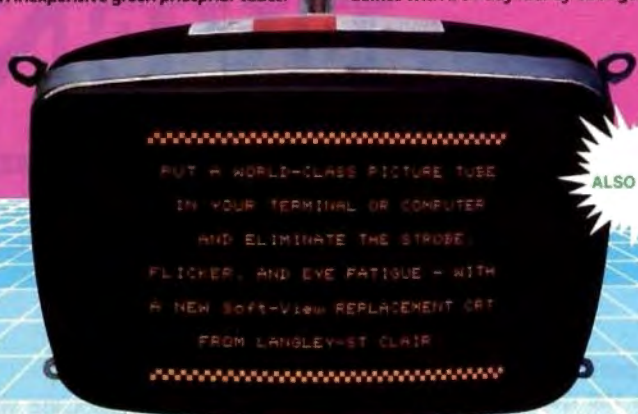


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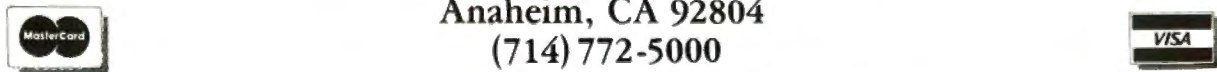
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# CURRENT EVENTS

Power surges can prove fatal to computer equipment and data. Learn what causes destructive current oscillations and what to look for in effective protection.

**Y**ou probably don't often question the quality of the electric current coming into your house or office. Usually, whatever the power company and Mother Nature conspire to send down the line is good enough.

But that's not the case if you're using computer equipment. The effects of uneven electrical impulses, called voltage spikes or surges, can have a devastating effect on both equipment and data. What might appear as minor glitches can cost hundreds or thousands of dollars in hardware repairs, not to mention the cost of lost data. What's worse, some power protection schemes offered by glib salesmen aren't any more effective than snake oil against the common cold.

The power supply on the Models III and 4 is relatively dependable—but it can't handle a 1,000-volt surge. It converts 120-volt household current into 5- and 12-volt inputs to the Z80 processor, memory circuits, and disk drives.

A spike can come in on any of the three lines associated with the electrical plug (hot, neutral, and ground) on your computer. It burns up the power supply, then travels into the microprocessor with devastating results. Small surges don't wreck the computer, but often imitate the computer's interrupt signal, causing spontaneous reboots and wiping out memory.

Spikes also affect peripherals. Many printers run under microprocessor control and contain buffer memory chips that are just as vulnerable to power irregularities as the system unit. The same holds true for external hard disks, printer buffers, terminals, and smart peripherals.

## Surge Sources

Most people associate voltage surges with lightning, and sensibly refrain from using the computer during electrical storms. But surges have many other sources.

Everyday operations at a power plant, such as firing up an additional boiler to meet increased demand, can cause deadly spikes. Arc welding, which uses tremendous electrical currents, can also wreak havoc.

Voltage spikes can also occur when you remove loads from circuits. When a fuse blows, the overloaded circuit snaps off, abruptly removing the load from the electrical system. The system compensates for the sudden reduction in power load in microseconds, but that's all that's necessary to zap a computer and its peripherals.

Less dramatic and more common events, like turning on and off appliances, generate small spikes that are disruptive, but don't cause permanent damage.

Finally, radio frequency interference (RFI) and electromagnetic interference (EMI) are line noise generated by hair dryers, electric motors, and other sources. RFI/EMI is a very small voltage surge that can cause video glitches, screen jumps and wobbles, and garbled data.

## Limited Tolerances

The voltage at which surges are disruptive varies with temperature, humidity, and a host of other variables. But even small voltage surges that reach the microprocessor can cause damage.

Transistor-to-transistor logic (TTL) circuitry operates in binary, with zero volts as "off" and 5 volts as "on." The Z80 microprocessor in the Models I, II, III, and 4 interprets voltages from  $-.3$  to  $.8$  volts as off and voltages from 2 to 5.25 volts as on. Voltages between these ranges are ambiguous. A surge of 1.2 volts is enough to bomb a program or scramble data. Voltages above 7 volts can destroy the Z80 in a wink.

Before a surge reaches the microprocessor, it must pass through the computer's power supply, which can absorb some minor disruptions. What the power supply can't absorb passes to the central processing unit (CPU).

The Z80 has a nonmaskable interrupt that can run a shutdown program if it detects a fatal power disturbance. Most Z80 microcomputers, however, have a switching power supply that uses a microchip to take slices of the incoming 120-volt ac waveform to create 5 and



Photo 1. EPD's KIWI surge suppressor.



12-volt dc output. A switching power supply can't alert the microprocessor of a surge on the way—and this is where a surge hits first.

From my experience, the Model I tends to reboot frequently from low-level line surges, while the Models III and 4 tend to be more steady. There's no telling how big a surge your computer can handle, however, so your best bet is to overprotect.

### Protection Rackets

The traditional approach to protecting computers and peripherals from spikes is to unplug the computer and peripherals when they're not in use.

This solution is safe and cheap. Unfortunately, it's only effective when you're not using the computer. The only way to protect a running computer from spikes is by using a clamping device, commonly called a surge protector. These devices usually include an RFI/EMI filter and several protected power outlets.

Selecting a "power strip," however, isn't as simple as picking up any unit that claims to clean up line currents. Some devices labeled "line filters" or "power conditioners" are actually nothing more than RFI/EMI filters. Other devices, properly labeled "power surge protectors," contain fuses or other mechanical devices that cut the circuit when a surge occurs—but within a few 10ths of a second, not in the microseconds required for true protection.

### MOVs and Gas Discharge Tubes

Most surge suppressors, such as EPD's Peach and Kiwi units, use metal oxide varistors (MOVs) for voltage clamping (see Photo 1). MOVs are resistors whose resistance decreases as volt-



Photo 3. The Ruby and Sapphire models from Curtis Manufacturing.

ages increase. They provide an "easy out" for a voltage surge—an out that avoids valuable computer equipment.

A typical surge protection scheme wires the varistor between the line carrying the current to the protected outlets (the hot line) and the ground wire. At normal voltages the resistance on the varistor is high and the current goes to the outlets.

When a power surge occurs, the increased voltage reduces the resistance of the varistor, opening a path for the surge to the ground wire. Since electricity seeks the path of least resistance, the surge goes through the non-resisting varistor to the ground.

This is called common mode protection. While this is the most frequent source of surges, a spike can also travel through the neutral line, the ground line, or through a combination of lines.

The best surge protectors, like Severts-Zorman's Zapstar S-5P, contain three MOVs that protect against

surges in common mode (hot to ground), normal mode (hot to neutral), and from neutral to ground (see Photo 2).

Some units also include a gas discharge tube comprising two disks separated by a tube of radioactive gas. A surge jumps across the gap between the disks and is shunted from your equipment. Gas discharge tubes aren't as fast as MOVs, but they can accommodate a larger surge.

### Manufacturer Ratings

Unlike car and appliance purchases, surge protectors have no common standard for comparison. Some are rated in amperes, some in joules, some in watts, and many carry no ratings at all.

The most reliable standard for comparison is the joule rating. A joule is a measure of electrical energy over a time constant (watts/microseconds). Joule ratings range from a minimum of 40 joules to a maximum protection of 200 joules. If the rating units differ or if a protector carries no rating, you can determine its reliability by looking inside the unit.

With minor differences only two types of varistors are appropriate for surge protection on 120-volt ac lines: the 14 millimeter MOV (Panasonic Series 20 or General Electric MOVs with a part number beginning with 10) and the 20 millimeter MOV (Panasonic Series 20 or General Electric MOVs with a part number beginning 20). The latter handles roughly twice the surge of a 14 millimeter MOV.

If you're curious what level of protection you have, or if you've convinced the salesman to let you look inside, look for the MOVs described above (see Photo 2). Look for small, dime-sized components covered with red plastic, with two wires coming from the bot-

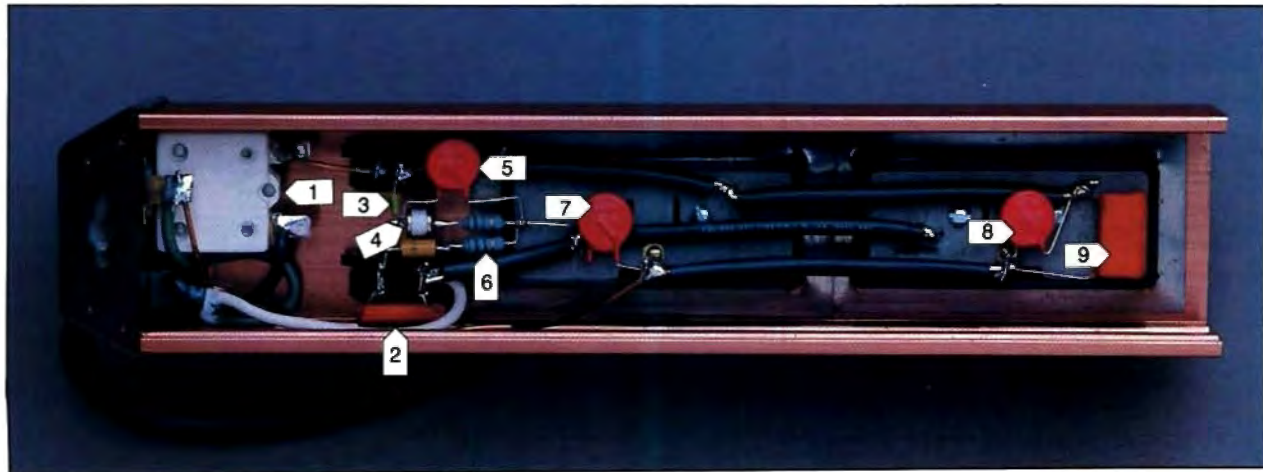


Photo 2. Innards of the Severts-Zorman Zapstar S-6P surge suppressor. (1) 15-amp circuit breaker. (2) Filter capacitor (hot to neutral). (3) Fuse. (4) Gas discharge tube. (5) MOV (hot to neutral). (6) Current limit resistors. (7) MOV (neutral to ground). (8) MOV (hot to ground). (9) Filter capacitor (hot to ground). (Unit courtesy of Severts-Zorman Engineering.)

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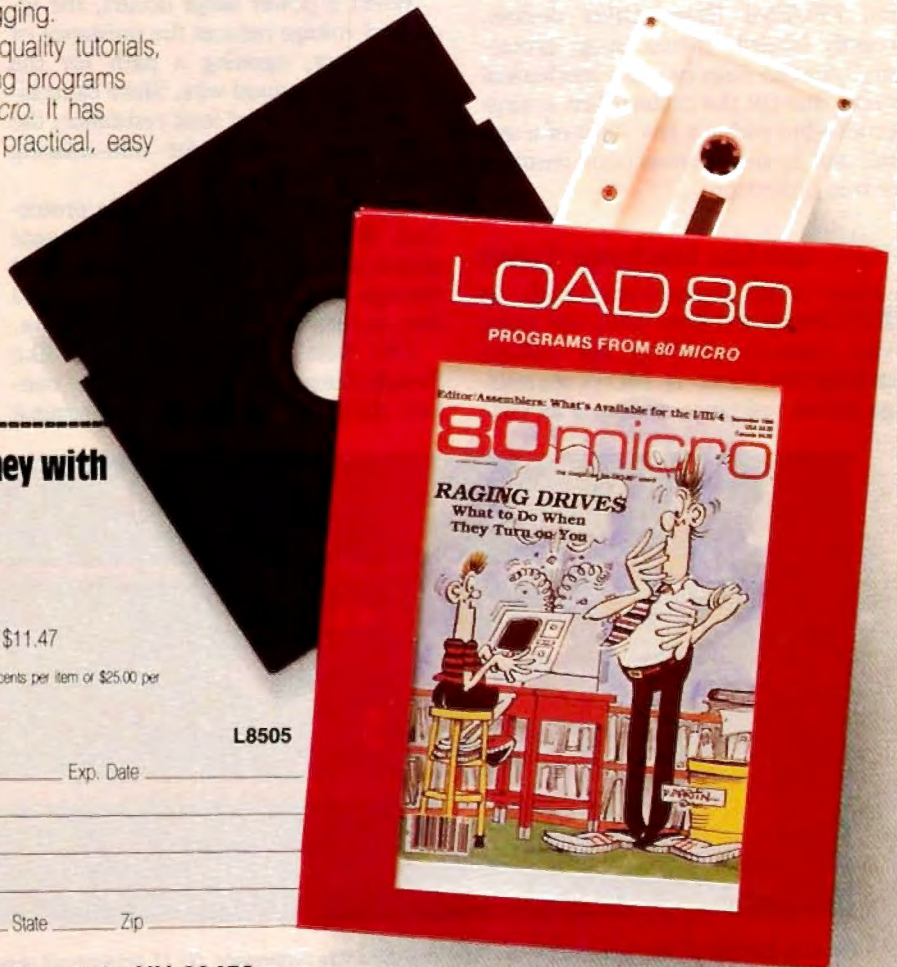
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tom. If you find three MOVs, you're well protected. If you find none, look for another unit.

If you can't look inside the unit, check for a label stating conformance to the Institute of Electrical and Electronics Engineers (IEEE) standard. Protectors meeting this standard will

protect your equipment from normal mode surges.

### Selecting Protection

When shopping for a surge protector, look for one that uses voltage clamping and that protects in normal and common modes. Many units, including the

Curtis Sapphire and Ruby models, provide RFI/EMI filtering in addition to surge protection (see Photo 3). Table 1 provides a sampling of surge suppressors and their features; Table 2 lists manufacturers addresses.

If a product states that it protects against voltage surges but doesn't in-

Manufacturer	Product	RFI/EMI Filtering	MOVs	Gas Discharge Tubes	Normal Mode	Common Mode	Joule Rating	On/Off Switch	Number Of Outlets	Cord Length	Status Light(s)	Price	Warranty	Comments
Curtis Mfg.	Sapphire	Y	3	0	Y	Y	70	Y	3	0	Y	\$79.95	Lifetime	
	Ruby	Y	3	0	Y	Y	70	Y	6	6	N	\$89.95	Lifetime	
	Diamond	N	3	0	Y	Y	70	Y	6	0	Y	\$49.95	Lifetime	
Computer Accessories	Powerline 4	Y	3	0	Y	Y	NA	Y	4	6	Y	\$49.95	1 yr.	
	Powerline 6	Y	3	0	Y	Y	NA	Y	6	6	Y	\$79.95	1 yr.	
Computer Power Solutions	System 3	N	3	0	Y	Y	150	N	1	0	Y	\$18.95	5 yrs.	
	System 4	N	4	0	Y	Y	150	Y	6	6	Y	\$79.95	5 yrs.	
	System 12	N	3	0	Y	Y	150	Y	6	6	Y	\$59.95	5 yrs.	
Dynatech	Surge Sentry MSF	Y	3	1	Y	Y	100	Y	6	6	Y	\$99.95	2 yrs.	Reset switch
	Surge Sentry SC	Y	3	1	Y	Y	100	Y	5	6	Y	\$179.95	2 yrs.	
	Surge Sentry DSF	Y	3	1	Y	Y	100	N	4	6	Y	\$129.95	2 yrs.	
Electronic Specialists	SKF-33	Y	1	0	Y	N	70	N	3	3	Y	\$49.95	5 yrs.	
	SKF-33M	Y	3	0	Y	Y	210	N	3	3	Y	\$87.96	5 yrs.	
	SKF-33S	Y	1	0	Y	N	70	N	3	3	Y	\$66.95	5 yrs.	
EPD	Kiwi	N	3	0	Y	Y	NA	N	1	0	Y	\$19.95	5 yrs.	
	Peach	Y	3	0	Y	Y	NA	N	3	0	Y	\$59.95	5 yrs.	
	Squash	Y	3	0	Y	Y	NA	Y	4	6	Y	\$99.95	5 yrs.	
Indus-Tool	Isobar 4-6	Y	3	0	Y	Y	70	Y	4	6	Y	\$79.95	1 yr.	
	Isobar 2-6	Y	3	0	Y	Y	70	Y	2	6	Y	\$54.95	1 yr.	
	Isobar 8-15	Y	3	0	Y	Y	70	Y	8	15	Y	\$97.95	1 yr.	
Kalgjo Electronics	Mini II	Y	3	0	Y	Y	100	N	2	6	Y	\$49.95	1 yr.	Switch for each outlet
	Quad II	Y	3	0	Y	Y	135	N	4	0	Y	\$59.95	1 yr.	
	DPC	Y	3	0	Y	Y	135	Y	8	7	Y	\$89.95	1 yr.	
MFJ Enterprises	MFJ 1105	N	3	0	Y	Y	50	Y	12	6	Y	\$44.95	1 yr.	
	MFJ 1107	Y	3	0	Y	Y	50	Y	8	6	Y	\$79.95	1 yr.	
	MFJ 1109	Y	3	0	Y	Y	50	Y	8	6	Y	\$129.95	1 yr.	
Networx	Wire Tree Plus	Y	3	2	Y	Y	120	Y	6	9	Y	\$99.95	5 yrs.	Modem Protection
	Wire Tree	Y	1	0	Y	N	40	Y	4	9	Y	\$69.95	5 yrs.	
	Wire Cube	Y	1	0	Y	N	40	N	1	0	Y	\$29.95	5 yrs.	
Para Systems	Clean Power 1200	Y	1	0	Y	Y	100	Y	4	6	Y	\$49.95	2 yrs.	Flame retardant case
PMC Industries	Model 061	N	3	0	Y	Y	70	Y	4	0	Y	\$59.95	1 yr.	Reset switch
	Model 062	Y	3	0	Y	Y	70	Y	2	0	Y	\$79.95	1 yr.	
	Model 038	Y	6	0	Y	Y	70	Y	6	6	Y	\$125.00	1 yr.	
PTI Datashield	Model 100	Y	4	1	Y	Y	200	N	6	6	Y	\$99.95	Lifetime	Reset switch
	Model 110 AMS	Y	4	1	Y	Y	200	N	6	6	Y	\$99.95	Lifetime	Reset switch
	Model 575	Y	4	1	Y	Y	200	Y	4	6	N	\$59.95	Lifetime	
Severts-Zorman Engineering	Zapstar S-6	Y	4	0	Y	Y	800	Y	6	6	Y	\$59.95	Lifetime	
	Zapstar S-6P	Y	3	1	Y	Y	200	Y	6	6	Y	\$79.95	Lifetime	
	Zapstar S-4	Y	3	0	Y	Y	50	Y	4	6	Y	\$39.95	Lifetime	
Tandy Corp./Radio Shack	Automatic Power Strip #26-1429	N	2	0	Y	Y	NA	Y	6	6	N	\$69.95	3 mos.	
	Spike Protector #26-1244	Y	2	0	Y	Y	50	Y	8	6	Y	NA	3 mos.	
Verité	Veri/Protector	N	1	0	Y	N	90	Y	4	6	Y	\$49.95	1 yr.	Reset switch
	Veri/Protector II	Y	1	0	Y	N	90	Y	4	6	Y	\$69.95	1 yr.	Reset switch
	Veri/Protector III	Y	1	0	Y	N	90	Y	4	6	Y	\$189.00	1 yr.	Reset switch

Table 1. Features of sample surge protectors. NA means not available.

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603-924-7803

Dynatech Computer Power Inc.  
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Electronic Protection Devices Inc.  
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Stoneham, MA 02180  
617-279-0424  
800-343-1813

Electronic Specialists Inc.  
171 S. Main St.  
Natick, MA 01760  
617-655-1532

Indus-Tool  
325 W. Huron St.  
Chicago, IL 60610  
312-642-6871  
800-662-5021 (orders only)

Kaglo Electronics Co. Inc.  
6584 Ruch Road  
Bethlehem, PA 18107  
215-837-0700

MFJ Enterprises Inc.  
921 Louisville Road  
Starkville, MS 39739  
800-647-1800  
601-323-5869

Networkx  
203 Harrison Place  
Brooklyn, NY 11237  
800-522-2222

Para Systems Inc.  
11425 Mathis St., Suite 404  
Dallas, TX 75234  
214-869-1688

PMC Industries  
9353 Activity Road, Suite K  
San Diego, CA 92126  
619-695-3520

PTI Datasield  
320 River St.  
Santa Cruz, CA 95060  
408-429-6881

Severts-Zorman Engineering  
7144 W. McNab Road  
Fort Lauderdale, FL 33319  
305-722-7770

Tandy Corporation/Radio Shack  
1800 One Tandy Center  
Fort Worth, TX 76102  
817-390-3700

Verité  
1614 W. Anaheim Road  
Harbor City, CA 90710  
213-325-0200

Table 2. List of manufacturers' addresses.

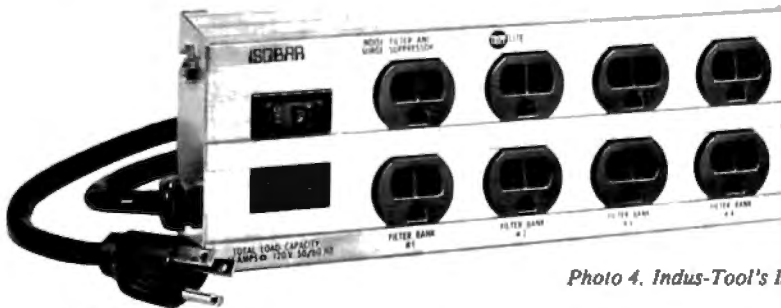


Photo 4. Indus-Tool's Isobar 8-15.

dicating voltage clamping, the device probably contains only a filter circuit. A line filter can control RFI/EMI noise, but it's the large surges that ruin equipment.

Price is no indicator of quality when choosing a surge protector. Some of the cheapest units feature full protection against voltage surges, and some costly units contain no surge protection at all.

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Photo 5. The Kalgo Electronics Quad II.

reliability is to buy a device that states that it uses MOV voltage clamping with RFI/EMI filtration.

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Some suppressors include an extension cord. Indus-Tool's Isobar 8-15, for example, includes a 15-foot cord, while Kalgo Electronic's Quad II (see Photos

4 and 5) plugs directly into an outlet. Units are also available with a main switch that turns all outlets off at once, or with LED displays that tell you system status and/or whether a spike has occurred. Such niceties add to the price of surge protection, but might be worth the extra cash to you.

### Caveat

Finally, even the best surge protectors have their limits. A surge containing more energy than a surge protector's rating "splashes over" into your equipment. MOV-equipped surge protectors handle most surges with no splashover, but nothing can protect your equipment against a direct lightning hit.

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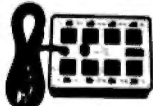
*Mark D. West is a doctoral student in journalism at the University of North Carolina at Chapel Hill. Contact him at P.O. Box 325, Chapel Hill, NC 27514.*

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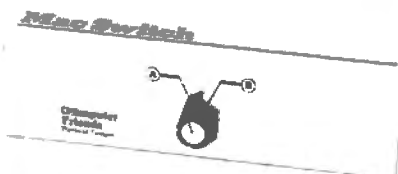
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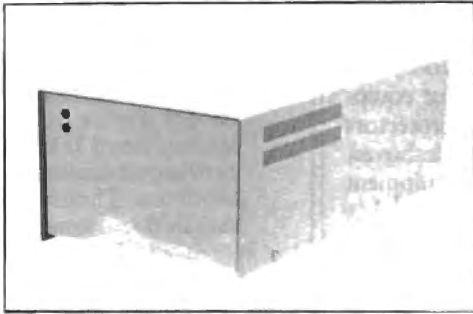
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# RESTRICTED ENTRY

by José. E. Anaya

Prompter lets you specify the kind of prompted input your programs accept.

**Y**ou're finished entering data in an application program, and at the file name prompt you type in DATABASE3 and hit the enter key. Everything is fine until you look for the DATABASE2 file. It's gone. You forgot: The input routine accepts only eight characters. You wrote over DATABASE2.

My Basic input routine, Prompter, solves this problem by letting you specify the type and number of characters a program accepts as input. In addition, Prompter replaces the question mark prompt with a blinking cursor, preserves the screen line following input (most input routines clear the screen), allows multiple inputs on the same line, and rejects input that erases the display.

## The Shortcomings Of Input Routines

Input and LINEINPUT statements often cause program crashes. Both accept any character you type in from the keyboard, including destructive input such as the clear key or line feeds.

These input statements accept characters typed in from the keyboard up to the limit of the input buffer. Many programs issue a caveat: "Enter a file name of up to eight characters." However, you still might accidentally enter more characters.

Also, these input statements limit you to entering only characters represented on the keyboard. You can't, for example, enter ASCII 191 (a block character).

Finally, input statements erase the screen after you press the enter key

because Basic inserts a carriage return as a terminator.

## The Routine

You can insert Prompter anywhere in a program. Models I, III, and 4 owners should use Program Listing 1. Program Listings 2 and 3 contain changes for running the routine on the Models 1000/1200 and the Model 2000.

To use the routine, you first have to define several variables to control the cursor and represent valid characters as shown in lines 60 and 80, respectively. Do this early in the program.

Variable BS\$ in line 60 is the backspace character. I use it to erase the last character typed in. The Models 1000 and 1200 recognize CHR\$(8) as the backspace key input but it doesn't per-



form the back-up and erase functions—it prints a block character. Use CHR\$(29) to move the cursor left and CHR\$(32) to erase.

Variable CR\$ is the carriage return character for the enter key, and PT\$ is the cursor character. I use ASCII 132—a block character—as the cursor.

You must also define strings of valid characters the routine can accept. You can define other sets of characters or enhance those shown in line 80. AU\$ represents the uppercase alphabet; NU\$ represents numbers 0-9, the period, and the hyphen characters.

You might want to add the space or backslash characters to AU\$ or add the lowercase alphabet: AL\$="abcdefghijklmnopqrstuvwxy.z."

## Program Operation

The subroutine in lines 110-130 is a keyboard scanner loop that controls the iterations to blink the cursor. You can change the number of iterations to make the cursor flash faster or slower, but be sure to define X as a single-precision number, not as an integer. At line 120, the statement X=30 lets you exit the loop as soon as you press a key.

Line 150 turns on the cursor, calls the scanner to get a character, then turns off the cursor by backspacing over it (rather than replacing it with a space character). This technique makes sure that when you exit, you get the cursor positioned after the last input character.

After turning off the cursor, the routine tests Z\$, the INKEY\$ variable, for a pressed key that terminates scanning.

If you aren't pressing a key, line 160 recalls the Scanner subroutine with the cursor turned off and the procedure repeats until you press a key. With the cursor turned on, you can't exit the loop.

The Cursor subroutines get a character from the keyboard and the subroutine at lines 170-220 displays and validates it.

Line 180 sets the input buffer, BF\$, as an empty string and sets buffer length (LN) to zero. You can control the buffer length by PEEKing VARPTR(BF\$) or by computing LEN(BF\$).

Line 190 GOSUBs to the Cursor subroutine, which goes to the keyboard scanner subroutine. If you press the enter key, the subroutine ends and control returns to the point where the program requested input.

Note the CR\$ variable isn't displayed, so you can input more variables on the same line. You can't do this with Input or LINEINPUT statements unless you control the cursor position

with a PRINT@ statement. However, this approach doesn't prevent Basic from destroying the next display line. With Input or LINEINPUT you can't avoid scrolling at line 16 on the screen because of the carriage return that the interpreter inserts.

Line 200 determines whether or not you entered a backspace character. It goes to line 210 if it finds a backspace; otherwise it goes to line 220.

Line 210 tests the buffer length. If the buffer is empty, the routine rejects the backspace to avoid destroying the input line. The program then goes back to the Scanner subroutine through the appropriate call at line 290. If the buffer isn't empty, the routine decrements the buffer length by 1, adjusts the buffer to drop the right-most character, and returns to the Scanner subroutine.

Line 220 tests for a valid character by searching Z\$ through the valid character set. Define the valid character set before the line that calls the subroutine in the main program by setting VD\$ (the valid character set string) to include all characters valid for the specific input. For example, you might specify VD\$=AU\$, VD\$=NU\$, or VD\$=AU\$+AL\$, or whatever you need.

It also tests the buffer length LN full status by comparing LN, the actual buffer length, against LM, the maximum input length. Set LM from the calling line in the main program. Define LN and LM as integers to get a fast system response.

If the routine detects an invalid character or a full buffer, it rejects Z\$ and directs control to the Scanner subroutine. Press the backspace or enter keys for a full buffer condition, or enter a valid character.

If you press a valid character and the routine finds unused space in the buffer, it increments the length by 1 and the buffer incorporates and displays the new character. Control then returns to the Scanner subroutine.

## A Short Demonstration

Lines 499-560 contain a small program that illustrates the correct calling procedures. This program prompts you for a name and a check number.

Assume that you want users of your program to type in a name no more than 30 characters long in uppercase, with periods and spaces as acceptable input. You also want users to enter a check number no longer than five characters.

Line 510 sends the prompt, defines the valid character set for names, and sets the maximum number of characters

to 30. Line 520 calls the Input subroutine. If you enter no characters, control returns to the subroutine.

Line 530 transfers the buffer to the permanent variable CN\$ and uses a Print statement to generate a carriage return. This puts the second input on the next line.

Line 540 starts this process over for the second input, changing the valid character set and the maximum input length.

## Limitations and Improvements

The Input routine performs much like the LINEINPUT statement. On a single call you can set only one variable, and you can only set strings. But you can convert BF\$ to its numeric equivalent with VAL(BF\$).

To improve the program, you might add the capability to erase a line with one keystroke, as you can with Input and LINEINPUT. Finally, you might modify the routine to control the exact input length for entering dates, phone numbers, and so on. ■

---

*José E. Anaya is a computer consultant and chief of the Department of Business Administration at the Universidad de Monterrey. Contact him at Fresnillo 224-A, Col. Mitras Centro, Monterrey, NL 64460, Mexico.*

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## System Requirements

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Disk Basic**



## Related Articles

Alfred, Norma Jean. "Bus Stop," April 1982, p. 244. Model I utility that provides direct access to machine-language routines.

Bishop, Daniel R. "The Competition's Cursor," September 1980, p. 210. Gives Model I, Level II Basic a flashing cursor.

Byrnes, Christian F. "Formatted Screen Input," October 1981, p. 350. A technique that makes Model I data entry easier.

Decker, Jack. "Input with Insight," October 1980, p. 138. Correct the limitations of the Input command with the INKEY\$ function.

Mickey, Everett. "The Flasher," January 1982, p. 276. A flashing prompt routine for Model I programs.

Schweizer, G. "The Input Specifier," February 1983, p. 328. A Model II utility that specifies the input parameters by setting variables.

Smith, Roger A., Jr. "Easy Input," November 1984, p. 109. One line of code that helps you design formats for user input in your Model III Basic programs.

Wilde, Tim. "Versatile Input," September 1980, p. 98. A Model I utility that makes input more flexible.

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	INT	SNG	DBL	STR
Assignment (LET)	178	26	20	7.3
Array Reference (1-dim)	35	36	30	3.5
Array Reference (2-dim)	30	30	30	3.0
AND OR	35	18	16	6.6
Compare (= * + etc.)	23	20	16	3.6
Concatenate (+)	57	18	13	
Subtract (-)	48	15	11	
Multiply (*)	15	108	117	102
Divide (/)	108	70	84	93
Constant Reference	77	19		
FOR-NEXT	111	68	48	
POKE	10	45	30	81
SET RESET	47	45	35	
IF THEN ELSE	33	68	51	
ON expression GOTO	50	101	103	12
ON expression GOSUB	13	90	37	
PRINT simple-variable	61			
OUT				
Flow of Control			216	
GOTO			74	
GOSUB/RETURN				
Functions	int	int	int	int
VARPTR	52	19	17	
POINT	38	23	17	
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MID\$				25
CHR\$( )				36
CVI				16
MKI\$( )				7.1
CVS				25
MK\$( )				5.4
MKSS				16
CVD				
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\*Actually, ratios are even better in real programs.

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*Program Listing 1. Basic input routine.*

```

10 REM ***          THE CUSTOM INPUT ROUTINE          ***
20 REM ***          AUTHOR: JOSE E ANAYA P            ***
30 REM ***          80 MICRO READERS ARE LICENSED TO USE THIS ***
40 REM ***          BASIC CODE FOR PERSONAL USE. NOT FOR SALE. ***
50 CLEAR 1000: DEFINT I-N
60 BS$=CHR$(8): CR$=CHR$(13): PT$=CHR$(132)
70 REM ***          VALID CHARACTER SETS ARE DEFINED ***
80 AU$="ABCDEFGHIJKLMNOPQRSTUVWXYZ. ": NU$="0123456789"
90 REM ***          GOTO MAIN PROGRAM ***
100 GOTO 500
110 REM ***          KEYBOARD SCANNER ***
120 FOR X=1 TO 30: Z$=INKEY$: IF Z$<>" " THEN X=30
130 NEXT X: RETURN
140 REM ***          BLINKING CURSOR SUBROUTINE ***
150 PRINT PT$;:GOSUB 120:PRINT BS$;:IF Z$<>" " THEN RETURN
160 GOSUB 120: IF Z$="" THEN 150 ELSE RETURN
170 REM ***          INPUT BUFFER CONTROLLER ***
180 LN=0: BF$=""
190 GOSUB 150: IF Z$=CR$ THEN RETURN
200 IF Z$<>BS$ THEN 220
210 IF LN=0 THEN 190 ELSE LN=LN-1: BF$=LEFT$(BF$,LN): PRINT BS$;
: GOTO 190
220 IF INSTR(VD$,Z$)=0 OR LN=LM THEN 190 ELSE LN=LN+1:
BF$=BF$+Z$: PRINT Z$;: GOTO 190

- - - - - OTHER LINES COULD BE HERE - - - - -
499 REM ***          MAIN PROGRAM BEGINS ***
500 CLS
510 PRINT "TYPE CUSTOMER NAME: ";: VD$=AU$: LM=30
520 GOSUB 180: IF LN=0 THEN 520
530 CN$=BF$: PRINT
540 PRINT "TYPE CHECK NUMBER: ";: VD$=NU$: LM=5
550 GOSUB 180: IF LN=0 THEN 550
560 CK$=BF$: PRINT

- - - - - PROGRAM CONTINUES HERE - - - - -

```

End

*Program Listing 2. Changes for the Models 1000 and 1200.*

MODEL 1000/1200 CONVERSION

```

60 BS$=CHR$(29): CR$=CHR$(13): PT$=CHR$(8): SP$=CHR$(32)
150 PRINT PT$;BS$;:GOSUB 120:PRINT SP$;BS$;:IF Z$<>" " THEN RETURN
200 IF Z$<>PT$ THEN 220

```

End

*Program Listing 3. Changes for the Model 2000.*

MODEL 2000 CONVERSION

```

60 BS$=CHR$(8): CR$=CHR$(13)
150 GOSUB 120: IF Z$<>" " THEN RETURN

```

End



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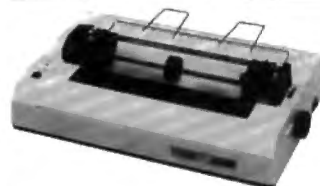
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Scroll lets you scroll-protect up to seven lines at the top of your Model 4's video screen. And you can run the program from TRSDOS Ready or incorporate it anywhere in a Basic program.

## Using Scroll

Scroll resides on disk, in the memory area that begins at 2600 hexadecimal.

To use Scroll, type in the Assembly-language code in Program Listing 1. If you don't have an ALDS assembler, change line 130 to ORG 2600H. Then save the program to disk and assemble it.

If you're not using an editor/assembler, type in the Basic program (Program Listing 2). Listing 2 creates an executable machine-language file on disk that's identical to the machine-language file my editor/assembler produces.

To run the Assembly-language program from TRSDOS Ready, type in SCROLL (LINES=n), where n is the number of lines (up to seven) you want to scroll-protect. To run the program from Basic, type in SYSTEM "RUN SCROLL (LINES=n)". You can abbreviate LINES, the parameter name, to L, which you can use anywhere in a Basic program.

Scroll considers the parameter n as modulo 8, meaning that if you specify LINES=8, Scroll translates that as a zero. Similarly, it interprets LINES=9 as a 1, and so on.

The LINES=n parameter accepts only numeric input; if you enter any other value, you'll get an error message.

Because Scroll resides on disk, it's not nearly as fast as a simple POKE from Basic, but unless you plan to constantly change the number of protected

lines within a single program, speed shouldn't be a major factor. ■

Contact Raymond C. Boggs at 4735 Feigley Road SW, Port Orchard, WA 98366.

### Related Article

Keller, M. "As the Screen Scrolls," February 1982, p. 264. Scroll protection for the Model 1.

Program Listing 1. Source Listing for Scroll in ALDS 03.02.00 format.

```

00100 @DSPLY EQU 0AH ;DEFINE MESSAGE LINE DISPLAY SVC
00110 @PARAM EQU 11H ;DEFINE PARAMETER PARSE SVC
00120 @VDCTL EQU 0FH ;DEFINE VIDEO CONTROL SVC
00130 PSECT 2600H ;START PROGRAM IN OVERLAY AREA
00140 SCROLL LD A,@PARAM ;LOAD @PARAM SVC NUMBER
00150 LD DE,PTABLE ;LOAD 'DE' WITH PARAMETER TABLE
00160 RST 20H ;GO PARSE PARAMETER FROM COMMAND LINE
00170 JR NZ,ERROR ;ERROR ON RETURN - DISPLAY ERROR...
00180 ;MESSAGE & RETURN.
00190 LD A,(RESP) ;GET RESPONSE CODE
00200 AND 05H ;TEST FOR PROPER RESPONSE
00210 JR Z,ERROR ;IMPROPER RESPONSE - GO PRINT ERROR MESSAGE
00220 LD A,(LINES) ;EVERYTHING OK - GET USER'S INPUT VALUE...
00230 LD C,A ;INTO 'C'.
00240 LD A,@VDCTL ;LOAD VIDEO CONTROL SVC
00250 LD B,07H ;LOAD VIDEO CONTROL FUNCTION
00260 RST 20H ;GO SCROLL PROTECT LINES
00270 LD HL,0000H ;SET HL FOR NO ERROR ON RETURN
00280 RET ;RETURN TO CALLER
00290 ERROR LD A,@DSPLY ;POINT 'HL' TO ERROR MESSAGE
00300 LD HL,ERRMES ;GO DISPLAY MESSAGE
00310 RST 20H ;SET HL FOR NO ERROR ON RETURN
00320 LD HL,0000H ;RETURN TO CALLER
00330 RET ;ERROR MESSAGE
00340 ERRMES DEFB 'Parameter error' ;ERROR MESSAGE
00350 DEFB 0DH ;MESSAGE TERMINATOR
00360 ;*****
00370 ;** TABLE OF PARAMETER TYPE BYTES, PARAMETER NAMES,AND **
00380 ;** RESPONSE TYPE & LENGTH RETURNED BY THE @PARAM SVC. **
00390 ;*****
00400 PTABLE DEFB 00H ;PARAMETER TABLE HEADER CODE
00410 DEFB 10010000B+05H ;BIT 7 = ACCEPT NUMERIC VALUE...
00420 ;BIT 4 = ACCEPT ABBREVIATED PARAMETER NAME...
00430 ; 05H = LENGTH OF PARAMETER NAME.
00440 DEFB 'LINES' ;PARAMETER NAME
00450 RESP DEFB 00H ;RESPONSE BYTE : TYPE & LENGTH OF RESPONSE
00460 DEFB LINES ;POINT TO # LINES TO SCROLL PROTECT,...
00470 ;AS CONVERTED & STORED BY THE @PARAM SVC.
00480 DEFB 00H ;END OF PARAMETER TABLE
00490 LINES DEFB 02H ;AREA TO RECEIVE # LINES TO PROTECT
00500 END SCROLL
    
```

End

## System Requirements

Model 4

64K RAM

Assembly language or Disk Basic

TRSDOS 6.X

Editor/assembler optional



Program Listing 2. Basic program that creates Scroll from Basic.

```

10 OPEN "0",1,"SCROLL/CMD"
20 FOR X=1 TO 95 : READ Y : AS=AS+CHR$(Y) : NEXT X
30 PRINT #1, AS;
40 CLOSE 1
50 END
100 DATA 5,9,0,0,0,83,67,82,79,76,76,5,9,0,0,38,32,32,32,32,32
110 DATA 1,67,0,38,62,17,17,54,38,239,32,20,58,61,38,230,120,40,13
120 DATA 58,65,38,79,62,15,6,7,239,33,0,0,201,62,10,33,38,30,239,33
130 DATA 0,0,201,80,97,114,97,109,101,116,101,114,32,101,114,114,111
140 DATA 114,13,120,149,76,73,78,69,83,0,65,38,0,2,2,0,38
    
```

End

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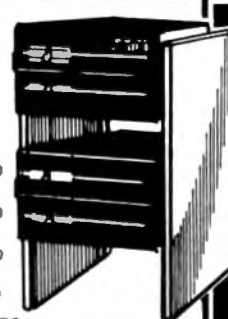
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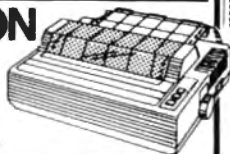


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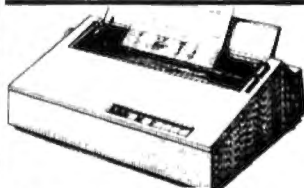
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# Coming Together: Building The CMOS Computer

Last month (p. 82), I described the component parts of a CMOS (complimentary metal oxide semiconductor) single-board computer. This month, I'll explain how to build and operate the computer.

## Building the DR800 Board

I've developed a printed circuit (PC) board for this project, and it's available as indicated in the parts list I included in April's column (p. 85). The schematics for the DR800 board are shown in Figs. 4a, 4b, and 4c (Figs. 1-3 appeared last month). Most of the parts are readily available. You can substitute special parts (like the specific type of reset switch) as required.

The board uses a 2 MHz NSC800 microprocessor. NSC800's are also available in 1 MHz and 4 MHz versions. The DR800 isn't designed to operate at 4 MHz, but you can operate it at 1 MHz if desired. Processor speed is one-half the crystal frequency, so a 2 MHz crystal can be used for 1 MHz operation. You might wonder why anyone would want to operate at a slower frequency. Besides being less expensive (for the 1 MHz NSC800), it draws less power because the processor operates slower; a 1 MHz processor uses significantly less current than a 2 MHz processor.

All of the logic chips, except the bus interface chips, use high-speed CMOS (HC) logic. This is a relatively new logic family having speeds similar to low-power Schottkey (LS) logic, with the power consumption of CMOS. You don't need to install the bus interface chips U35, U29, U31, and U32, (or the RP4 resistor pack) if you're not using the Multibus interface.

The bus offers several jumper-selectable memory options as far as RAM and ROM installations. I'll describe them in the operations section.

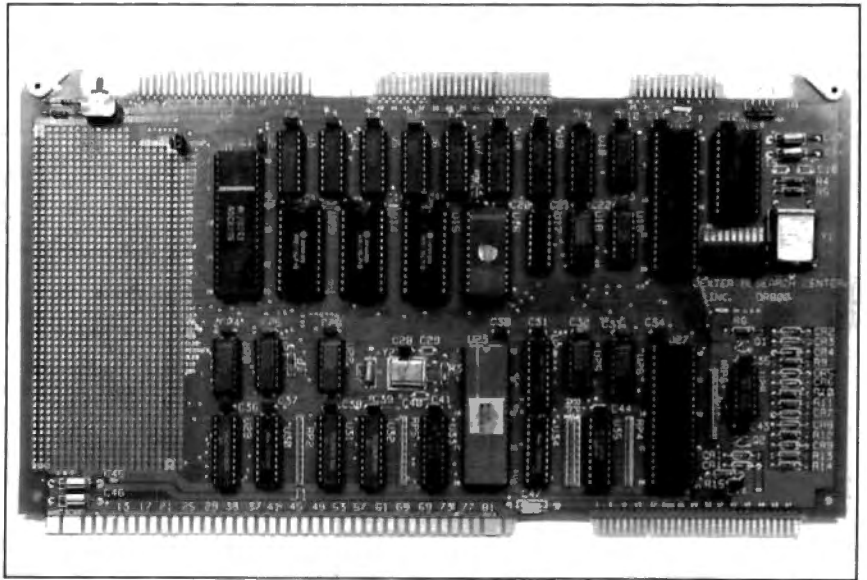


Photo. The DR800 single-board computer.

Connector J1 is the 86-pin Multibus connector, connector J2 is the 50-pin I/O connector and connector J3 is the 26-pin serial I/O connector. These connectors have odd-numbered pins on one side, and even-numbered pins on the opposite side.

You have a little versatility concerning power supply requirements. You need a +5V supply at 40 milliamperes (mA) to run the board. You'll also use the +5V supply as the positive RS-232C voltage. A negative RS-232C voltage (at 5mA) is also required. Although a -5V supply is specified, any voltage between -5V and -12V can be used.

## Operating the DR800 Board

I chose the J2 connector for external device control, as well as I/O device expansion, if desired. The pinout for the J2 connector is shown in Fig. 5. As shown, all of the signals for I/O device expansion are available, as well as most of the NSC810 signals.

The J3 serial I/O connector pinout is shown in Fig. 6. I used serial port zero as the terminal interface and serial port 1 as the host interface, when using the available DR800 monitor (described below). Note that these are bare-bones ports, lacking any handshaking lines.

You should interface the NSC810 to other devices through the J2 I/O connector, though you can also interface it with circuitry built on the board's prototyping area. It provides a jumper option for the signal into the NSC810's timer zero input (pin 3). One source is the 2 MHz buffered processor clock, the other is a line on the J2 I/O connector, to allow an external device to control the line.

If you're using the PC board, you might find the prototyping area useful for trying out different circuits. All necessary microprocessor signals are available on pads next to the prototyping area, making memory and I/O device addressing and interfacing



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straightforward. Power and ground buses are also available at the prototyping area.

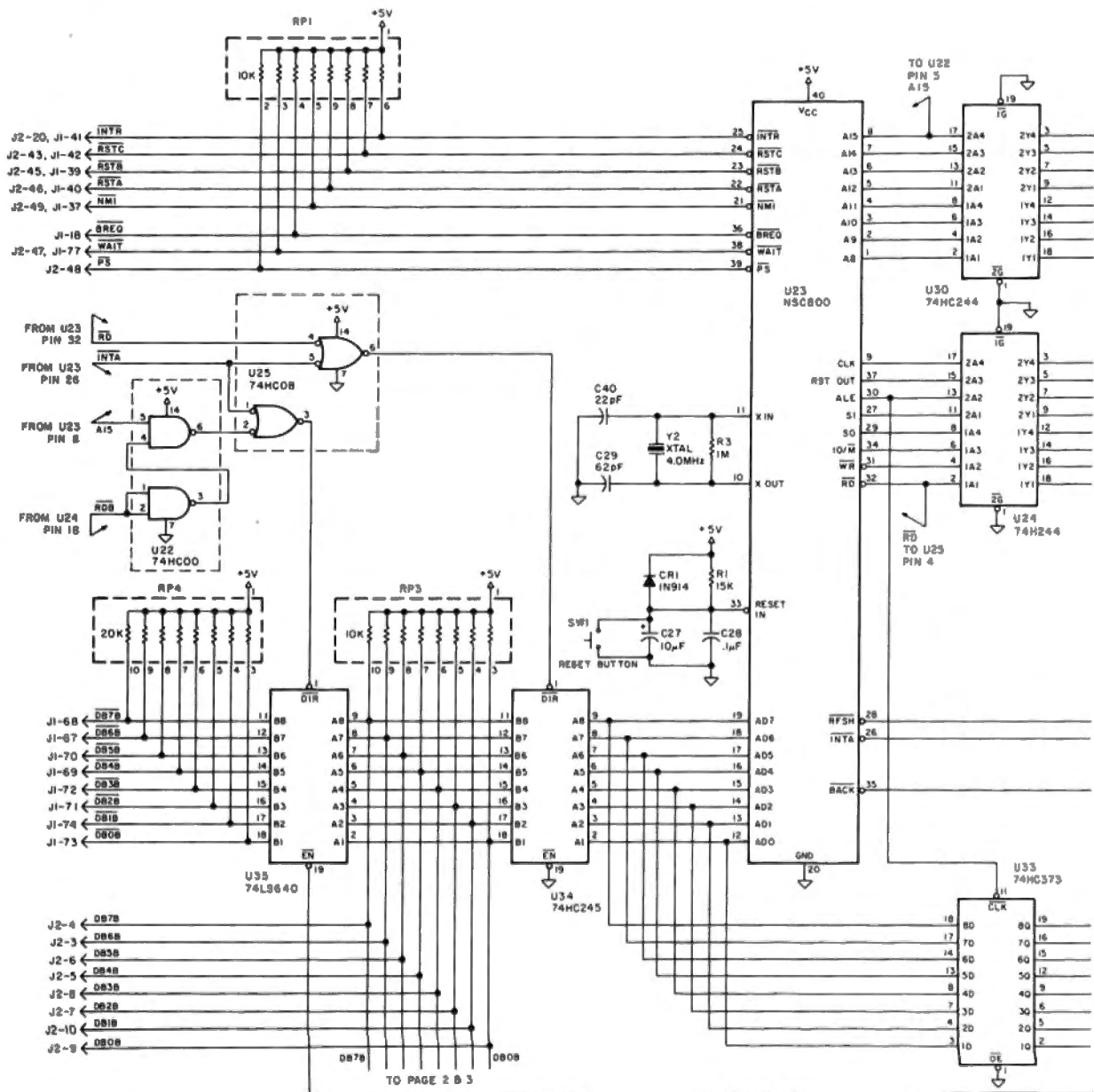
You can select the amount and type of memory used based on the requirements of your particular application. There are eight sockets for 6514-type 4K-bit RAM chips, which are nibble-wide. You can, therefore, add these chips in 1K increments as needed (one pair of 6514s at a time), to a maximum of 4K of 6514s. You can also use 2114-type NMOS RAMs in these sockets, though with greater power consumption.

The DR800 provides four 24-pin

JEDEC sockets for ROM and, optionally, additional RAM. The first socket is wired to always be a ROM socket, since the microprocessor boots from this area (location 0000 hex) on reset. The remaining three sockets each have a jumper to select the socket for RAM or ROM operation. If you choose RAM operation, you can use a 6116-type CMOS RAM (2K) in the socket. If you select ROM operation, you can use either a 27C16 (or 2716 with higher power consumption) or a 27C32 (or 2732A with higher power consumption) EPROM in the socket, depending on other jumper configurations.

Each of the four sockets will take up either 2K or 4K of address space, depending on whether you pick 2716 mode (2K) or 2732 mode (4K). To select 2716 mode, you have to jumper the 2716/2732 jumper to the 2716 setting, and remove the 2732 select jumper. Similarly, to select 2732 mode, you have to jumper the 2716/2732 jumper to the 2732 setting, and the 2732 Select jumper must be in place.

Note that while you can put the 4K ROMs in the sockets, you can only put 2K byte RAMs in the sockets. If you put a 6116 RAM device into a socket



TO PAGE 2 B 3

jumpered for RAM while the board is set for the 2732 mode, the RAM will be double-addressed at the lower 2K and the higher 2K addresses.

You can use this to advantage. Suppose you need 4K more RAM (more than the 6514s provide), but you're also using 2732-type EPROMs. By putting a 6116 RAM chip into each of the higher-order JEDEC sockets, you can use the higher 2K addressing for the lower RAM and the lower 2K addressing for the higher RAM to get 4K of contiguous RAM space.

You should note that addressing any memory in the 0000-7FFF hex

range is reserved for on-board use, while addressing in the range 8000-0FFFF hex is reserved for off-board (or patch area) use. Likewise, I/O port addresses 00-7F hex are used on-board, while addresses 80-0FF hex are addressed off-board (or in the patch area).

If you address the upper memory or I/O through the patch area or the J2 I/O connector, you should remove U35 to prevent bus conflicts with the Multibus buffer.

I used a clever circuit to allow both 2K and 4K socket addressing. Chip U17 (74HC157) is a quad 2-to-1 switch

that switches the address lines going to the U18 (74HC138) address decoder chip, when inserting or removing the 2732 select jumper. This changes the address range on the address decoder outputs between 2K and 4K, as desired.

The 6402 UARTs are fairly simple devices and have been around for some time. I chose them because they're readily available, inexpensive, and simple to use. Since the control and status bits are signals brought out to the package pins instead of internal registers, you have to create the effect of a control register and a status regis-

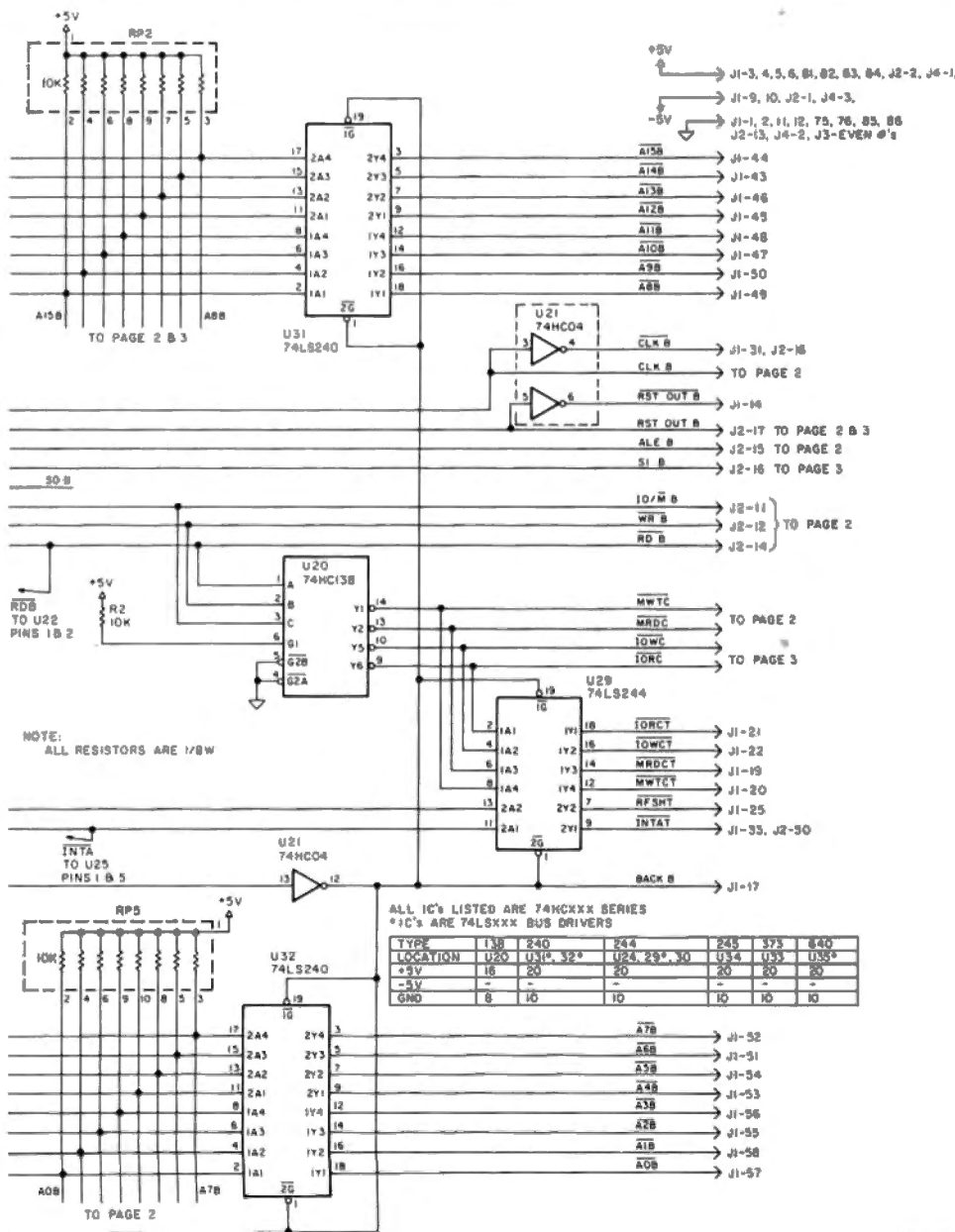


Figure 4a. DR800 single-board microprocessor.

ter by the design. This also means that no standard bit sequence for these registers is available, so I had to create my own.

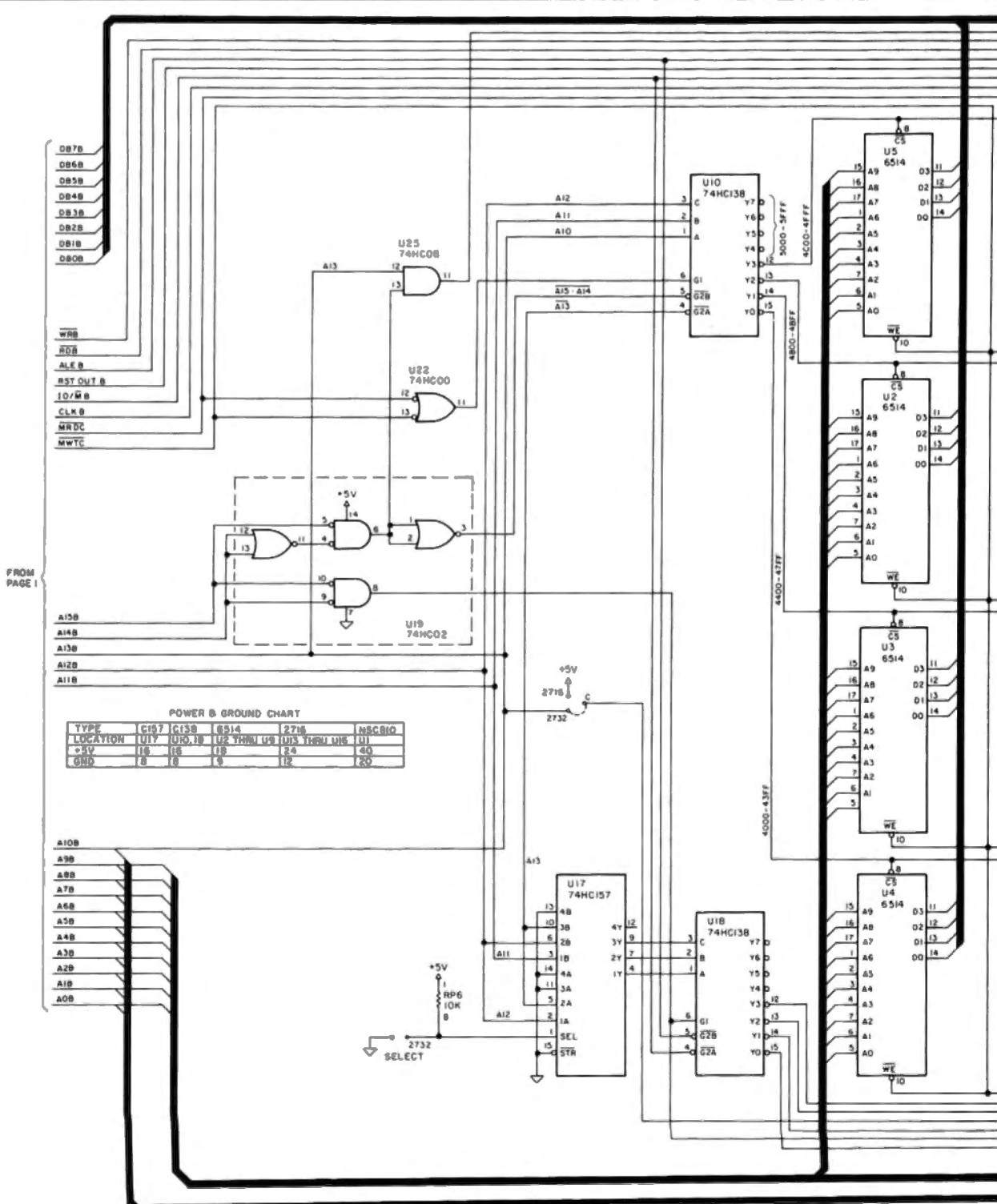
The 6402 control register is shown in Fig. 7, while the 6402 status register is shown in Fig. 8. These registers are designed to act as typical UART registers; thus, for example, the data

register ready signal is automatically deactivated when the processor reads the received data byte. Refer to the manufacturer's data sheet for more information on using the 6402 UART.

The MC14411 (U12) is a CMOS baud-rate generator, used to generate the baud rates for the two UARTs.

The baud rates are individually jumper-selectable. Merely jumper the desired baud rate frequency from the MC14411 to the appropriate UART clock line to set its baud rate.

Table 1 shows the memory and I/O addressing map for the on-board DR800 functions. Use this to access the memory and I/O devices.



## The DR800 Monitor

I've written a reasonably extensive monitor program for the DR800 board (the DR800 monitor). This monitor takes up most of a 27C32 EPROM, and provides functions that let you look at and alter memory and I/O locations, set breakpoints, run programs, see NSC800 registers,

download programs from a host system, and do other development operations. Because of the length of the program, it's impractical to include a listing here. A copy of the ROM with operating instructions is available from the author as described in the parts list. A documented source listing is also available for an additional \$5.

I will briefly describe the functions of the DR800 monitor so you can understand its function and the functions of the DR800 board more fully. Incidentally, the DR800 Monitor uses the 128 bytes of NSC810 RAM for variable and stack purposes, leaving all other memory space (aside from the 27C32) available for use as desired.

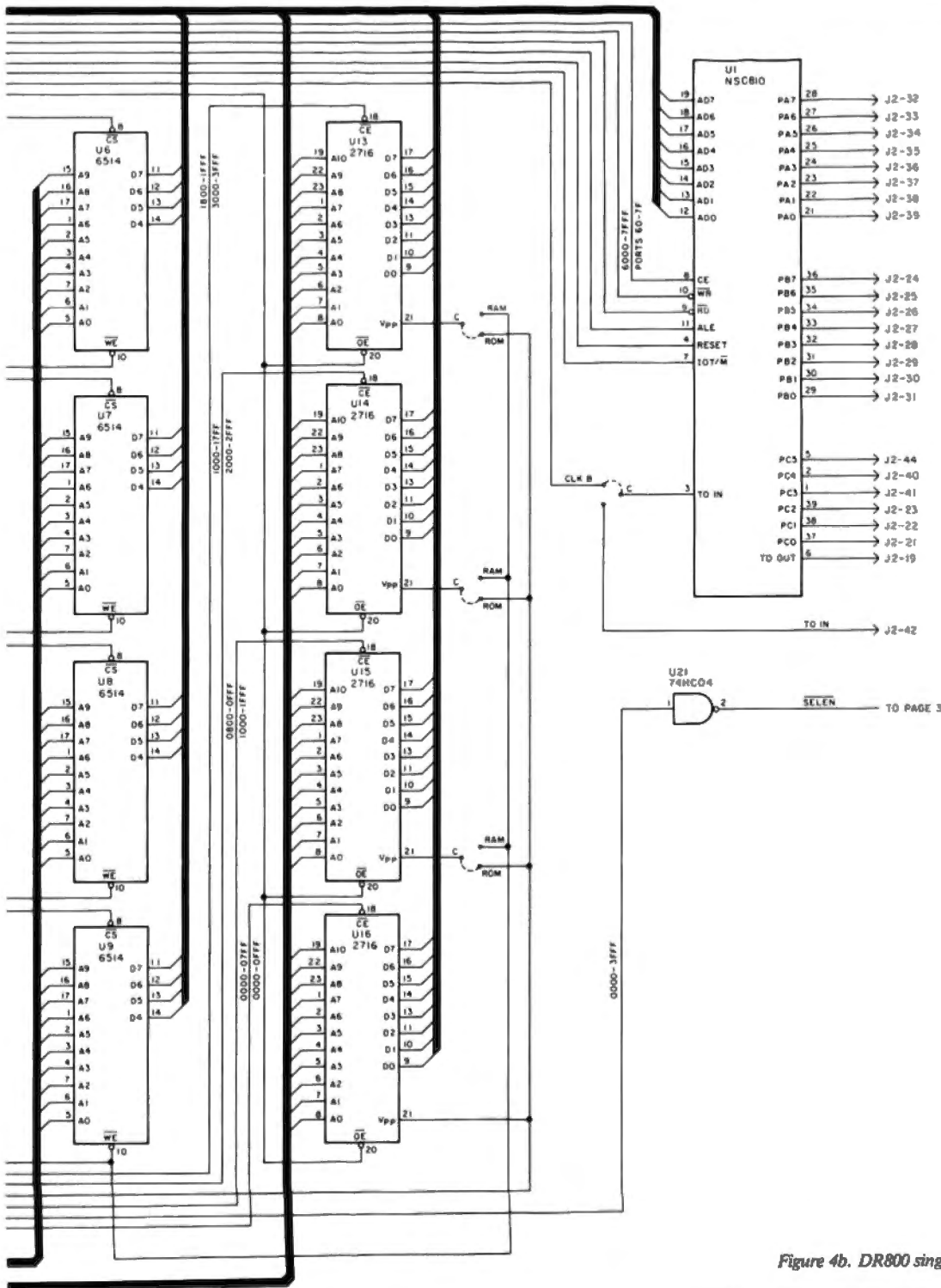


Figure 4b. DR800 single-board microprocessor.

Table 2 shows the commands available for the DR800 Monitor. The C (Communicate with the host) command allows the operator on the terminal line to communicate transparently to the host system through the host serial line. This is useful for initiating program downloads and editing files, etc. A control-T from the ter-

minal brings the operator back to the DR800 monitor.

The D (Display Memory) command lets you display a part of memory on the terminal. For example, the command D 100,1FF displays the memory in the range 0100-01FF hex in rows of 16 bytes. The starting address of the row appears at the beginning of each

screen line, and corresponding ASCII characters in the line, if any, are displayed at the end of each screen line.

The F (Fill Memory) command fills the specified memory range with a specified bit pattern. Zeros are the default if no bit pattern is specified.

The G (Go Execute) command starts program execution at the speci-

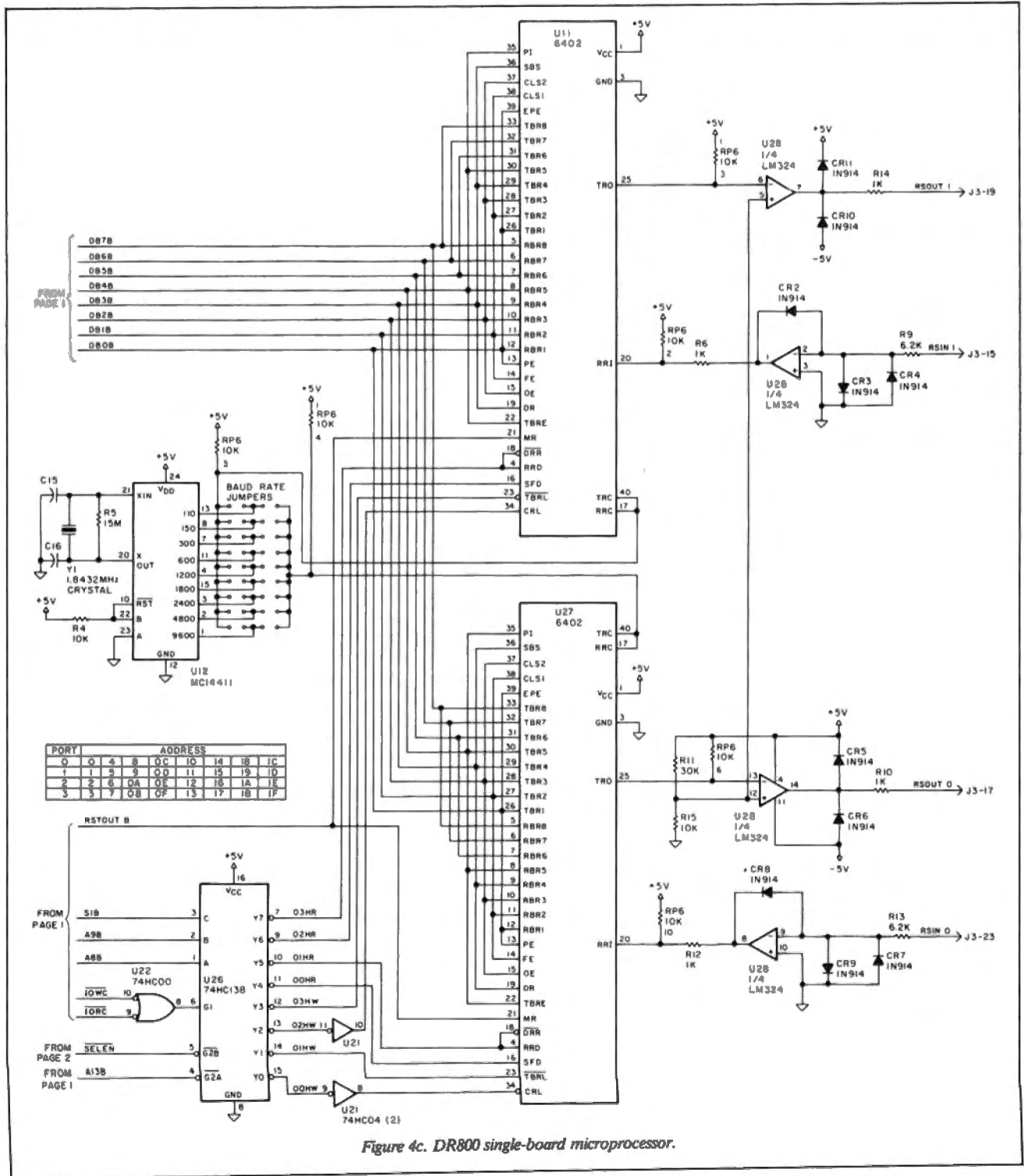


Figure 4c. DR800 single-board microprocessor.

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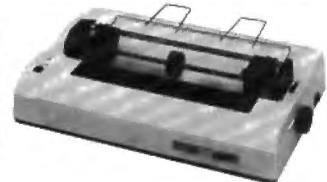
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fied address. You can also optionally specify a breakpoint. If you reach a breakpoint, you can see the register values with the X (Examine Registers) command.

The I (Input) command permits inputting from an input port (in I/O space). Similarly, the O (Output) command permits outputting a value to an output port (in I/O space).

The L (Load From Host) command

lets you download program object files in standard Intel hex/ASCII format from the host system to the DR800's memory for execution and debugging.

The M (Move Memory) command allows you to move a block of memory from one area to another.

The P (Put ASCII) command permits you to put ASCII characters in memory. For example, suppose you

want to put the words "I love Tandy" in memory starting at location 1000 hex. Simply enter the command P 1000 <CR>I LOVE TANDY <CTRL-D>, where <CR> is a carriage return and <CTRL-D> is a control-D. Use control-D to exit the put ASCII mode.

The R (RAM Test) command permits testing of board memory in specified address ranges, for any specified

Pin #	Signal
1	-5V supply
2	+5V supply
3	DB6B data bus lines
4	DB7B
5	DB4B
6	DB5B
7	DB2B
8	DB3B
9	DB0B
10	DB1B
11	IO-MB/
12	WRB/
13	GND
14	RDB/
15	ALEB
16	S1B
17	Reset out
18	CLKB/
19	TO OUT
20	INTR/ (NSC800)
21	PCO-INTR/
22	PCI-BF
23	PC2-STB/
24	PB7
25	PB6
26	PB5
27	PB4
28	PB3
29	PB2
30	PB1
31	PB0
32	PA7
33	PA6
34	PA5
35	PA4
36	PA3
37	PA2
38	PA1
39	PA0
40	PC4-T2IN
41	PC3-TG
42	TOIN
43	RSTC/
44	PCS-TIOUT
45	RSTB/
46	RSTA/
47	WAIT/
48	PS/
59	NMI/
50	INTAT/

Figure 5. J2 I/O connector pinout.

### Memory Addressing:

0000H-3FFFH	JEDEC ROM/RAM sockets
4000H-4FFFH	6514 RAM
5000H-5FFFH	Reserved (not implemented)
6000H-607FH	NSC810 RAM
6080H-7FFFH	NSC810 RAM multiply addressed
8000H-FFFFH	Off-board addressing range

### I/O Addressing:

00	UART 0 (U27) status/control ports
01	UART 0 (U27) data ports (input and output)
02	UART 1 (U11) status/control ports
03	UART 1 (U11) data ports (input and output)
04-5FH	Reserved (not implemented)
60-7FH	NSC810 I/O
80H-FFH	Off-board I/O addressing range

Table 1. DR800 memory and I/O addressing.

### Pin # Signal

15	Serial port 1 data in (connect to DB-25S pin 2)
17	Serial port zero data out (connect to DB-25S pin 3)
19	Serial port 1 data out (connect to DB-25S pin 3)
23	Serial port zero data in (connect to DB-25S pin 2)
2-26	EVENS GND

All remaining pins are unused

Figure 6. J3 serial I/O connector pinout.

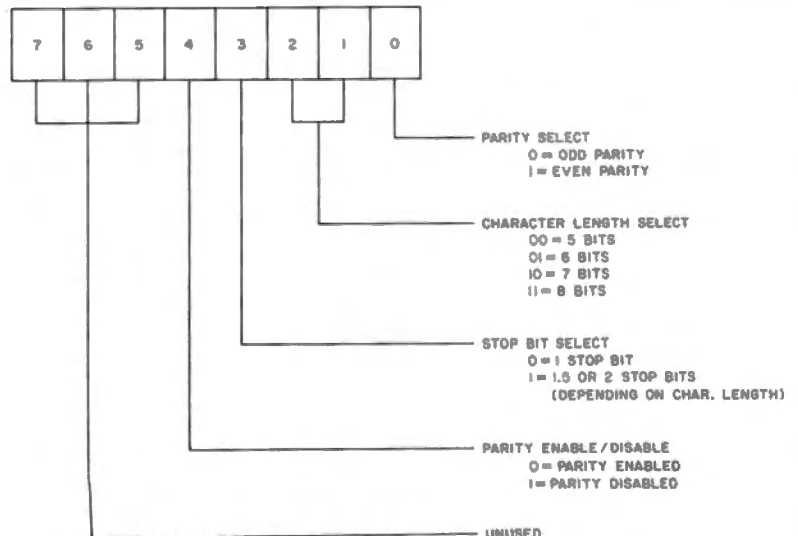


Figure 7. 6402 control register format.



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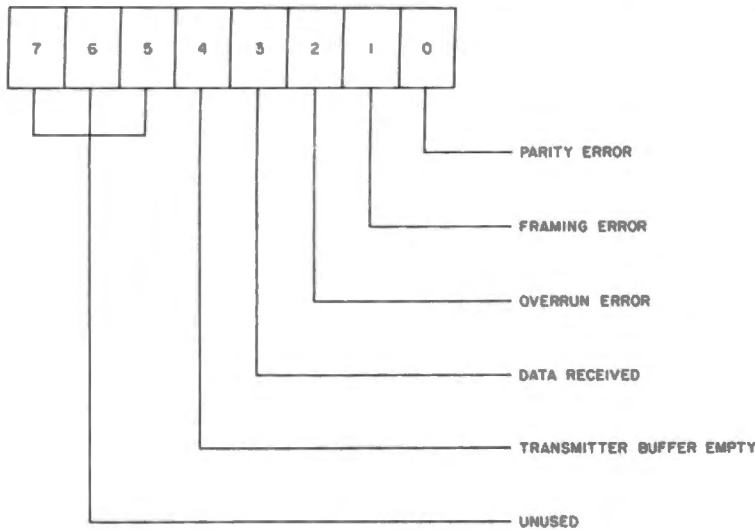


Figure 8. 6402 status register format.

- C Communicate with host system
- D Display memory
- F Fill memory with bit pattern
- G Go execute program
- I Input from port
- L Load program from host
- M Move memory block
- O Output to port
- P Put ASCII values in memory
- R RAM test
- S Substitute memory locations
- X Examine CPU registers

Table 2. DR800 monitor command summary.

also make copies of the DR800 manual available for \$5.

I would like to thank Don Szeles of Dexter Research enter, Dexter, MI, for his help in getting the material together for this project. ■

number of iterations (not greater than FFFF hex).

The S (Substitute Memory) command lets you see memory locations in sequence beginning at a specified address, as well as selectively altered.

**Conclusion**

There is much more to be said about the DR800 board, but it is impractical to cover everything here. Interested readers are urged to use the list of references for further information. I will

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

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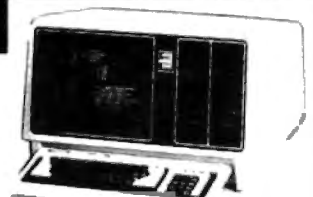


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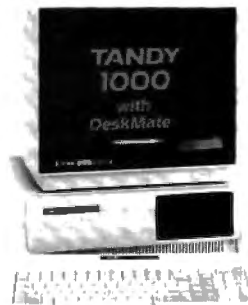
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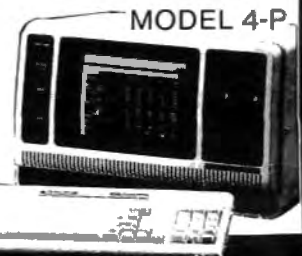
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\*Model 3 requires LDOS

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See opposite page ▶▶▶▶▶

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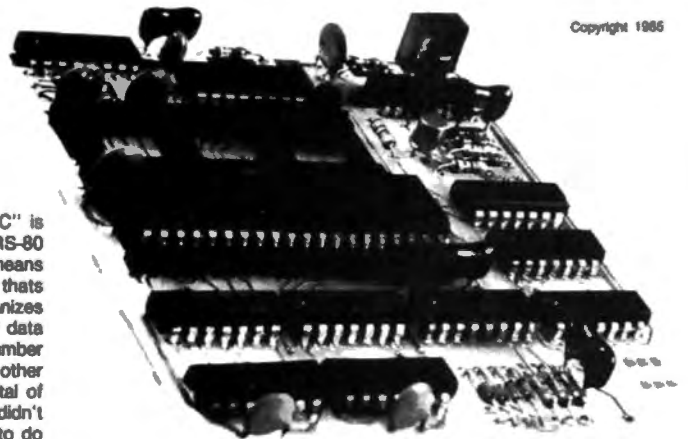
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Consider some potential trouble spots on the BBS. A poor telephone connection is the first thing to check if you're having problems. The telephone has to deliver a clear signal at all times; any static on the line will cause problems.

If the telephone is doing its job and you're still having problems, check out the modem. Simply put, there are good modems and bad modems; Radio Shack's Modem II falls into the second category. Though some people have been able to use the Modem II successfully, we've yet to find reliable solutions to the hang-up and reset problems characteristic of this modem. You can turn the modem off and then back on to initiate a reset, but this just isn't practical on a BBS. Try these commands if you own a Modem II.

```
OUT234,175:FOR X=1 TO 1000:NEXT:
OUT 234,164
```

or

```
OUT234,180:FOR X=1 TO 1000:NEXT:
OUT 234,164
```

If you're using the Hayes Smart-modem, set the front panel switches to UDUDUUU.

Some modems in half-duplex systems, like the Hayes, have a habit of echoing everything back to the computer. If the software echoes everything it receives to the modem and the modem echoes everything it receives to the software, you're stuck with an infinite loop. The cursor zips to the end of a 255-byte line and locks up your



system. If this happens, turn off your modem's echo function.

### Automatic Control

When you turn on your Model III, there's no connection between the communications line and the video or keyboard. This is the responsibility of Upload, the BBS's software linker. From TRSDOS Ready, type in UPLOAD. The TRSDOS Ready banner should return, though it'll run slowly. If, however, your cursor goes crazy, your modem is echoing.

Under LDOS, the procedure is a little different. You'll need this JCL file (LINKUP):

```
MEMORY (HIGH=X'FDFE')
UPLOAD
SET *KI KI (TYPE)
SET *CL RS232T (DTR=ON)
(RS232R on the Model I)
LINK *KI *CL
LBASIC RUN "HOST/BAS"
//STOP
```

To run your BBS from LDOS, type in DO=LINKUP. LDOS is more convenient than TRSDOS here because you can apply an automatic boot-up command to the disk by typing in AUTO DO=LINKUP.

TRSDOS can't handle an automatic command because of memory conflicts. Instead, get into Basic, set the memory size at 65000, reserve three files, and type in RUN "HOST/BAS". Before entering Basic, however, you need to build a file. To do this, type in BUILD MSG001/BBS:1 at the Ready prompt of either DOS. When the disk drive light goes out, type in the following: "Hi, everybody. Welcome to my BBS." Then press the enter key, followed by the break key.

### Signing On

One of your first tasks after booting up the BBS is to log yourself on as the sysop. There's only one way to do this and that's from the console. Operating from the console is called the wizard mode. It gives you full access to

### System Requirements

Model III  
48K RAM  
Disk Basic  
Assembly language  
Two disk drives  
Editor/assembler



## Program Listing 1. BBS machine-language assist module.

```

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00060 ;Copyright (c) 1984 Schneider and Bowen
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00090 ;granted.
00110 ; RECEIVER SECTION 3/23/84
00120 ; RECEIVES CHARACTERS FROM THE RS232 LINK
00130 ; OR THE KEYBOARD, AND STORES THEM
00140 ; SEQUENTIALLY IN I$ UNTIL THE LENGTH OF I$
00150 ; IS MET, OR A CARRIAGE RETURN IS ENTERED.
00160 ; RECOGNIZES BACKSPACE, AND RETURNS ERROR
CONDITION
00170 ; ON LOSS OF USER CARRIER.
00180 ;
00190 ;
00200 VBLK EQU 401DH ;VIDEO DCB
00210 KBLK EQU 4015H ;KB DCB
00220 UDATA EQU 0EBH ;UART DATA PORT
00230 USTAT EQU 0EAH ;UART STATUS REGISTER
00240 MSTAT EQU 0EBH ;MODEM STATUS PORT
00250 PRINT EQU 33H ;ROM PRINT ROUTINE
00260 KEYBRD EQU 2BH ;ROM KEYBOARD SCAN
00270 BASIC EQU 0A9AH ;PASS TO BASIC
00280 TODOS EQU 402DH ;JUMP TO DOS
00290 TRSDOS EQU 1 ;SET TO 0 FOR LDOS
00300 ;
00310 ;
00320 ORG 0FE00H
00330 RECV CALL PARAM ;GET STRING VALUES
00340 MN LD B,245
00350 LD C,0 ;ACCUMULATOR
00360 LD A,11H ;CONTROL-Q
00370 CALL PRINT ;SEND IT
00380 MAIN IN A,(MSTAT) ;CHECK MODEM STATUS
00390 AND 32 ;CHECK CARRIER DETECT
00400 TN JR NZ,NOTONE ;LOST THE TONE
00410 CALL KEYBRD ;CHECK EVERYTHING
ELSE
00420 OR A
00430 JR Z,MAIN ;NOTHING
00440 CP 8 ;BKSPCE?
00450 JR NZ,NOTBKS ;NO
00460 LD A,C
00470 OR A ;AT FIRST CHAR?
00480 JR Z,MAIN ;YES - IGNORE
00490 INC B
00500 INC B ;FOR THE DECREMENT
00510 DEC C
00520 DEC C ;FOR THE INCREMENT
00530 DEC HL
00540 LD (HL),20H
00550 DEC HL
00560 LD A,8
00570 JR NP ;PERFORM BKSPCE
00580 NOTBKS LD (HL),A ;STORE CHARACTER
00590 NP CALL PRINT ;PRINT IT
00600 INC HL ;FOR NEXT CHARACTER
00610 INC C
00620 CP 0DH ;TERMINATOR ENTERED?
00630 JR Z,EXIT ;TERMINATOR FOUND
00640 NOT010 DJNZ MAIN ;LOOP TIL DONE
00650 EXIT LD A,13H ;CONTROL-S
00660 CALL PRINT ;SEND IT
00670 LD B,255 ;DELAY
00680 LD A,10 ;MAX # OF CHAR.
00690 EXI010 IN A,(MSTAT) ;CHECK MODEM STATUS
00700 AND 32 ;CARRIER DETECT
00710 TT JR NZ,NOTONE ;LOST CARRIER
00720 CALL KEYBRD ;CHECK FOR INCOMING
00730 OR A
00740 JR Z,EXI030 ;NONE - EXIT
00750 INC C ;COUNT CHARACTER
00760 LD (HL),A ;STORE IT
00770 INC HL ;BUMP POINTER
00780 INC E ;DECREMENT CHAR.
00790 DEC E
COUNT
00800 JR Z,EXI020 ;MAX # RECEIVED
00810 EXI030 DJNZ EXI010 ;DECREMENT TIMER
00820 EXI020 LD L,C
00830 LD H,0 ;TO PASS TO BASIC
00840 JP BASIC
00850 NOTONE LD HL,-1
00860 JP BASIC ;PASS ERROR TO BASIC
00870 ;
00880 ;
00890 ; CAPITALIZATION ROUTINE
00900 ; CAPITALIZES CHARACTERS IN THE RANGE
00910 ; 96 < C < 123
00920 ;
00930 ORG 0FE6CH
00940 CAPIT CALL PARAM ;GET VARPTR(I9)
00950 CAPL LD A,(HL)
00960 CP 97
00970 JR C,NOCAP ;C<97
00980 CP 123
00990 JR NC,NOCAP ;C>122
01000 AND 95 ;MAKE IT A CAPITAL
01010 LD (HL),A ;REPLACE IT
01020 NOCAP INC HL
01030 DJNZ CAPL
01040 RET ;DONE
01050 ;
01060 ; VIDEO SCANNER
01070 ; RECEIVES STRING VARPTR AND VIDEO WIDTH
01080 ; FROM BASIC, AND PARSES STRING TO CORRECT
01090 ; WIDTH
01100 ;
01110 PARSE CALL PARAM ;GET VARPTR(STRING)
01120 LD A,(REMAIN)
01130 LD C,A ;REMAIN. CHAR. TO C
01140 LD DE,0 ;CLEAR COUNTER
01150 LD (SPACE),DE ;CLEAR SPACE
INDICATOR
01160 SLOOP LD A,(HL) ;GET CHAR.
01170 CP 20H ;SPACE?
01180 JR NZ,SL010 ;NO
01190 LD (SPACE),HL
01200 LD E,B ;SAVE COUNTER &
ADDRESS
01210 SL010 CP 0DH ;CAR. RET?
01220 JR NZ,SL020 ;NOPE
01230 LD DE,0
01240 LD (SPACE),DE ;CLEAR THINGS OUT
01250 LD A,(VIDWIT)
01260 LD C,A
01270 JR ELOOP
01280 SL020 DEC C
01290 JR NZ,ELOOP ;HAVEN'T REACHED END
01300 LD A,(VIDWIT)
01310 LD C,A ;RESET VIDWIDTH
01320 LD A,E
01330 OR A ;SPACE IN LINE?
01340 JR Z,ELOOP ;NOPE
01350 LD HL,(SPACE)
01360 LD (HL),0DH ;INSERT C.R.
01370 LD B,E ;RESET COUNTER
01380 LD DE,0
01390 LD (SPACE),DE ;RESET MARKER
01400 ELOOP INC HL ;FOR NEXT CHAR.
01410 DJNZ SLOOP ;LOOP TIL DONE
01420 LD A,C
01430 LD (REMAIN),A ;STORE REMAINING
01440 LD A,E
01450 OR A ;SPACE IN LAST LINE?
01460 RET Z ;NOPE
01470 LD A,C
01480 CP 5 ;REMAINING CHAR <=5?
01490 RET NC ;NOPE
01500 LD A,(VIDWIT)
01510 ADD A,E ;A=VIDWIT+SPACE
COUNTER
01520 SUB (IX+0)
;A=VIDWIT+SPACE-LEN(STR)
01530 LD (REMAIN),A ;RESET REMAINING
CHAR.
01540 LD HL,(SPACE)
01550 LD (HL),0DH ;INSERT C.R.
01560 RET
01570 REMAIN DEFB 0
01580 SPACE DEFW 00
01590 VIDWIT DEFB 0
01600 ;
01610 ; PARAMETER RECOVERY SUBROUTINE
01620 ; RECOVERS VARPTR(STRING) AND PLACES
01630 ; LENGTH IN B, STRING ADDRESS IN HL
01640 ; VARPTR(STRING) IN IX
01650 ;
01660 PARAM CALL 0A7FH ;GET VARPTR(STRING)
01670 PUSH HL
01680 POP IX ;TO IX
01690 LD B,(IX+0) ;LENGTH TO B
01700 LD L,(IX+1)
01710 LD H,(IX+2) ;ADDRESS TO HL
01720 RET ;DONE
01730 ;
01740 ; SEARCH FORWARD FOR SPECIFIED 2-BYTE STRING
01750 ;
01760 PSRCH CALL PARAM ;GET VARPTR(MNS)
01770 SEARCH LD DE,0000 ;SEARCH STRING
01780 PUSH HL
01790 POP IX
01800 LD C,255 ;STR. POS. COUNTER
01810 PSR010 LD L,(IX+0)
01820 LD H,(IX+1) ;GET FIRST PAIR FOR
CHPR
01830 INC C
01840 INC C ;BUMP STRNG POINTER
01850 BIT 7,H ;CHECK FOR NEGATIVE
01860 JR NZ,REVR ;NEGATIVE - DEAD FILE
01870 RST 18H ;COMPARE HL/DE
01880 JR Z,FSR100 ;FOUND
01890 JR NC,FSR100 ;TARGET>SOURCE
01900 REVR INC IX
01910 INC IX
01920 DEC B
01930 DJNZ FSR010 ;LOOP TIL FOUND
01940 PSR100 INC C ;STRPOS+1
01950 SRL C ;(STRPOS+1)/2
01960 LD B,0
01970 PUSH BC
01980 POP HL
01990 JP BASIC ;PASS TO BASIC
02000 ;

```

Listing continued

*Listing continued*

```

02010 ; NEW VIDEO DRIVER PATCH
02020 ;
02030 VIDEO PUSH AF ;SAVE FLAGS
02040 PUSH BC ;SAVE CHARACTER
02050 WAIT IN A,(USTAT) ;CHECK UART FOR CLEAR
02060 AND 40H ;BIT 6 IS THE ONE
02070 JR Z,WAIT ;TRANSMITTER BUSY
02080 LD A,C ;GET CHARACTER
02090 OUT (UDATA),A ;SEND IT
02100 PF AND 255 ;LF/CR SWITCH
02110 CP 0DH ;CAR. RET?
02120 JR NZ,VID010
02130 LD C,0AH ;INSERT L.F.
02140 JR WAIT ;SEND L.F.
02150 VID010 POP BC ;RECOVER CHARACTER
02160 POP AF ;RECOVER FLAGS
02170 VCONT JP 0000 ;PATCH POINT
02180 ;
02190 ; NEW KEYBOARD DRIVER PATCH
02200 ;
02210 KEYBD PUSH BC ;SAVE FLAGS
02220 PUSH AF
02230 IN A,(USTAT) ;CHECK UART
02240 AND 08H ;CHECK BIT 7 - DATA
REC'D
02250 JR Z,KOUT ;NONE READY
02260 IN A,(UDATA) ;GET DATA
02270 CP 1 ;CHECK FOR BREAK
02280 JR Z,KOUT ;AND IGNORE
02290 LD C,A
02300 POP AF ;RECOVER FLAGS
02310 LD A,C ;CHAR. TO A
02320 POP BC
02330 RET
02340 KOUT POP AF
02350 POP BC
02360 KCONT JP 0000 ;PATCH POINT
02370 ;
02380 ; INSTALLATION OF NEW VIDEO AND KEYBOARD
02390 ; LINKS TO RS-232
02400 ;
02410 ; FIRST, PATCH VIDEO DCB TO NEW ROUTINE
02420 ;
02430 INSTAL DI ;A LITTLE PRIVACY,
PLEASE LD DE,(VBLK+1) ;GET EXISTING ADDRESS
02440
02450 LD HL,VIDEO ;NEW ADDRESS
02460 LD (VBLK+1),HL ;PUT NEW ADDRESS IN
DCB
02470 LD (VCONT+1),DE ;PUT OLD ADDRESS IN
VIDEO
02480 COND TRSDOS ;ASSEMBLE IF TRSDOS
02490 ;
02500 ; THEN, PATCH KEYBOARD DCB
02510 ; TRSDOS 1.3 ONLY
02520 ;
02530 LD DE,(KBLK+1) ;GET OLD ADDRESS
02540 LD HL,KEYBD ;NEW ADDRESS
02550 LD (KBLK+1),HL ;INSTALL NEW ADDRESS
02560 LD (KCONT+1),DE ;OLD ONE TO OUR
ROUTINE
02570 ;
02580 ; FINALLY, CONFIGURE UART FOR 300/7/E/1
02590 ; TRSDOS 1.3 ONLY
02600 ;
02610 OUT (080H),A ;MASTER RESET
02620 LD A,55H ;SET 300 BAUD
SEND/RECV
02630 OUT (0E9H),A
02640 LD A,0A4H ;7/E/1
02650 OUT (0EAH),A ;SET IT
02660 ENDC
02670 IN010 EI
02680 JP TODOS
02690 END INSTAL

```

*End*

*Program Listing 2. Remaining Basic lines needed to complete the BBS Express.*

```

1360 IF (INP(&HE0)AND32)=0 THEN 1380
1365 A$=INKEY$:N=PEEK(&H387F):IFN=0THEN1360
1375 IPAS<>"THENAS=CHR$(ASC(A$)AND95):GOTO6500 ELSE1360
1385 IF (TTS="ALL") AND (SY) THEN TTS=TTS+CHR$(128)
1390 LSET F1$=NA$:LSET T2$=TIMES:LSET F2$=A$:LSET
T1$=TTS:LSET S1$=S0$:LSET S2$=CHR$(ASC(S7$) AND 32) OR
(ASC(S9$)):PUT 1,SN:PRINT"Awaiting delivery.":GOTO3640
13640 POKE MN,250:RETURN

```

*End*

everything in the system. Only a wizard or a sysop can change access codes.

Because you don't have a System/BBS data file yet, the BBS has no system defaults or system password. This prevents even a wizard from entering the system, so you'll have to use the break key to get into the BBS this first time. When the system asks for a system password, hit the break key, then type in GOTO 1600 to bypass the log-on procedures.

### A Note About Passwords

If you set your system password to PASSWORD, your board becomes an auto sign-on board, meaning that anyone can become a member simply by calling the board. If the system password is something other than PASSWORD, a new caller must know the password before signing on. Under these circumstances, the board is referred to as a closed-access board.

On the first run, the system password could be anything, depending on what was on the disk before you started. You'll be prompted for your name, address, and other personal information. Set your password to something other than PASSWORD—you're the sysop and you must protect your

personal BBS records. Set your access level to 0123456789ABCDE\*. The asterisk gives you sysop powers.

Next, from the Main Command prompt, enter a dollar sign. This is your point of entry into sysopland and works only if you include an asterisk in your access code. From the Sysop's Access mode, choose S for system, and set your defaults by choosing each of the displayed items by number.

Unless you're running a closed board, we suggest that you set line feeds to Y, video width to 64, and the system password to PASSWORD. The default access is the access level to which the BBS assigns new callers. You can enter digits 0-9 and letters A-E, though you don't have to keep them in order. For example, 03E is acceptable. For starters, set the board's maximum number of messages to 50 to prevent running out of directory slots.

Now choose N from the sysop command menu and name each of the BBS's 15 special-interest sections. Name the sections with care as callers often read special-interest letters only. Use the B command to write a bulletin board message for the new callers, welcoming them to your board. Now you're ready for business.

The message board might cause some problems at first because it requires at least one message to function properly. Hence, you need to set the message index (MBS). To do this, type in a dollar sign (\$) at the sysop command to break the program. Now, in the immediate mode, enter MB\$=MKI\$(1)+STRING\$(98,CHR\$(0)). This indexes the very first message, though you still need a header. To get one, type in the following:

```

GOSUB 220:GET 1,1:LSET T1$="ALL"
:LSET F1$="SYSOP":LSET F2$="MSG
0001":LSET S2$=CHR$(1):LSET S1$=
"WELCOME":LSET T2$=TIMES:PUT1,
1:CLOSE.

```

Next, you need to set up the System/BBS file. The command for this is:

```

SH=1:SN=1:SL=1:GOSUB190:GET
3,1:LSET SN$=MKI$(SN):LSET SL$=
MKI$(SL):LSET SH$=MKI$(SH):LSET
SC$=MKI$(1):LSET NMS$=MKI$(1):LSET
DSS$=MKI$(0):LSET NDS$=MKI$(0):PUT3,
1:CLOSE

```

Reenter the program now by typing in CONT. We have one message and one header indexed, so write a message and log off with the E command. Never exit without first logging off with this E command.



## BBS EXPRESS

An easier way to handle the initial business of setting up your board is to call us at 606-739-6088 and pick up a copy of INTRO/BAS from our data base—it does all the above for you.

### Closing Thoughts

Program Listing 1 is the machine-language assist module; Program Listing 2 provides a few lines we missed in previous listings. You should have no problems incorporating these listings with those from other BBS Express installations.

The COND and ENDC statements in Listing 1 are conditionals. If your assembler doesn't support this syntax, delete the lines marked for TRSDOS to make an LDOS version.

Originally, we thought that the BBS Express was relatively crash proof. In November, however, we received reports of repeated crashes and realized that the vandals were waiting out the modem and gaining access to the title page options. Lines 2705 and 1335 of Listing 2 prevent this from happening.

TRSDOS seems to be more of a problem than we originally anticipated, particularly with regard to the sypop Submit command. One version handles variable length records poorly, while the other doesn't handle them at all. In addition, TRSDOS allows only 80 files on a data disk, and if the total exceeds 80, TRSDOS reports that the disk is full. If you have a high-traffic operation in mind, drop us a line and we'll fix you up with a high-volume version of the BBS Express. LDOS users, on the other hand, report no problems. In fact, if you switch to LDOS, you get 112 files, a 40 percent increase in board capacity.

We've had a lot of fun with the BBS Express and hope it has been a rewarding experience for all of you who've been following us for the past year. ■

*This installment marks the end of the BBS Express, 80 Micro's do-it-yourself bulletin board. To see the finished product, call the 80 Micro BBS at 603-924-6985. UART parameters are 300 baud, 7-bit words, 1 stop bit, and even parity.*

You can reach J. Stewart Schneider and Charles E. Bowen either through their bulletin board at 606-739-6088 or c/o Saturday Software, P.O. Box 404, Catlettsburg, KY 41129.

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# Like a Circle in a Circle, Like a String Within a String

The Basic INSTR statement is short for "instring." It provides a quick way to check for characters within a character string. For example, if you type in PRINT INSTR ("hambone", "bone") and press the enter key, the computer displays a 4. This tells you that the character string "bone" appears in the string "hambone" starting at the fourth character.

Uses for INSTR are as diverse as your imagination. I've used it to direct program execution, validate responses to program prompts, separate data items into specified categories, and selectively print out or display data. Model I Basic doesn't recognize INSTR, but you can use it in Models III and 4 Basic and in GW-Basic.

## Starting with INSTR

INSTR statements take the form INSTR(search string, sought string). Basic checks for the occurrence of the sought string within the search string.

You can search for string literals, as in the hambone example above; for string variables, such as INSTR(A\$, Z\$); or for a combination of string variables and literals, such as INSTR("Peace", B1\$) or INSTR(LIST\$, "Enid").

## Learning by Example

Type in PRINT INSTR("hambon", "bone") and hit the enter key. The answer is zero because the string "bone" does not occur within "hambon."

Now type in PRINT INSTR(6, "hambone", "bone"). The computer again responds with a zero, even though "bone" resides within "hambone." The number six, the first item in the parentheses, tells Basic to start searching at the sixth character in "hambone." Basic reads the letters "ne" and returns a zero answer. Basic will also return a zero if the position number is greater than the length of the search string.

Now that you know INSTR funda-



## Program Listing 1. Search String.

```
100 REM * Search String *
110 REM * Won't work on Model I *
120 CLS: A$="The quick brown fox"
130 PRINT "THE SEARCH STRING: "A$
140 INPUT "Type a sought string ";B$
150 CLS: Z=INSTR(A$,B$)
160 PRINT "The character(s): ";B$
170 IF Z=0 THEN PRINT "do not occur in "A$:END
180 REM * If program reaches this line, the Z > 0.
190 PRINT "appear in ";: PRINT A$
200 PRINT STRING$(Z-1,32);STRING$(LEN(B$)," ")
210 PRINT "starting at character position"Z
220 END
```

End

## Program Listing 2. Input Menu.

```
100 REM * INPUT MENU - Without INSTR *
110 REM * Works on all TRS-80s *
120 CLS: PRINT "The Menu:"
130 PRINT "1 - First"
140 PRINT "2 - Second"
150 PRINT "3 - Third"
160 PRINT:PRINT "Press 1, 2 or 3 for choice and press enter."
170 INPUT Z
180 CLS: Z=INT(Z): IF Z<1 OR Z>3 THEN 120
190 ON Z GOTO 200,300,400
200 PRINT "Choice one":END
300 PRINT "Choice two":END
400 PRINT "Choice three":END
```

End

mentals, try Search String in Program Listing 1. In this program, search string A\$ equals "The Quick Brown Fox" and the sought string becomes whatever you enter.

Type in "brown," then type in "BROWN." The results show that the search is exact: The upper- and lower-case characters in the search string

must match those of the target string or Basic returns a zero.

You can use INSTR to limit choices

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to Basic prompts as well. First, a long version:

```
100 INPUT "WANT TO CONTINUE <Y>ES
OR <N>O";A$
110 IF A$<> "Y" AND A$<> "y" AND
A$<>"N" AND A$<> "n" THEN CLS:
GOTO 100
120 PRINT "Okay."
```

This works, but considering upper- and lowercase forms is cumbersome. It's especially onerous if the prompt leaves many possible answers.

Consider this alternative:

```
100 CLS: PRINT "WANT TO CONTINUE:
YES OR NO?"
110 A$=INKEY$: Z=INSTR("YNyn",A$)
120 IF A$= "" OR Z=0 THEN I10
130 PRINT "Okay."
```

This program gives results with a single keystroke by searching a string containing the first letters of all legal answers.

In Input Menu in Program Listing 2, I've demonstrated the standard way to use input to direct program execution.

To do the same thing using INSTR, try INSTR Menu in Program Listing 3. It combines INSTR with the live keyboard action of INKEY\$. Line 170

### Program Listing 3. INSTR Menu.

```
100 REM * INSTR MENU *
110 REM * Won't work on Model I *
120 CLS: PRINT "The Menu:"
130 PRINT "<F>irst"
140 PRINT "<S>econd"
150 PRINT "<T>hird"
160 PRINT:PRINT "Press F, S or T for choice."
170 A$=INKEY$: Z=INSTR("FSTfst",A$)
180 IF A$="" OR Z=0 THEN I70
190 ON Z GOTO 200,300,400,200,300,400
200 PRINT "Choice one" :END
300 PRINT "Choice two" :END
400 PRINT "Choice three" :END
410 END
```

End

### Program Listing 4. Sandwich Shop.

```
100 REM * SANDWICH SHOP *
110 CLS: CLEAR 500
120 A$="BOLOGNA CHEESE TURKEY PASTRAMI HAM"
130 FOR X=1 TO 5
140 INPUT "NAME PLEASE ";N$
150 PRINT:PRINT "HERE'S THE SELECTION":PRINT:PRINT A$
160 PRINT: INPUT "WHAT DO YOU WANT";C$
170 Z=INSTR(A$,C$)
180 IF Z=0 THEN CLS: PRINT "WE AIN'T GOT IT": GOTO 150
190 A$=LEFT$(A$,Z-1)+MID$(A$,Z+1+LEN(C$))
200 X$=X$+N$+" GETS "+C$+"."
210 CLS: NEXT X
220 PRINT "LEMME READ BACK YOUR ORDERS."
230 PRINT X$
240 END
```

End

contains an INSTR test. The string FSTfst combines all legal answers to the menu prompt.

Now try running Sandwich Shop in Program Listing 4. The A\$ variable

contains the names of the five sandwiches available. Five people type in their names and select from the available menu.

In line 170, the program uses IN-

Circle 71 on Reader Service card.

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## Program Listing 5. Sequence Search.

```

100 REM * Sequence Search *
120 CLS: A$="red red blue red green red green blue blue"
130 INPUT "Color sought";B$
140 X=1
150 Z=INSTR(X,A$,B$)
160 IF Z>0 THEN C=C+1: X=Z+LEN(B$): GOTO 150
170 PRINT B$" occurs"C"times in"
180 PRINT A$: END
    
```

End

STR to test whether the requested sandwich is available. If it is, the program assigns the choice to the requestor's name and removes the sandwich from the menu (line 190) using the value Z from the INSTR test. This line reshapes A\$ by removing the chosen sandwich word from the string and uniting the two orphan strings.

If the selected sandwich is unavailable, line 180 displays a message to that effect and prompts you to make another choice.

Sequence Search in Program Listing 5 uses the same INSTR(X,search,sought) form. You could use this listing as a routine in another program. It counts the number of times the same set of characters occurs in a string.

Run the program and type in the name of the color for which you're searching. The computer displays the number of times the color appears in the string.

Line 160 is the heart of the program. When Z (the number of the first occurrence) is greater than zero, the program has found an occurrence, and it limits the search to the right of the search string by making X equal Z plus the length of the characters just found.

### INSTR Applications

The aim of using INSTR is to obtain a number representing the start of a sought string within a search string. You can then use that number to achieve further goals. This is where

If...Then tests become useful. Consider these plain-English applications:

- Examine 1984 receipts, adding individual sales to arrays MONTHS(1)-MONTHS(12) based on the corresponding month names, then print a bar graph of the findings.
- Go through a document file and feed what you find into a new file. In every case where you find the character string "Scream," replace it with "Screen."
- Separate all employees into groups reflecting years of service.

### INSTR("NEXT", "MONTH")

I hope these examples have given you ideas on how to use INSTR in your own programs. It's the If...Then test that lends resilience and complexity to the moves you can make within a program.

Next month I'll discuss how to limit user responses to prevent improper program entries. See you then. ■

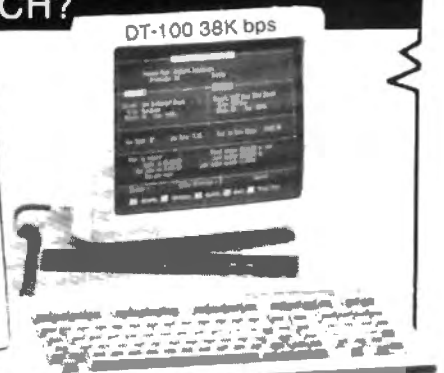
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# Program Access In One Easy Step

If you have a Model 4/4P running TRSDOS 6.2, try typing in an asterisk at the TRSDOS Ready prompt. Your computer will respond with the message "No command <\*> present, as SYS13." Now type in "MEMORY (ADD = "E",BYTE = X'80")" at TRSDOS Ready; you'll see the message "No Extended Command Interpreter Present, as SYS13." You have just stumbled across two of TRSDOS 6.2's most interesting capabilities, the immediate execution program (IEP) and the extended command interpreter (ECI).

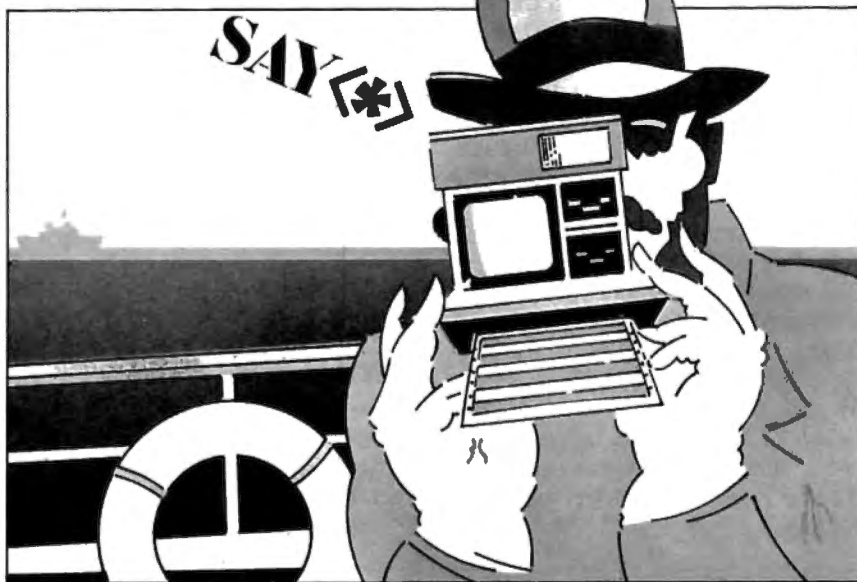
These two features represent an undefined system file that lets you create a program that permanently circumvents the TRSDOS Ready prompt and becomes your resident system program.

The undefined system file is SYS13. You won't find either the IEP or the ECI with TRSDOS 6.1; they're available in TRSDOS 6.2 only.

Although interesting, two new error messages might seem of little practical value. However, the IEP and the ECI can be of great help. Before I explain how to use them, I'll discuss how TRSDOS 6.2 works.

## TRSDOS 6.2's Operation

When you boot up a TRSDOS 6.2 disk, the system prompts you for the date. It then configures itself according to the information in the CONFIG/SYS file, which you create with the SYSGEN command (more about this later). Then TRSDOS checks the system disk for an Auto command and, if it finds one, executes it. Fi-



nally, TRSDOS checks EFLAG\$, the fifth byte in its flag table. If that byte is set to zero, the TRSDOS Ready prompt appears on the screen and the command interpreter in SYS1/SYS takes control of the computer.

However, if EFLAG\$ assumes any nonzero value, TRSDOS loads and runs SYS13/SYS. It also checks EFLAG\$ and automatically runs SYS13 every time a program returns to DOS using the @Abort or @Exit supervisory call (SVC).

TRSDOS recognizes one shorthand entry while it runs the normal SYS1/SYS interpreter: the asterisk key, which commands it to load and run whatever program resides in SYS13/SYS. Here is where the IEP or the ECI comes into play. They are actually two different versions of the same utility; since they both use SYS13/SYS, you can't use them together. The IEP is the easiest to use, so I'll begin with that.

## Using an IEP

You can put any machine-language program (including Basic) in SYS13/SYS and execute it by typing in an asterisk at TRSDOS Ready. Use this

Copy command to load one of your programs into SYS13/SYS:

```
COPY MYPROG/CMD TO SYS13/SYS.  
LSIDOS (C=N)
```

To execute Basic automatically, use:

```
COPY BASIC/CMD.BASIC TO SYS13/  
SYS.LSIDOS (C=N)
```

The password for SYS13 (and almost all other system files) is LSIDOS; the password for Basic is, simply, "Basic." The parameter (C=N) at the end of the Copy command tells the system not to transfer the file attributes along with the file. If you leave out that command, TRSDOS won't recognize SYS13 as a system file, and the IEP won't work.

OK, I agree that being able to boot up a program by typing in one character instead of a possible 20 characters is handy, but hardly earthshattering. Things get more interesting if your system program changes EFLAG\$. From then on, until you reboot your system (or until your program sets EFLAG\$ equal to zero again and exits to TRSDOS), you'll never see the TRSDOS Ready prompt. Whenever you finish running almost any soft-

## System Requirements

Model 4

64K RAM

TRSDOS 6.2

Assembly language  
Editor/assembler



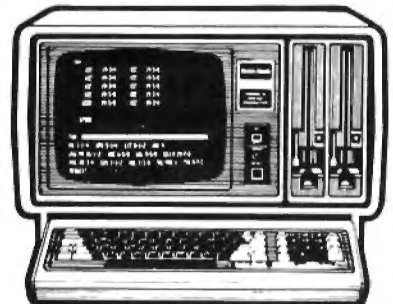
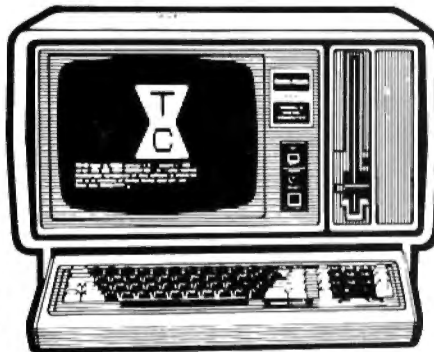
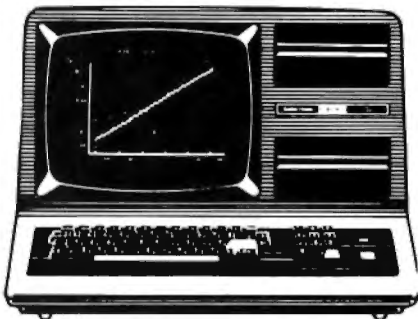
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# THE NEXT STEP

## Program Listing. Demonstration of an extended command interpreter.

```

00110 ; TITLE 'Model 4 Interface -- Hardin Brothers
00120 ; 'Friendly Model 4 Interface'
00130 ; Hardin Brothers, 12/30/84
00140 ;
00150 ; See text for installation procedures
00160 ;
00170 ;
00180 ;List of SVCs used:
00190 ;
00200 @ABORT EQU 21
00210 @CKBRK EQU 106
00220 @CLS EQU 105
00230 @CHMDI EQU 24
00240 @DSP EQU 2
00250 @DSPLY EQU 10
00260 @ERROR EQU 26
00270 @FLAGS EQU 101
00280 @KEY EQU 1
00290 @NUL0 EQU 90
00300 @VDCFL EQU 15
00310 ;
00320 ;ASCII Equates:
00330 ;
00340 @FK EQU 03H
00350 @CR EQU 0DH
00360 @LFTARW EQU 08H
00370 @RTARW EQU 09H
00380 @DNARW EQU 0AH
00390 @UPARW EQU 0BH
00400 @CURSON EQU 0EH
00410 @CURSOP EQU 0FH
00420 @INVOW EQU 10H
00430 ;
00440 ;
00450 START SVC @FLAGS ;Start in free memory
00460 LD (STKSAV),SP ;Point IX=> Flag Table
00470 SVC @CKBRK ;Save the stack pointer
00480 JR NZ,ERROR ;Check and clear BREAK bit
00490 ; ;Go if no break
00500 LEAVE XOR A ;A = 0
00510 LD (IX+'E'-'A'),A ;Set EFLAG$ to 0
00520 LD C,CURSON ;Set cursor on
00530 SVC @DSP ;Send to *DO
00540 JP NZ,ERROR ; Error trap
00550 SVC @CLS ;And clear the screen
00560 JP NZ,ERROR ; Error trap
00570 SVC @ABORT ;And leave
00580 ;
00590 STARTA LD A,(IX+'E'-'A') ;Get current EFLAGS
00600 OR A ;Test it
00610 JR NZ,SETUP ;Go if set non-zero
00620 CPL ;Else make non-zero
00630 LD (IX+'E'-'A'),A ;And store it
00640 ;
00650 SETUP BIT 0,A ;Have we been here once?
00660 JR NZ,SETUPA ;Go if not
00670 LD A,@FFH ;Set flag to @FFH
00680 LD (IX+'E'-'A'),A ;Store in EFLAGS
00690 HL,WAITMSG ;HL=> 'Press a key...'
00700 SVC @DSPLY ;Display it
00710 JP NZ,ERROR ; Error trap
00720 SVC @KEY ;Wait for a key
00730 JP NZ,ERROR ; Error trap
00740 SETUPA SVC @CLS ;Clear the screen
00750 JP NZ,ERROR ; Error trap
00760 LD HL,HELLO ;HL=> Opening message
00770 SVC @DSPLY ;Put it on the screen
00780 JP NZ,ERROR ; Error trap
00790 ;
00800 ;
00810 CALL DISPLAY ;Show options
00820 CALL SELECT ;Make a choice
00830 ;
00840 ;
00850 ;
00860 ; Read through the list of options, and display each on the
00870 ; screen in 4-across format.
00880 ;
00890 ;
00900 DISPLAY LD C,CURSOP ;Turn off cursor
00910 SVC @DSP ;Send to *DO
00920 JP NZ,ERROR ; Error trap
00930 LD IX,OPTTAB ;IX=> Options & addresses
00940 DLOOP LD A,(IX) ;Get option #
00950 OR A ;Is it 0?
00960 RET Z ;If so, we're done here
00970 CALL SET_RC ;Set Row/Col in HL
00980 LD B,3 ;Select "Set Cursor"
00990 SVC @VDCFL ;Set the cursor
01000 JP NZ,ERROR ; Error trap
01010 LD L,(IX+1) ;Get LSB of option message
01020 LD E,(IX+2) ; And MSB
01030 SVC @DSPLY ;Display it
01040 JP NZ,ERROR ; Error trap
01050 INC IX ;Bump IX
01060 INC IX ; Three times to
01070 INC IX ; next position
01080 JR DLOOP ;Repeat until done
01090 ;
01100 ;
01110 ;
01120 ;SELECT
01130 ; User can move inverse block around screen with arrow keys,
01140 ; select option under block with <ENTER>, or go to TRSDOS
01150 ; with <BREAK>.
01160 ;
01170 SELECT LD C,INVOW ;Set inverse bit
01180 SVC @DSP ;Send to *DO
01190 JP NZ,ERROR ; Error trap
01200 LD A,1 ;Start with first option
01210 LD (CURRENT),A ;Set as current
01220 LD (INVM),A ; and as next
01230 SEL0 CALL SETNEXT ;Erase old & set new inverse
01240 SVC @CKBRK ;Check for break key
01250 JP NZ,LEAVE ;Go if <BREAK> hit
01260 SVC @KEY ;Get a keystroke
01270 JP NZ,ERROR ; Error trap
01280 CP CR-1 ;Larger than <ENTER>?
01290 JR NC,SEL0 ;Loop back if yes
01300 CP CR ;Is it an <ENTER>?
01310 JR NZ,LEFT ;Go if not <ENTER>
01320 LD A,(CURRENT) ;Get current choice
01330 RET ;And return
01340 ;
01350 LEFT CP LFTARW ;Left arrow?
01360 JR NZ,RIGHT ;Go if not
01370 LD A,(CURRENT) ;Get current option
01380 CP 2 ;Must be at least 2nd
01390 JR A,C,SEL0 ;Go if can't back up
01400 DEC A ;Else decrement A
01410 LD (INVM),A ;Set new value
01420 JR SEL0 ;And loop back
01430 ;
01440 RIGHT CP RTARW ;Right arrow?
01450 JR NZ,DOWN ;Go if not
01460 LD A,(CURRENT) ;Get current option #
01470 CP MAXOP ;Compare with maximum value
01480 JR NC,SEL0 ;Go if already at top
01490 INC A ;Else increment A
01500 LD (INVM),A ;Save as new value
01510 JR SEL0 ;And loop back
01520 ;
01530 DOWN CP DNARW ;Down arrow?
01540 JR NZ,UP ;Go if not
01550 LD A,(CURRENT) ;Get current option #
01560 ADD A,4 ;Add 4 for next row
01570 CP MAXOP+1 ;Over the top?
01580 JR NC,SEL0 ;Go if too high
01590 LD (INVM),A ;Else set new value
01600 JR SEL0 ;And loop back
01610 ;
01620 UP CP UPARW ;Up arrow?
01630 JR NZ,SEL0 ;Go if not
01640 LD A,(CURRENT) ;Get current option #
01650 SUB 5 ;Move up row + 1
01660 JR C,SEL0 ;Go if too low
01670 INC A ;Correct to Current - 4
01680 LD (INVM),A ;Set new value
01690 JR SEL0 ;And loop back
01700 ;
01710 ;
01720 ;COMMAND
01730 ; A = current option choice.
01740 ; Point HL => action for this choice, and then use @CHMDI to
01750 ; execute it.
01760 ; @CHMDI does not return, but EFLAG$ is set, so control will be
01770 ; passed back to this program after action is completed.
01780 ;
01790 ;
01800 COMMAND LD HL,CMDTAB-2 ;HL=> List of addresses
01810 ADD A,A ;Multiply A * 2
01820 ADD A,L ;Add to pointer
01830 LD L,A ;And save it
01840 JR NC,C1 ;Go if no carry
01850 INC B ;Else bump B
01860 C1 HL ;Get LSB of action address
01870 INC HL ;Bump HL
01880 LD D,(HL) ; And MSB of action address
01890 ER DE,HL ;HL=> Action line
01900 LD C,CURSON ;Turn on cursor
01910 SVC @DSP ;Send to *DO
01920 JP NZ,ERROR ; Error trap
01930 SVC @CLS ;Clear the screen
01940 JP NZ,ERROR ; Error trap
01950 LD A,@H ;Show we've been here
01960 LD (IX+'E'-'A'),A ;Set the EFLAG
01970 SVC @CHMDI ;And go do it
01980 ; Note -- there is no return from @CHMDI
01990 ;
02000 ;
02010 ;ERROR
02020 ; The ERROR routine displays the current error message
02030 ; then starts this program over again.
02040 ; Error code is in A register on entry.
02050 ;
02060 ERROR OR 12800000 ;Get for short message and return
02070 LD C,A ;Error code in C
02080 SVC @ERROR ;Display the error
02090 LD HL,WAITMSG ;HL=> Our message
02100 SVC @DSPLY ;Display it
02110 JR NZ,ERROR ; Error trap
02120 SVC @KEY ;Get any keystroke
02130 JR NZ,ERROR ; Error trap
02140 LD SP,(STKSAV) ;Clear the stack
02150 JP START ;Start program over
02160 ;
02170 ;
02180 ;SET_BC
02190 ; Option # is in A register. Set HL so that
02200 ; H => Row that option is displayed on
02210 ; L => Column for option display
02220 ; Preserve other registers
02230 ;
02240 ;
02250 SET_BC PUSH BC ;Save BC pair
02260 PUSH DE ;And DE
02270 DEC A ;Work with A-1
02280 PUSH AF ;Save A register
02290 LD HL,(TOP_RC) ;Get top row and column
02300 SRL A ;A/2
02310 SRL A ;A/4
02320 ADD A,H ;Add to row counter
02330 LD W,A ;And save
02340 POP AF ;Recover A register
02350 PUSH AF ; and save again
02360 AND 03H ;A MOD 4
02370 LD C,A ;Store in C
02380 LD E,255H ;Multiplier
02390 SVC @MUL ;Multiply: A = C * E
02400 LD L,A ;Set as column
02410 POP AF ;Recover original A
02420 INC DE ;Reset to original value
02430 POP DE ;And DE
02440 POP BC ;And BC
02450 RET
02460 ;

```

Listing continued



Listing continued

```

02470 ;-----
02480 ;SETNEXT
02490 ; Remove the inverse print from the old (current) option, and
02500 ; add it to the new option. Then set CURRENT = NEW.
02510 ;-----
02520 ;
02530 SETNEXT LD DE,LINBUF ;DE=> DE char. line buffer
02540 LD A,(CURRENT) ;Get current option #
02550 CALL SET_RC ;Get row number
02560 PUSH HL ;Save L register
02570 LD BC,0991H ;Set "Move line to memory"
02580 SVC $VDCPL ;Do it
02590 JP NZ,ERROR ; Error trap
02600 POP HL ;Recover HL pointer
02610 PUSH HL ; and save again
02620 LD B,0 ;HL = start column of option display
02630 LD DE,LINBUF ;DE ==> line buffer
02640 ADD HL,DE ;HL ==> Start of option label
02650 LD B,17 ;Number of characters to change
02660 SET18 LD A,(HL) ;Get a character
02670 AND 7FH ;Clear high bit
02680 LD (HL),A ;Put it back
02690 INC HL ;Point to the next
02700 DJNZ SET18 ;Repeat for 17 characters
02710 POP HL ;H ==> Screen row again
02720 LD BC,0990H ;Select "Move memory to line"
02730 SVC $VDCPL ;Put line back on screen
02740 JP NZ,ERROR ; Error trap
02750 ;
02760 LD DE,LINBUF ;Now start again
02770 LD A,(NEW) ;Get new option #
02780 LD (CURRENT),A ;Save as current #
02790 CALL SET_RC ;Get row number
02800 PUSH HL ;Save L register
02810 LD BC,0991H ;Set "Move line to memory"
02820 SVC $VDCPL ;Do it
02830 JP NZ,ERROR ; Error trap
02840 POP HL ;Recover HL
02850 PUSH HL ;And save again
02860 LD B,0 ;HL = start column of option display
02870 LD DE,LINBUF ;DE ==> Line buffer again
02880 ADD HL,DE ;HL ==> Start of option label
02890 LD B,17 ;Number of characters to change
02900 SET20 LD A,(HL) ;Get a character
02910 OR 08H ;Set high bit
02920 LD (HL),A ;Put it back
02930 INC HL ;Point to the next
02940 DJNZ SET20 ;Repeat for 17 characters
02950 POP HL ;H ==> Screen row again
02960 LD BC,0990H ;Select "Move memory to line"
02970 SVC $VDCPL ;Do it
02980 JP NZ,ERROR ; Error trap
02990 RET
03000 ;
03010 ;-----
03020 ; List of storage locations and constants
03030 ;-----
03040 ;
03050 STKSAV DEFB 0-5 ;Room to save stack pointer
03060 CURRENT DEFB 0-5 ;Current option
03070 NEW DEFB 0-5 ;Next option
03080 TOP_RC DEFB 0400H ;Start row & column for Option list
03090 MAXOP EQU 18D ;# Options available
03100 LINBUF DEFB 80 ;Buffer for screen line
03110 ;
03120 OPTTAB DEFB 1 ;Table of display messages
03130 DEFB OPT1 ;for each option
03140 DEFB 2
03150 DEFB OPT2
03160 DEFB 3
03170 DEFB OPT3
03180 DEFB 4
03190 DEFB OPT4
03200 DEFB 5
03210 DEFB OPT5
03220 DEFB 6
03230 DEFB OPT6
03240 DEFB 7
03250 DEFB OPT7
03260 DEFB 8
03270 DEFB OPT8
03280 DEFB 9
03290 DEFB OPT9
03300 DEFB 10
03310 DEFB OPT10
03320 DEFB 0 ;Mark end of table
03330 ;
03340 CNDTAB DEFB CND1,CND2 ;Table of action commands for
03350 DEFB CND3,CND4 ;each option.
03360 DEFB CND5,CND6,CND7,CND8,CND9,CND10
03370 ;-----
03380 ; Messages, option displays, and option actions
03390 ;-----
03400 ;
03410 HELLO DEFB 192+28 ;Tab 28 spaces
03420 DEFB 'The Friendly Model 4' ;Line feed
03430 DEFB DWHARW
03440 DEFB 192+8
03450 DEFB 'Use arrows to move, <ENTER> to select,'
03460 DEFB ' <BREAK> to go to TRSDOS'
03470 DEFB CR
03480 ;
03490 ;
03500 WAITMSG DEFB 'Press any key to continue'
03510 DEFB CR
03520 ;
03530 OPT1 DEFB 'Catalog--Drive 1' ;List of display messages
03540 DEFB STX
03550 OPT2 DEFB 'Catalog--Drive 2'
03560 DEFB STX
03570 OPT3 DEFB 'Format Drive 1'
03580 DEFB STX
03590 OPT4 DEFB 'Format Drive 2'
03600 DEFB STX
03610 OPT5 DEFB 'Backup Dr 1 => 2'
03620 DEFB STX
03630 OPT6 DEFB 'Backup Dr 2 => 1'
03640 DEFB STX
03650 OPT7 DEFB 'Print File 1'
03660 DEFB STX
03670 OPT8 DEFB 'Print File 2'
03680 DEFB STX
03690 OPT9 DEFB 'Run Program 1'
03700 DEFB STX
03710 OPT10 DEFB 'Run Program 2'
03720 DEFB STX
03730 ;
03740 CND1 DEFB 'CAT :1' ;List of actions
03750 DEFB CR
03760 CND2 DEFB 'CAT :2'
03770 DEFB CR
03780 CND3 DEFB 'FORMAT :1 (CYL=48,DDEN,ABS,Q=N)'
03790 DEFB CR
03800 CND4 DEFB 'FORMAT :1 (CYL=48,DDEN,ABS,Q=N)'
03810 DEFB CR
03820 CND5 DEFB 'BACKUP /DAT:1 TO :2'
03830 DEFB CR
03840 CND6 DEFB 'BACKUP /DAT:2 TO :1'
03850 DEFB CR
03860 CND7 DEFB 'LIST FILE1/DAT:1 (P)'
03870 DEFB CR
03880 CND8 DEFB 'LIST FILE2/DAT:1 (P)'
03890 DEFB CR
03900 CND9 DEFB 'PROGRAM:1'
03910 DEFB CR
03920 CND10 DEFB 'BASIC PROGRAM2/BAS (P=5,N=63450)'
03930 DEFB CR
03940 ;
03950 END START

```

End

ware, TRSDOS loads the program stored in SYS13 and it takes over. Unlike a program Auto calls, which runs once and then quits, your SYS1 program becomes the system program and you can't return to TRSDOS Ready unless your program lets you.

### Enter the ECI

This technique is especially useful in creating a new user interface for TRSDOS. By using an ECI, a user never need worry about parameters or dummy devices. You can give the Model 4 whatever kind of user interface you want.

The Program Listing, which makes a Model 4 look a little like a Model 100, demonstrates one possibility. The user only needs to move the cursor to select one of a limited set of com-

mands. He won't have to worry about a command string like "BASIC MY-PROG (F=5,M=62000)" when the computer can do it instead. Once you install this program, a user will never see the TRSDOS Ready prompt.

I used the ALDS assembler for my program; if you use EDAS or Pro-Create, you'll have to change line 440 from PSECT 3000H to ORG 3000H and define an SVC macro at the beginning of the program like this:

```

SVC MACRO #SVC
LD A,#SVC
RST 28H
ENDM

```

The program should be easy to understand, but I'll explain a couple of the routines. First, the program uses EFLAG\$ for two different purposes. The beginning of the program checks

EFLAG\$. If you invoke the program with the asterisk key, EFLAG\$ will be set at zero (assuming you've copied the program into SYS13). The SYS1 program sets EFLAG\$ to OFF hexadecimal (hex) to change itself from an IEP to an ECI, clears the screen, and gets to work.

If SYS1 finds EFLAG\$ set to OFF hex instead of zero, it leaves the flag alone and immediately displays the options screen. However, if it finds EFLAG\$ set to 80 hex, it displays a "Press any key" message and waits before displaying the options screen. This last feature is necessary because an immediate clear would erase important information left on the screen by commands like DIR before a user has a chance to read it. To signal the pause, the program sets EFLAG\$ to

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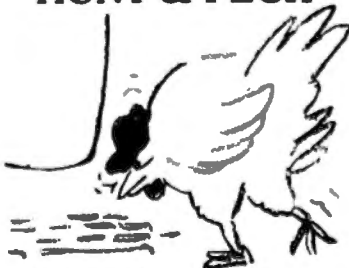
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**THE NEXT STEP**

80 hex before executing any user command.

Three main routines follow the program's setup section. The first displays the available options on the screen, the second lets a user move an inverse block around to pick an option, and the third executes the commands related to whatever option the user chose. My program executes all commands through the @CMNDI SVC, which sends a string to TRSDOS and lets the DOS parse and execute it. With a little more programming, you could make the interface display messages, prompt for more information, or send multiple commands like JCL does.

The inverse print block that the program uses as a cursor works because of the Model 4's video hardware. With inverse print on, TRSDOS displays any character sent to video memory with the high bit set in inverse video. If inverse print is off, the same values are displayed as graphics blocks and special characters. (With inverse print on, the DOS \*DO driver automatically sets the high bit of every normal character it receives.)

The program turns on inverse print when it's ready to display the inverted block. Then it uses the @VDCTL SVC to read and write lines of text from video memory. Two short loops either set or reset high bits of appropriate characters to make them appear inverted or normal. You can easily modify the two prompts that the screen displays and the action that each causes. The MAXOP value in line 300 defines the number of options in the program. It can be any value between 1 and 80. The OPTTBL (line 303) contains a number and the address of each visual option prompt.

The list of option prompts begins on line 344, and the corresponding list of TRSDOS commands on line 365. You must end each prompt with an ETX (end-of-text) character (CHR\$(03)), and end each action command with a carriage return character. Also, each prompt has a maximum length of 17 characters. Feel free to alter the prompts and the actions as you write the program; the ones I chose are only for demonstration.

When you assemble the program, don't give it the name SYS13/SYS! Instead, name and test it just as you would any other Assembly-language

program until you finish debugging it. Then copy the program into SYS13 with the Copy command shown previously. Test it some more by invoking it with the asterisk command. When you're sure everything works, set EFLAG\$ permanently to OFF hex so the program automatically runs on each reboot.

**Changing EFLAG\$**

Permanently changing EFLAG\$ is a small problem. You can't use the TRSDOS Memory command and then SYSGEN, because the computer will invoke your program as soon as Memory finishes execution. The easiest solution is to change your configuration file.

Every time you invoke a SYSGEN command, TRSDOS creates a file named CONFIG/SYS that contains all current information on your system, including the value of all flags, any programs held in protected high or low memory, information about your disk drives, and the current device filtering and routing. You can patch that file like any other.

First, give TRSDOS the command MEMORY (ADD="E"). The computer will display a line of information that includes the address of EFLAG\$. On my system, EFLAG\$ is stored at 006E hex; it's probably at the same location on all current versions of TRSDOS 6.2. Then type in the following command, inserting the appropriate address where shown:

PATCH CONFIG/SYS.CCC (X'006E' = FF)

If you don't get an error message, your new program is now a full-fledged ECI. Press the reset button, and your program has full control of the computer. Anyone who boots that disk will never see TRSDOS Ready and will have whatever kind of simplified user interface you've designed. ■

*Contact Hardin Brothers through CompuServe. GO PCS-117 to the Writers' and Editors' SIG (WESIG), and leave your message on section zero of the message board. You can also write to him at 280 N. Campus Ave, Upland, CA 91786. Enclose a self-addressed, stamped envelope if you want a reply.*

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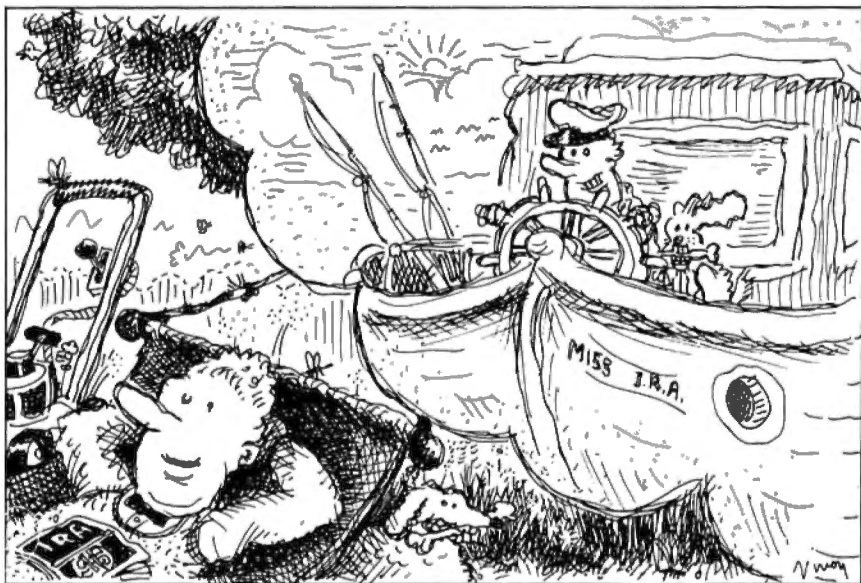
Submit your template to *Spreadsheet Beat*, 80 Micro, 80 Pine St., Peterborough, NH 03458. We'll pay \$50 for each one we publish. We'll also publish any valuable hints and patches you'd like to share.

by Russ Couey

**I**ndividual Retirement Accounts (IRAs) are a popular means of investment, but they exist in many forms. Among those available are speculative funds, fixed-rate money market funds, and bonds. These types of investments not only give you the opportunity to realize significant gains but also the potential to suffer substantial losses.

Before you decide on an investment, you may wonder how you would fare if you took a different route. By using my template formulas (see Fig. 1), you can analyze a potential investment and compare it to other types. In my example (Fig. 2), I invest in an ersatz speculative fund (ABC Growth Fund) and compare it to a more conservative money market fund with a fixed interest rate. You can also use the template to compare an investment you've already made with an alternative.

I designed my template for VisiCalc, but you can use it with any spreadsheet. Just change the cell labels and formatting commands to meet your spreadsheet's needs. The /F\$ part of my formulas formats results in dollars. Use whatever code is appropriate for your spreadsheet. When



Cell	Cell Formula
H14	/F\$ (F14 + G14)
F20	/F\$ (F18 * F19)
H20	/F\$ (F20 + G20)
F22	/F\$ (F18 - F15) * F19
F23	/F\$ (F15 * F19) - F14
F25	/F\$ (F22 + F23)
H25	/F\$ (F25 + G25)
F26	/F\$ (F25 / F14) * 100
H26	/F\$ (H25 / H14) * 100
F30	/F\$ (F19 - F29) / F29 * 100
H35	/F\$ (H34 - H33) / H33 * 100
F40	/F\$ ((F30 / 100) / 12 + 1) * (F39) * F14)
H40	/F\$ (F40 + G40)
F41	/F\$ (F40 - F20)
H41	/F\$ (H40 - H20)
F42	/F\$ (F41 / F20) * 100
H42	/F\$ (H41 / H20) * 100
F44	/F\$ (F40 / F18)

Figure 1. Formulas for the VisiCalc template. The /F\$ characters format the cells for dollars. You have to use the command appropriate for your spreadsheet.

typing in the formulas, ignore the spaces; I only included them here for readability.

Column G (XYZ Growth Fund) lets you track an additional investment. I have not included formulas for that column, as they are identical to the formulas for column F. To use column G, copy the F cell formulas to the corresponding G line numbers with VisiCalc's Replicate-relative command. If you use a different spreadsheet, use the applicable Copy command.

My formulas analyze a speculative

investment that pays dividends in stock, not cash. The amount and value of the stock you own increases or decreases according to market trends. Your only cash outlay comes when you first buy the stock.

## Template Format

Figure 2 shows my template's layout. The top section is for header information. The two investment columns (the ABC and XYZ Growth Fund columns) show example mutual fund-type growth stock investments.

A	B	C	D	E	F	G	H	I
1								
2								
3	Filespec =		IRA:3					
4	Program =		Individual Retirement Account					
5	Data Date =		08-01-84					
6								
7								
8					ABC	XYZ		
9					Growth	Growth		
10					Fund	Fund	Grand	
11							Totals	
12	Inception to Date							
13	Purchase Date			01-27-82		05-01-83		
14	Account Number			341-06		621-05		
15	Investment \$			1000.00		1000.00		2000.00
16	Shares Bought			126.582		51.072		
17	Share Price \$			7.90		19.58		
18	Current Shares			132.838		56.243		
19	Current Price \$			18.00		18.59		
20	Current Value \$			1320.30		1045.56		2373.94
21								
22	Share Change \$			62.56		96.13		
23	Price Change \$			265.82		-50.57		
24								
25	Total Change \$			328.38		45.56		373.94
26	Percent Change			32.84		4.56		18.70
27								
28	Annual Fund Comparison							
29	January 1984 Value \$			9.37		20.34		
30	Percent Change			6.72		-8.60		
31								
32	Standard & Poor's 500 Comparison							
33	January 1984 Value \$							164.04
34	Current Value \$							162.35
35	Percent Change							-1.03
36								
37	Money Market Comparison							
38	Interest Rate			10.25		10.25		
39	Elapsed Months			30		15		
40	Current Value \$			1290.67		1136.08		2426.75
41	Difference \$			-37.71		98.52		52.81
42	Percent Gain/Loss			-2.84		8.66		2.22
43								
44	Break-Even Price			9.72		20.20		
45								
46								
47								

Figure 2. Sample layout of the template. You should customize it to suit your needs.

The section titled Inception to Date lists basic information about your annual IRA. Lines 12-16 define the initial purchase. Lines 18-20 reflect the status as of the current date (line 5). In line 18, you enter the number of shares you own according to your periodic mutual funds status report. In line 19, enter the current price as indicated in the mutual funds section of your newspaper.

Lines 22 and 23 indicate the amount

of change attributable to dividends (share increases) as opposed to market price changes. Lines 25 and 26 calculate the change in your investment's value from its value on the purchase date.

The third section of the template, Annual Fund Comparison, requires you to enter a price at the beginning of the current year (line 29). Line 30 then calculates a year-to-date percent change.

In the fourth section, Standard &

Poor's 500 Comparison, you must insert data at the beginning of the current year (line 33) as well as at each periodic update for current value (line 34). Line 35 calculates the percent change from the beginning of the year to the data date.

The fifth section, Money Market Comparison (lines 38-42), outlines a safe, conservative investment. Use this as a guideline in determining your relative financial gain or loss had you taken this investment route. Here, the "safe" investment is a money market fund with a long-term fixed interest rate.

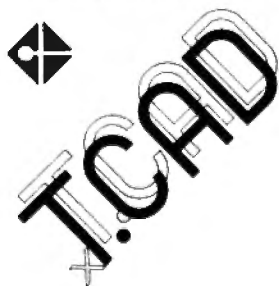
For this example, I assumed an annual interest rate of 10.25 percent, the elapsed months are from the date of the IRA investments (line 12) to the data date (line 5), and interest is compounded monthly. Line 41 compares the money market's current value (line 40) with that of the growth investment (line 20). Here, the more conservative investment would have been better by \$52.81 (H41) or 2.22 percent (H42).

The sixth section, Break-Even Price, indicates what the share value of the growth fund would have to be to match the money market fund performance. Line 44 calculates this by using the data in line 18 (current shares) and line 40 (Money Market Comparison current value).

You can customize the template to include subsequent investments by using column inserts and modifying the totals column for the new sum. The Annual Fund Comparison and Standard and Poor's 500 Comparison are optional sections you can delete without affecting the template. ■

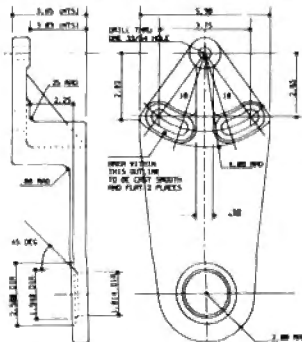
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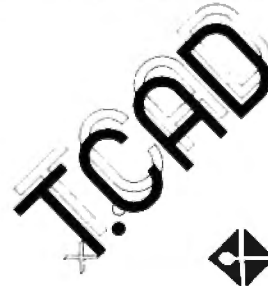
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## REVIEWS

Continued from p. 36.

board into a Dvorak-style keyboard by translating all input keys, the other you can use either in an output filter connected to the printer or the RS-232 port, or to translate ASCII values to EBCDIC, the standard used on IBM mainframes.

### RDTEST/CMD

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### TYPEIN/CMD

The last program on the LS-Utilities disk is an enhancement of the TRSDOS 6.X job control language (JCL) called TYPEIN/CMD. TYPEIN offers two advantages and two drawbacks compared to JCL.

The first advantage is that TYPEIN can send characters to programs that scan the keyboard (using the @KEY SVC) to look for single-key responses. Basic programs often use INKEY\$ or INPUT\$ to get a single keystroke as a menu selection. The TRSDOS JCL program is incapable of sending responses to such programs, but TYPEIN can.

TYPEIN's second advantage is that it can take its input either from a file or directly from the keyboard. You may know what you want a program to do and how it should respond to several prompts, but perhaps you don't use it that often. Or, you may answer the prompts differently each time you run a program. With TYPEIN, you can enter each command that you want to run automatically at the beginning of a session, in much the same way that you'd build a JCL file. However, LS-Utility doesn't save the list of automatic commands to disk.

TYPEIN's biggest disadvantage compared to JCL is that it can only process keystrokes. It can't handle any of the JCL macros such as //IF. Therefore, you can't access the full capabilities of the TRSDOS job control language with TYPEIN.

Secondly, TYPEIN won't work with programs that scan the keyboard

looking for abort keys only, such as the break and clear keys. Each such scan drains and discards keystrokes in the type-ahead buffer and also drains and discards all keystrokes in TYPEIN's buffer or disk file. Because of TRSDOS's structure, you can't get around such a problem.

### The Docs

The 22 pages of loose-leaf documentation is terse, but adequate to explain how to use each of the utilities (except in the case of the READ40/CMD drive table mentioned).

### Conclusion

It is unlikely that most Model 4/4P owners will use all eight utilities. That doesn't detract from its value, however. If you have a use for only one or two of these programs, you should find that LS-Utility is well worth its price. If you need more than one utility, it's an excellent buy. ■

## The Price is Write

by John B. Harrell III

★ ★ ★ ★

**EasyWriter 1 System** runs on the Tandy 2000, 1200, 1000 (128K) and on IBM PC compatibles. It requires one disk drive and either a monochrome or color monitor. Information Unlimited Software, 2401 Marinship Way, Sausalito, CA 94965-9987. \$195.

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**Volkswriter Deluxe 2.0** runs on the Tandy 2000, 1200, 1000 (256K) and on IBM PC compatibles. It requires one disk drive and either a monochrome or color monitor. Lifetree Software Inc., 411 Pacific Street, Monterey, CA 93940. 408-373-4718. \$295.

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**P**eople most often use computers in word processing. But it's not easy to find a word processor that suits both your needs and your pocketbook. EasyWriter and Volkswriter Deluxe are two well done, modestly priced word processors that provide most of the text manipulation functions you'll need.



**EasyWriter I System**

EasyWriter readily supplies all the basics for almost any word processing application. With its low cost (\$195) and ease of operation, it's perfect for users just beginning to work with their computers.

The EasyWriter package comprises three interfaces: the file manipulation menu, the editor, and the print menu. You select each of these options with the function keys; when you first boot up the system, however, you're in the file manipulation menu. Here you can invoke the standard file functions: delete, rename, load, store, and so on.

EasyWriter also lets you specify a file mask to selectively display certain files. For example, the mask C:DAT\* pulls all files from drive C that begin with the letters DAT. But you can't specify a file extension or a path name as part of the mask.

**The Editor**

EasyWriter's file editor resembles my old friend WordStar. Special print effects require symbols on the screen and don't use the computer's hardware for bold and underlined text. The files indicate soft spaces for justification and other special features with special characters.

EasyWriter includes some nice features, like an undelete function that takes care of any finger slips you might make. The ability to tell the computer "Whoops!" as you learn is particularly important.

**The Printer**

Also vital is good printer support. EasyWriter shines in this area, supporting 37 printers, including definition files for all of the Tandy printers. (EasyWriter comes installed for the Radio Shack DWP-410 printer.)

The printer menu lets you produce multiple copies of a file or print only part of a file. You can use continuous forms or single sheets of paper.

You can link files together, too, to print out a document that spans more than one file (and even more than one disk). Also, you can preview a document prior to printing it out to check on the format.

**The Speller**

To me, the best part of EasyWriter is its spelling checker. The checker comes with an 80,000-word dictionary

that handles words up to 29 characters long. You can check linked files as well, and the checker retains words you've identified as satisfactory.

For those of you who can't spell, a spelling checker alone sometimes isn't enough; you have to know how to spell the flagged words to enter them in the dictionary. The words that confuse me are those close to the correct spelling. EasyWriter solves this problem by using a phonetic substitution analyzer to recommend candidates for replacing an erroneous word.

EasyWriter also contains a sophisticated MailMerge function that lets you print customized documents for mass mailing. In addition, you can produce form letters or insert boilerplate text with this module.

**Deficiencies**

Some items I don't like. First of all, EasyWriter works only in black and white and doesn't compensate for the video bug in MS-DOS Version 02.00.XX, which incorrectly handles the intensity of the characters. Because of this defect, EasyWriter displays text in bright white letters against a black screen (on a color monitor).

EasyWriter limits the directory display to only those files it can access. You must exit to MS-DOS to see the entire directory or to determine the space remaining on a disk. The limitation on path name support under MS-DOS is an unreasonable restriction.

I experienced trouble with both of the Okidata printer files. Someone might have installed them who glanced through a list of control codes and didn't read the printers' supporting text. Nevertheless, several features were inoperative on my Okidata and I couldn't get it to print bold using the enhanced/emphasized modes because I didn't have enough bytes available to install the proper codes. I couldn't check out any of the daisy wheel printers and no mention is made in the text for support of proportionally spaced printing.

**Volkswriter Deluxe 2.0**

I have to rate Volkswriter Deluxe the Cadillac of small word processors. It has many of the features of higher-priced word processors and I found it easy to use once installed.

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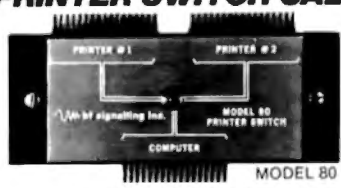
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The operation of formatting and transferring a system to your working disks is a necessary chore and generally doesn't take too long. The configuration program supplied with this version should be thrown away, however: I spent 90 minutes on a 10-minute job because every time I used the escape or arrow keys, the program hung up, requiring a system reset. This was unsatisfactory in a beginner's system.

Once I got past this stumbling block, I fell in love with Volkswriter Deluxe. It's really simple to use and makes magnificent use of the Tandy 2000's colors to display the special attributes of the printer code and page layout.

### Solid Functions

Unlike EasyWriter, Volkswriter takes full advantage of MS-DOS 2.0's features. You can use full path names to access any subdirectory and you can print text to disk to allow background printing of a document (or several documents) using the DOS Print command.

Volkswriter manipulates files that are essentially ASCII text files. In fact, if you use no special printing enhancements, you can integrate the files in any application. Volkswriter can also process any text file output from other programs, such as dBASE II or SuperCalc. Lifetree even includes a utility to convert WordStar files to Volkswriter format.

Volkswriter supports the entire line of Radio Shack printers, including the CGP-220 Color Ink Jet printer. While it doesn't support any of the popular printers (including Epson or Okidata models), installing your own printer codes is easy and requires only about 10 minutes.

Volkswriter also supports keyboard translation tables. You can customize your keyboard to support foreign languages or math symbols, and you can apply these commands to printer translation tables. The table can translate a single-byte code into multiple bytes, so you can generate extended characters.

Another outstanding feature is Volkswriter's ability to create a file larger than your memory size. You can write files up to 1 megabyte in size if you have the disk capacity. Volkswriter uses a memory-demand paging algorithm where the least recently used page is the first to be spilled to the disk

if you need more space. This provides maximum efficiency while you edit.

### Deficiencies

Volkswriter isn't without its faults. First of all, it doesn't run properly in color under the older MS-DOS; you'll need version 2.11 to allow adequate screen update. Second, Lifetree has modified Volkswriter's black and white characteristics to accommodate the defective BIOS in earlier versions. Running the black and white version under MS-DOS 2.11 hurts your eyes, because the high and low intensities are reversed! And the cursor leaves white blotches all over the screen when operating in the color mode.

The use of the soft keys was poor. I'm accustomed to having the more frequently used functions on the shifted and unshifted keys where I can get at them with a one- or two-hand manipulation. Some of the more frequent operations require using the alternate or control keys, forcing a touch typist into an abnormal series of keystrokes.

My biggest complaint with Volkswriter is the documentation. While Volkswriter presents all the proper details, it doesn't have photos showing computer-generated responses. There isn't a picture or drawing included. Further, the organization is poor, making it difficult to find information. I don't want to be forced into a lengthy search of the manual when I'm in the middle of a document.

While Volkswriter doesn't contain a spelling checker, its files lend themselves easily to many commercially supplied spelling checkers.

### Conclusion

It's impossible to satisfy everybody with one software package, because needs vary according to your skills and how you use the software. These two packages provide economical word processor systems. Each one has advantages and disadvantages. If your needs are minimal and your budget is limited, you can do no better than EasyWriter. This system has more than enough functions as an introductory word processor and offers some excellent features. It is also relatively easy to install and use.

My personal preference is Volkswriter Deluxe. The features that bothered me were the lack of a spelling

checker (which you can overcome) and the abysmal configuration program (which you only have to use once). But its other features far outweigh these deficiencies. It is an inexpensive package that has many features found in word processors costing twice as much. ■

## Convert 3 to 2000: Upward Mobility

by Gary Shade

★ ★ ★ ★ ★

Convert 3 to 2000 runs on the Model III (48K) and the Tandy 1000, 1200, 2000 (128K) and IBM PC compatibles. It requires two disk drives. Educational Micro Services, Inc., P.O. Box 471, Chester, NJ 07930. \$139.

Easy to use: ★ ★ ★ ★ ★

Good docs: ★ ★ ★ ★ ★

Bug free: ★ ★ ★ ★ ★

Does the job: ★ ★ ★ ★ ★

**C**onvert 3 to 2000 is a file transfer utility that lets you move Basic, ASCII, or binary files from the Models I and III to the Tandy 1000, 1200, 2000, or the IBM PC and compatibles. It's the best such program I've seen, well worth its higher price over similar programs.

Unlike other file transfer programs that require a hardware link between two computers, Convert transfers all files from disk to disk under software control. For instance, to transfer a Model III program to a Model 1000, you would format an MS-DOS disk on your Model III, transfer the Model III program to that disk, move the disk to the 1000 and run it through Convert's conversion program, then manually edit any problem lines Convert points out.

The problem in transferring Basic files is that some computers use different versions of Basic. The Basic interpreter of one computer contains key words not found or implemented differently in another. For example, the GW-Basic on most MS-DOS computers implements the random statement (RND) differently from that in Model III Basic. Convert 3 to 2000 addresses most of the problems involved in the successful transfer of files from one computer to another.

The two program disks included in the package are Hypercross, for the Model III, and the CVN32000 disk, which runs on the MS-DOS machines.

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# Tidbit #20

```

130 CLS
140 PRINT: PRINT: PRINT "Enter filename of /TXT file in"
150 PRINT "which to change periods to commas ";: LINE INPUT FILENAMES
160 F1$=FILENAMES+"/CHG:1": FILENAMES$=FILENAMES+"/TXT"
170 OPEN "I", 1, FILENAMES
180 OPEN "O", 2, F1$
190 IF EOP(1) THEN 260
200 LINE INPUT #1, A$
210 IF INSTR(A$, "DATA") > 0 THEN 250
220 IF INSTR(A$, ".") = 0 THEN 250
230 MID$(A$, INSTR(A$, "."), 1) = ","
240 GOTO 220
250 PRINT #2, A$: GOTO 190
260 CLOSE
270 PRINT: PRINT: PRINT "File saved as "; F1$: END
                    
```

Here's a better way to type in long lists of data statements on your Model 4. Use the numeric keypad, separating each integer with a period. Save the lines in an ASCII file with a /TXT extension, then use my program to convert the periods to commas. At the prompt, type in the text file's name without extension or drive number. The program saves the converted file with a /CHG extension on drive 1.

*Michael Shrout  
Greeley, CO*

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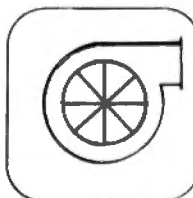
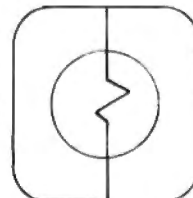
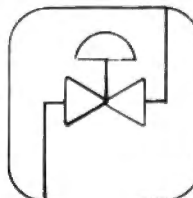
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**HyperCross**

The Model III Hypercross disk contains the programs HXI/CMD and HXIII/CMD. The disk comes in single-density TRSDOS 2.3 Model I format. Model III users must use their DOS Convert utility to transfer HXIII/CMD from the Model I-formatted disk to one with TRSDOS 1.3B. The programs HXI/CMD and HXIII/CMD let you format an MS-/PC-DOS single-sided, double-density disk, display either drive's directory, and copy files from one drive (and format) to another.

The Hypercross software HXIII/CMD runs under any of the following Model III operating systems: DOS-PLUS 3.4 or 3.5, LDOS, MULTIDOS, NEWDOS/80 2.0, and TRSDOS 1.3. When you initially run the program, you must specify the type of Model III DOS on the disk in drive zero. Once you do so, Hypercross displays the menu shown in Fig. 1. The program assumes that you have a Model III-formatted disk in drive zero and either a blank or an MS-DOS-formatted disk in drive 1.

Select from the following:

- 0 Directory of TRS-80 drive zero.
- 1 Directory of MS-DOS drive 1.
- 2 Copy file from drive zero to 1.
- 3 Copy file from drive 1 to zero.
- 4 Format a disk in drive 1.
- 5 Exit program.

Figure 1. Main Menu of Hypercross program.

After transferring the file to the MS-DOS-formatted disk in drive 1, remove the MS-DOS disk and insert it in the MS-DOS computer. If the file is a Basic program, run the CNV32000 conversion program on the MS-DOS computer. This converts the Model III Basic program to a format compatible with Tandy or IBM Basic. The program automatically inserts spaces between key words and replaces PRINT@ statements with Locate statements. Chapter 3 of the manual explains the reasons for any problems that occur during the conversion and tells you how to overcome them.

Some possible errors include PEEK/POKE statements, OUT/INP( ) statements, and others. Since

PEEK, POKE, OUT, and INP statements use machine-specific memory or port addresses, CNV32000 flags the line numbers where it encounters such statements. It's your responsibility to then make any necessary corrections, but the manual contains enough information for you to do so.

The manual also contains information on how to change any of the Model III Basic CMD commands. It further discusses special memory locations the Model III uses to monitor or change certain functions such as memory location 16409 (the Caps Lock switch) or memory location 16412 (the cursor blink switch). In most instances, the manual includes suggestions on how to replace the Model III statements with GW-Basic statements that do the same thing.

**Testing the Software**

I initially began testing Convert using a long Basic program found in an old issue of *80 Micro* called Kings and Castles (August 1983, p. 246). The conversion program performed flawlessly. When I ran CNV32000, I selected the options I wanted from the menu shown in Fig. 2. I directed the error report to the printer by selecting option D. What resulted was over four pages of errors or warnings produced by the conversion program. Most involved incompatible key words like RND, and PEEK/POKE statements that you'd have to edit manually after the conversion for compatibility.

I really had little need to see Kings and Castles run on the Tandy 2000, so I didn't bother to edit the four pages of errors. Instead, I developed a test program (Pro-

gram Listing 1) and ran it through the program (Program Listing 2).

Notice the difference between the listings. The Model III version contains no spaces between key words and operands, and the converted program does. CNV32000 automatically inserted the spaces when it made the conversion and replaced the Model III PRINT@ statement with an equivalent Locate statement.

Listing 3 contains the Model III program error statements produced by the conversion software. Notice that a warning error occurred in line 140 due to the RND statement. The manual suggests you substitute RND with INT (RND\*NUM) + 1, where NUM is the range you want to assign

Code	Option
A	Display errors on screen.
B	Display Model III program lines on screen.
C	Display IBM PC program lines on screen.
D	List errors on printer.
E	List Model III program lines on printer.
F	List IBM PC program lines on Printer.
G	Pause after each error condition.
H	Sound Bell after each error condition.
I	Save converted PC version on disk.
J	Insert line feed after each ":",
K	Insert line feed before If, Then, Else.
L	Remove remarks and comments from PC version.

Type the codes for all desired options and then press the enter key.

Figure 2. Main menu of Convert 3 to 2000 program.

Program Listing 1. Model III program listing before conversion.

```

10 'This is a test of the Model 3 to Tandy 2000 conversion
20 'Software (CONV 3 To 2000). A short program to illustrate
30 'the program's utility follows.
40 '***** Generate table of squares
50 FORI=0TO100
60 PRINTI,I[2,I[3
70 NEXTI
80 '
90 '***** TEST RANDOM NUMBER FUNCTION
100 '***** OBTAIN A NUMBER BETWEEN 5 AND 7.
110 FORX=1TO260:NEXTX
120 CLS:PRINT@535,"Random Number Test "
130 FORRN=1TO100
140 I=RND(10):IFI<4ORI>8THEN140
150 PRINTI;
160 NEXTRN
170 '
180 END
    
```

End

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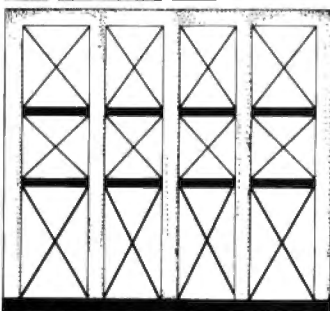
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Program Listing 2. Model III program listing after conversion.

```

10 'This is a test of the Model 3 to Tandy 2000 conversion
20 'Software (CONV 3 To 2000). A short program to illustrate
30 'the program's utility follows.
40 '***** Generate table of squares
50 FOR I=0 TO 100
60 PRINT I,I^2,I^3
70 NEXT I
80 '
90 '***** TEST RANDOM NUMBER FUNCTION
100 '***** OBTAIN A NUMBER BETWEEN 5 AND 7.
110 FOR X=1 TO 260:
NEXT X
120 CLS:
LOCATE 9,24:
PRINT"Random Number Test "
130 FOR RN=1 TO 100
140 I= INT (RND*10)+1:
IF I<4 OR I>8
THEN 140
150 PRINT I;
160 NEXT RN
170 '

```

End

Program Listing 3. Error statements produced by Convert 3 to 2000 and printed out.

```

-MOD 3- 10 'This is a test of the Model 3 to Tandy 2000 conversion
10 ' This is a test of the Model 3 to Tandy 2000 conversion

-MOD 3- 20 'Software (CONV 3 To 2000). A short program to illustrate
20' Software (CONV To 2000). A short program to illustrate

-MOD 3- 30 'the program's utility follows.
30 'the program's utility follows.

-MOD 3-40 '***** Generate table of squares
40 ' ***** Generate table of squares

-MOD 3- 50 FORI=0TO100
50 FOR I=0 TO 100

-MOD 3- 60 PRINTI, I^2,I^3
60 PRINT I, I^2,I^3

-MOD 3- 70 NEXTI
70 NEXT I

-MOD 3- 80 '
80 '

-MOD 3- 90 ' ***** TEST RANDOM NUMBER FUNCTION
90 ' ***** TEST RANDOM NUMBER FUNCTION

-MOD 3- 100 '***** OBTAIN A NUMBER BETWEEN 5 AND 7.
100 ' ***** OBTAIN A NUMBER BETWEEN 5 AND 7.

-MOD 3- 110 FORX=1TO260:NEXTX
110 FOR X=1 TO 260:
NEXT X

-MOD 3- 120 CLS:PRINT@535, "RANDOM NUMBER TEST "
120 CLS:
LOCATE 9,24:
PRINT"RANDOM NUMBER TEST "

-MOD 3- 130 FORRN=1TO100
130 FOR RN=1 TO 100

<<< ERROR 28 >>> Line # 140 WARNING ERROR <<RND>>
RND() statement encountered.
-MOD 3- 140 I=RND(10):IFI<4@RI>8THEN140
140 I=RND(10):
IF I<4 OR I>8
THEN 140

-MOD 3- 150 PRINTI;
150 PRINT I;

-MOD 3- 160 NEXTRN
160 NEXT RN

-MOD 3- 170'
170'

```

End

the random number. The program in Listing 1 contains the statement I=RND(10) at line 140. You should replace this with the statement I=INT(RND\*10)+1 in the MS-DOS converted program (Listing 2).

Conclusions

This is the most versatile file transfer utility that I've used. I was able to transfer any type of file to or from a Model I or III and my MS-DOS computers. The Basic conversion utility CNV32000 cleaned up the transferred Model III program, flagged potential compatibility problems and key words, and automatically substituted many key words such as Locate for PRINT@.

The big advantage I see in this software is that I don't need a serial card in the IBM PC, or a null cable to transfer a file between computers. I simply remove the MS-DOS-formatted disk from the Model I or III and put it in the PC. File transfers couldn't be easier.

The company advertises three conversion packages: One for converting programs from Model III to Model 4 Basic, one for Model III to Model 2000 conversions, and one for Model III to IBM PC and compatible Basics. The Model III to 4 package costs \$49.95, while the other two are \$139.95 each. The only difference between the MS-DOS versions is an addendum to the IBM PC program telling you to modify one line containing the Width statement so that it agrees with Advanced Basic syntax. This difference has nothing to do with how it converts the Model III Basic, but with how it prints out the information during conversion. The review package worked on the Tandy 2000, IBM PC, Compaq, and the Tandy 1000 and 1200.

The worst thing about the program is the manual. The program's documentation consists of 34 pages housed in an 8 1/2- by 11-inch three-ring binder. It's poorly organized and lacks an index. While it provides a lot of useful information, the manufacturer should have included a speedier way to access that information. A novice user will have some trouble using the software because of this.

While I feel that utility programs such as these should be priced from \$75 to \$90, Convert 3 to 2000 works so well it merits the \$139.95 price tag it carries. ■



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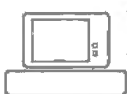
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## Making Connections

MLink (\$250) establishes micro to mainframe and micro to micro communications for the Model 4 running CP/M and the Models 1000, 1200, and 2000 under MS/DOS.

The package features on-line help functions, directory-based autodialing, and auto log-on. MLink also operates as a terminal emulator, data transfer utility, remote bulletin board, e-mail system, and as control software for distributed processing. You can also create automatic or menu-driven communications links.

For more information, contact Corporate Microsystems Inc. at Box 277, Etna, NH 03750, 603-448-5193.

Circle 551 on Reader Service card.

## Windows to CP/M

Monte's Window (\$49) can open windows for your 128K Model 4 with CP/M. A touch of the keys opens a software window containing a note pad, appointment calendar, calculator, and mini data base manager.

This desk organizer lets you interrupt program operation and display Monte's Window on-screen. One-key control resumes execution. Monte's Window uses no user RAM.

For more details, contact Montezuma Micro at Redbird Airport, Hangar 18, Box 32027, Dallas, TX 75232, 214-339-5104.

Circle 556 on Reader Service card.



The Penman Robot Plotter plots color graphics on up to a nine square-foot area.

## Plotting Robot

Axiom's Penman three-pen robot plotter (\$399) propels itself over a 3- by 3-foot area to produce multicolor graphics. Penman attaches to any computer through its RS-232 or serial port.

The unit's high-level commands include a built-in character set, arcs, and circles. The plotting vehicle measures four inches square and aligns itself with paper edges.

Penman works with many applications programs including Lotus 1-2-3, Visi-Calc, and Logo. For more information, contact Axiom, 1014 Griswold Ave., San Fernando, CA 91340, 213-365-9521.

Circle 559 on Reader Service card.

## On-Line Learning

The Information Online Toolkit (\$29.95) combines *The Microcomputer User's Guide to Information On-*

*line with SuperScout communication software for the Models 1000 and 1200.*

The guide includes step-by-step instructions on searching on-line data bases, downloading, sending mail, and talking to others. Users can subscribe to Business Computer Network Inc.'s service that provides 20 free accesses per month to information services and unlimited point-to-point communications.

For more details, contact Hayden Book Co., 10 Mulholland Drive, Hasbrouck Heights, NJ 07604, 201-393-6306.

Circle 562 on Reader Service card.

## Unearthly Software

Tracking Halley's comet is as easy as looking down—at your Model 100. Astro (\$39.95) turns your Model 100 into a portable planetarium. It plots a picture of the sky for any date, time, or location, and provides

information on celestial bodies of interest.

Move the cursor to the appropriate celestial body and Astro displays the name, brightness magnitude, direction, and altitude. Type in the name of the celestial body, and Astro points to it with the cursor.

Contact Loquor Enterprises, 3 Heneage Lane, Hanover, NH 03755 for more details.

Circle 555 on Reader Service card.

## Utilities 'R' Us

Dowling Enterprises Inc. (Box 12726, Albany, NY 12212, 518-459-2713) offers four utility programs for the Model I. Basic Screen Handler (\$35) lets you format and save full screens for use in Basic programs. Command File Processor (\$25) saves a series of commands in a file for automating command sequences.

Patch (\$15) alters Assembly-language object code without reassembling and linking the source code. D1Copy (\$15) copies files on one-drive systems.

Circle 563 on Reader Service card.

## Fast Tapes

The HHCI Tape Operating System (\$49.95) gives Model III cassette users faster input/output at a fraction of the cost of disk drives.

The system reads and writes data via CTR-41, CTR-80A, or CCR-81 cassette recorders at 8,000 baud, 50 times faster than

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### BUSINESS 100 PROGRAM LIST

NAME	DESCRIPTION
1 RULE78	Interest Apportionment by Rule of the 78's
2 ANNU1	Annuity computation program
3 DATE	Time between dates
4 DAYYEAR	Day of year a particular date falls on
5 LEASEINT	Interest rate on lease
6 BREAKVEN	Breakeven analysis
7 DEPRSL	Straightline depreciation
8 DEPRSY	Sum of the digits depreciation
9 DEPRDB	Declining balance depreciation
10 DEPRDDB	Double declining balance depreciation
11 TAXDEP	Cash flow vs. depreciation tables
12 CHECK2	Prints NEBS checks along with daily register
13 CHECKBK1	Checkbook maintenance program
14 MORTGAGE/A	Mortgage amortization table
15 MULTMON	Computes time needed for money to double, triple, etc.
16 SALVAGE	Determines salvage value of an investment
17 RRVARIN	Rate of return on investment with variable inflows
18 RRCONST	Rate of return on investment with constant inflows
19 EFFECT	Effective interest rate of a loan
20 FVAL	Future value of an investment (compound interest)
21 PVAL	Present value of a future amount
22 LOANPAY	Amount of payment on a loan
23 REGWITH	Equal withdrawals from investment to leave 0 over
24 SIMPDISK	Simple discount analysis
25 DATEVAL	Equivalent & nonequivalent dated values for oblig.
26 ANNUDEF	Present value of deferred annuities
27 MARKUP	% Markup analysis for items
28 SINKFUND	Sinking fund amortization program
29 BONDDVAL	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 BONDDVAL2	Value of a bond
35 EPSEST	Estimate of future earnings per share for company
36 BETAALPH	Computes alpha and beta variables for stock
37 SHARPE1	Portfolio selection model-i.e. what stocks to hold
38 OPTWRITE	Option writing computations
39 RTVAL	Value of a right
40 EXPVAL	Expected value analysis
41 BAYES	Bayesian decisions
42 VALPRINF	Value of perfect information
43 VALADINF	Value of additional information
44 UTILITY	Derives utility function
45 SIMPLEX	Linear programming solution by simplex method
46 TRANS	Transportation method for linear programming
47 EOQ	Economic order quantity inventory model
48 QUEUE1	Single server queueing (waiting line) model
49 CVP	Cost-volume-profit analysis
50 CONDPFOT	Conditional profit tables
51 OPTLOSS	Opportunity loss tables
52 FQJQOQ	Fixed quantity economic order quantity model
53 FQEOQWSH	As above but with shortages permitted
54 FQEOQPB	As above but with quantity price breaks
55 QUEUECB	Cost-benefit waiting line analysis
56 NCFANAL	Net cash-flow analysis for simple investment
57 PROFIND	Profitability index of a project
58 CAP1	Cap. Asset Pr. Model analysis of project

59 WACC	Weighted average cost of capital
60 COMPBAL	True rate on loan with compensating bal. required
61 DISCBAL	True rate on discounted loan
62 MERGANAL	Merger analysis computations
63 FINRAT	Financial ratios for a firm
64 NPV	Net present value of project
65 PRINDLAS	Laspeyres price index
66 PRINDPA	Paasche price index
67 SEASIND	Constructs seasonal quantity indices for company
68 TIMETR	Time series analysis linear trend
69 TIMEMOV	Time series analysis moving average trend
70 FUPRINF	Future price estimation with inflation
71 MAILPAC	Mailing list system
72 LETWRT	Letter writing system-links with MAILPAC
73 SORT3	Sorts list of names
74 LABEL1	Shipping label maker
75 LABEL2	Name label maker
76 BUSBUD	DOME business bookkeeping system
77 TIMECLCK	Computes weeks total hours from timeclock info.
78 ACCTPAY	In memory accounts payable system-storage permitted
79 INVOICE	Generate invoice on screen and print on printer
80 INVENT2	In memory inventory control system
81 TELDIR	Computerized telephone directory
82 TMUSAN	Time use analysis
83 ASSIGN	Use of assignment algorithm for optimal job assign.
84 ACCTREC	In memory accounts receivable system-storage ok
85 TERMSPAY	Compares 3 methods of repayment of loans
86 PAYNET	Computes gross pay required for given net
87 SELLPR	Computes selling price for given after tax amount
88 ARBCOMP	Arbitrage computations
89 DEPRSF	Sinking fund depreciation
90 UPSZONE	Finds UPS zones from zip code
91 ENVELOPE	Types envelope including return address
92 AUTOEXP	Automobile expense analysis
93 INSFILE	Insurance policy file
94 PAYROLL2	In memory payroll system
95 DILANAL	Dilution analysis
96 LOANAFFD	Loan amount a borrower can afford
97 RENTPRCH	Purchase price for rental property
98 SALELEAS	Sale-leaseback analysis
99 RRCOVBD	Investor's rate of return on convertible bond
100 PORTVAL9	Stock market portfolio storage-valuation program

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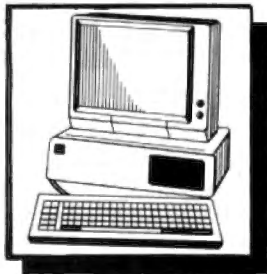
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*The Diskaddy filer holds up to 22 disks.*

normal cassette operation. HHCI TOS accepts commands from the Basic prompt, and includes a directory command.

You can install system hardware in one hour. The system also includes software, installation instructions, and a user's manual. For more details, contact HHCI Tape Systems, 725 Idlewild Road, Bel Air, MD 21014, 301-838-7692.

Circle 560 on Reader Service card.

accommodate up to 22 disks. Designed for toting disks in a handbag or briefcase, Diskaddy is available for 5¼- and 8-inch disks. A six-disk filer (\$7.99) is also available.

For more details, contact MB International Inc., 4322 Date St., La Mesa, CA 92041, 619-232-8772.

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### Glare Gone

The Glare/Guard Vantage (\$59) and Professional (\$99) glass antiglare panels reduce glare and static buildup on any CRT. They improve image-to-background

### Expanding Files

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## NEW PRODUCTS

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Indus-Tool's Modem Spike Protector protects your equipment from phone-line transients.

contrast while maintaining high resolution.

The Vantage model reduces glare by 90 percent; the Professional model reduces glare by 94 percent. A special coating on the inside of the screen shunts static electricity through a grounding cord to minimize static and dust build up.

For more details, contact Optical Coating Laboratory Inc., 2789 Northpoint Parkway, Santa Rosa, CA 95401, 707-545-6440.

Circle 570 on Reader Service card.

### Quick 'N' QWERTY

The FasType (\$39.95) typing tutor for the Models III and 4 teaches you how to type faster. This machine-language program improves typing speed and accuracy through a sequence of lessons. The program's add/change feature lets you create new typing lessons.

Contact Press A Software (Box 364, Jerome, AZ 86331, 602-634-2688) for more information.

Circle 554 on Reader Service card.

### Graphics Realities

Dennis F. Tanner's *The TRS-80 Graphics Book* shows you how to incorporate graphics in your Model I/III/4 programs.

Sample programs illustrate graphics programming techniques. Tanner covers the Set, Reset, Point, Print, and POKE commands for

creating graphics. Other topics include reverse video, animation, screen designs, creating graphics using block moves, and compressed graphics.

Hardbound (\$25.45) and softbound (\$16.45) editions are available. Contact Van Nostrand Reinhold Co. Inc. (135 W. 50th St., New York, NY 10020, 212-265-8700) for more details.

Circle 558 on Reader Service card.

### Tele-Shocker

The Modem Spike Protector (\$59.95) from Indus-Tool protects your equipment from transient spikes that come in over phone lines.

The device plugs into your modem to prevent errors, malfunctions, false printouts, and disk skips. It handles up to a 12,000-volt surge and carries a 70 joule rating.

For more information, contact Indus-Tool at 325 W. Huron, Chicago, IL 60610.

Circle 569 on Reader Service card.

### Showing Your Colors

Hamilton Software's Col-orwriter4 (\$400) integrated software for the Models 1000 and 1200 provides a word processor, graphics generator, data base manager, spreadsheet, and math calculator in full-color displays.

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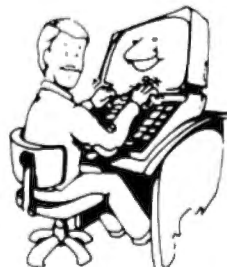


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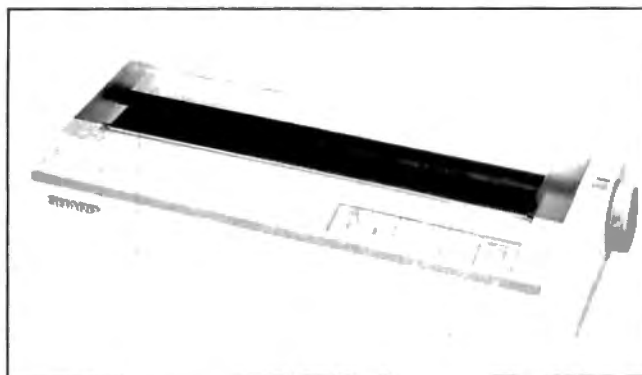
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## NEW PRODUCTS



The Sharp Model 250 thermal printer runs at 70 cps on standard printer paper.

and archives data, and creates up to seven full-screen windows. Colorwriter 4 requires 256K RAM and a color monitor. A demonstration disk is available for \$25.

For more information, contact Hamilton Software Corp., P.O. Box 791153, Dallas, TX 75379, 619-588-7448.

Circle 552 on Reader Service card.

ASCII or Model I character set.

The EC100 installs without soldering or cutting and doesn't affect graphics capabilities. It does, however, alter the underline function. The EC100B board (\$32) restores the underline function and requires some soldering.

Special-purpose EC100 boards are also available for designing your own character set. For more information, contact The Electronic Closet at 8187 Blakely Court W., Bainbridge Island, WA 98110.

Circle 567 on Reader Service card.

### Sharp Impressions

Sharp Electronics Corp. (10 Sharp Plaza, Paramus, NJ 07652, 201-265-5600) has introduced two thermal printers. The Model 220 (\$199) weighs 7.7 pounds and runs at up to 50 characters per second (cps). It prints at 120-dot-per-inch resolution and accepts thermal paper, bond paper, or transparencies. The unit includes a parallel interface.

The Model 250 (\$399) operates at up to 70 cps (35 cps in letter-quality mode) with 240-dot-per-inch resolution. The unit accepts roll paper, single sheets, or fan-fold paper.

Circle 565 on Reader Service card.

### System at a Glance

The TRS-80 Model 100 System Reference Card (\$2.50) summarizes all Model 100 operations for computing at a glance. One side of the card covers instructions for the text, address, and schedule programs. The flip side explains Basic commands and the telecommunications program.

For more information, contact Eighty Computing, Box 154, Orinda, CA 94563.

Circle 564 on Reader Service card.

### DMP Performer

The EC100 processor board (\$29) turns your DMP100 printer into an upper- and lowercase character printer. The new character font provides true one-line descenders, and comes with the standard

### Routine Recipes

TRS-80 Portable Computer Subroutine Cookbook by David Busch (\$12.95) includes 70 ready-to-merge subroutines for your Basic programs.

## NEW PRODUCTS



CompuKit's 30-megabyte hard drive for the Models I/III/4.

The book includes line-by-line descriptions of sub-routines that cover generating music and sound effects, finance, arcade games, designing character sets, using the clock and interrupts, and other special Model 100 features.

Contact Brady Communications Co. Inc. (Routes 450 and 197, Bowie, MD 20715, 301-262-6300) for more details.

Circle 568 on Reader Service card.

### Hard Driving

Hard Drive Specialist, a division of CompuKit Corp. (16208 Hickory Knoll, Houston, TX 77059, 800-231-6671; in Texas, 713-480-

6000), has introduced a 30-megabyte hard drive for the Models I, III, and 4.

The unit incorporates buffered seek logic and uses plated media that increases platter life and decreases access time by up to 75 percent over other hard drives. The 30-megabyte hard drive costs \$1,895; a secondary unit is \$1,695. An optional multiplexer lets you access the drive from up to four computers.

Circle 553 on Reader Service card.

### Fast Link

The Courier and Micro-link 2,400-baud autodial, auto-answer asynchronous modems (\$895 each) trans-



The Courier 2400 from U.S. Robotics uses advanced signal filtering technology for transmission at 2400 bits per second.

## CONVERT YOUR TRS-80 MODEL III OR 4 INTO A DEVELOPMENT SYSTEM

Now you can develop Z-80 based, stand-alone devices such as games, robots, instruments and peripheral controllers, by using your TRS-80 as a development system. The DEVELOPMATE plugs into the expansion connector of your TRS-80 and adds **PROM PROGRAMMING** and **IN-CIRCUIT-EMULATION** capabilities to your system.

Complete instructions and sample schematics are included to help you design your own simple stand-alone microcomputer systems. THESE SYSTEMS CAN BE AS SIMPLE AS FOUR ICs: one TTL circuit for clock and reset, a Z-80, an EPROM, and one peripheral interface chip.

When the In-Circuit-Emulation cable is plugged into the Z-80 socket of your stand-alone system, the system becomes a part of your TRS-80. You can use the full power of your editor/ assembler's debug and trace programs to check out both the hardware and the software. Simple test loops can be used to check out the hardware. Then the system program can be run to debug the logic of your stand-alone device.



Since the program is kept in TRS-80 RAM, changes can be made quickly and easily. When your stand-alone device works as desired, you use the Developmate's PROM PROGRAMMER to copy the program into a PROM. With this PROM, and a Z-80 in place of the emulation cable, your stand-alone device will work by itself.

The DEVELOPMATE is extremely compact. Both the PROM programmer and the In-Circuit-Emulator are in one small plastic box only 3 2" x 5 4". A line-plug mounted power supply is included. The PROM programmer has a personality module which defines the voltages and connections of the PROM so that future devices can be accommodated. However, the system comes with a universal personality module which handles 2758, 2508(BK), 2716, 2516(16K), 2532(32K), as well as the new electrically alterable 2816 and 48016(16K EEPROMs).

The COMPLETE DEVELOPMATE 83 with software, power supply, emulation cable, TRS-80 cable, and "universal" personality module, is ONLY \$329!  
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The Microlink 2400 is designed for use with IBM PC and PC-compatible computers. The Courier 2400 interfaces with any computer that has an RS-232 interface.

Features include call duration reporting, a repeat command, modem status display, external programming switches, and on-screen help. Also included are an on-board speaker with volume control for audio line monitoring and automatic speed setting in answer mode.

Both units work with Telpac, Cross Talk, SmartCom, and PC Talk communications software. For more details, contact U.S. Robotics Inc., 1123 W. Washington Blvd., Chicago, IL 60607, 312-733-0497.

Circle 566 on Reader Service card.

## DIFFERENT TRACK

### Creative Cabinetry

Creative Cabinets (5924 Veranda Drive, Springfield, VA 22152, 703-455-4958) offers a distinguished cabinet for your computer and peripherals. The Model I oriental-finish cabinet features adjustable-height shelves, drawers with dividers for disks, and compartments for a modem, telephone, manuals, and supplies.

The monitor and VCR shelves slide out for easy access, and a printer cart with a paper catch rolls out of the cabinet. Cabinets are available in burl, teak, or black laquer with hand-painted designs and hand-etched brass ornamentation. Prices start at \$1,999.

Circle 561 on Reader Service card.



*The Cadillac of computer cabinets, finished with etched brass and hand-painted designs from Creative Cabinets.*

Circle 227 on Reader Service card.

# NEW And IMPROVED CP/M-68K

Treat your TRS-80 Model-16 or Enhanced Model-II or -12 to our new Version 1.2 CP/M-68K, now with:

- **Keyboard Typeahead**
- **C compiler with standard and IEEE floating point**
- **Overlay loader**
- **New utilities**
- **68000 assembler**

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Version 1.1 users; order a language and receive your version 1.2 upgrade FREE. Upgrade alone only \$25.

## Trisoft

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Austin, Texas 78751  
(512) 453-2233



\*Requires 256 kbytes minimum except for BASIC-68K.



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*New Products listings are based on information supplied in manufacturers' press releases. 80 Micro has not tested or reviewed these products and cannot guarantee any claims.*

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## 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 seven 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.

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**xT.CAD** - Professional drafting aid which outputs to a printer or plotter. \$449.95.

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**MATHPLOT** - Plot equations of the form  $Y=F(x)$  with auto scaling. \$39.95.

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**GRAFYX SOLUTION.** Plug-in, clip-on board enhances any Model 4/4P/III to provide  $640 \times 240 / 512 \times 192$  dot graphics. Comes with over 40 programs and files including GBASIC 3.0 which adds over 20 new commands. \$199.95.

**80-GRAFIX.** Plug-in, clip-on board upgrades any Model III/I to provide 128 user-definable characters. Comes with over 20 programs. \$69.95 (III), \$99.95 (I).

**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. \$99.95.



**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  $65536 \times 65536$  dot tablet. The arrow keys are used to draw two or three-dimensional figures. The display can be scaled, shifted, or rotated in any dimension. The final picture is printed in hi-res on Radio Shack, Epson, Gemini, NEC 8023, or Prowriter printers. \$75.00.

Please specify your exact system configuration when ordering or requesting information. Payment may be by check, Visa, Mastercard, or COD. Domestic shipping is free on pre-paid orders. Texas residents add 5½% sales tax.

**MICRO-LABS, INC.** 214-235-0915  
902 Pinecrest, Richardson, Texas 75080

# Upgrade Notices: Who Gets What When

Send questions specifically dealing with Tandy policies, products, and services 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:** Why do customers get upgrade notices before the Radio Shack Computer Centers do? On too many occasions I've followed your instructions to go to my local Computer Center for a required upgrade, only to be met with blank stares.

**A:** We try our best not to let this happen, but it has happened several times. We become over-eager to get the word out when a mandatory upgrade crops up. Sometimes it's our own fault, and once in a while it may be a case of slow or lost mail.

Tandy has a system that's supposed to prevent our mailing upgrade notices until we've shipped upgrades to Computer Centers and stocked them in our warehouse. I know it's frustrating—we'll try to do better.

**Q:** I have a DMP-400 printer that I use with SuperScript. The lowercase "y" doesn't descend properly and is totally out of proportion with the rest of the alphabet. This isn't a calamity, but it does offend the discerning eye. Employees at the local Computer Center told me they can't fix it. Is that true?

**A:** On some older printers, the limited number of pins (vertical dots) make it necessary to lift some lowercase letters above the baseline by one dot. This lack of true descenders is even more pronounced on some Radio Shack printers older than the DMP-400.

Early printers had 7 or 9 pins. The DMP-430 has 18, so it produces nice-looking characters, and the DMP-2100, with a 24-pin head, forms characters of near-daisy-wheel quality.

Your Computer Center is right: Your printer's design dictates the shape of the "y." It's not a defect, and it's not correctable.

**Q:** A recent Radio Shack flyer advertised a program called "Machine-Language Concepts for the Color Computer," catalog number 26-2670. I can't find it.

**A:** The program is actually called "The Illustrated Computer." It's currently in Tandy's warehouses. The stores don't keep all products in stock, so you might have to ask your local store to order it. This program is courseware, intended for school use.

**Q:** I have a cassette-based Model I, so my card slot is unused. Where can I get information about building my own interface boards?

**A:** The Model I has no "card slots." It does have a bus connector, which attaches the computer to the Expansion Interface and a few other Tandy peripherals. A number of books have been written about adding boards to Tandy and other computers, but I can't endorse any particular one; I suggest you try a library or bookstore. Tandy recommends that customers not attempt homemade hardware add-ons because of the risk of damaging the computer if you do something wrong.

**Q:** I'm a junior in high school in England. I'm interested in electronics, computers, and programming. I'd like to go to one of the leading colleges for computer science, and I'm wondering which ones Tandy looks at first when hiring computer specialists. And what's your estimate of the demand for computer specialists around 1990?

**A:** Wow! You're asking me to estimate demand six years from now, with the whole micro industry barely six years old. I don't want to go too far

out on a limb, so I'll just say that demand should be increasing between now and then. Unless so many students go into computer sciences that there's an oversupply (hard to imagine, impossible to predict), it should be a good place to be.

As for colleges, we try not to recommend specific ones. We're more interested in the courses you take. As long as you choose a recognized school, you should be OK.

**Q:** When Tandy stopped publishing the TRS-80 Microcomputer News, I asked to have another TRS-80 magazine fulfill my subscription. So far, I haven't received one issue. What's happening?

**A:** I'll answer this one in a general way, because we get questions about almost all the magazines. First, after you send us the card, don't expect an issue for about three months. That's the average. One magazine found a batch of names in January 1985 that they'd misplaced since October 1984. That won't happen often, but we're all human.

If it's more than three months since you sent in your request and you want to check on your subscription, write, don't call, Theresa Moore, Radio Shack Circulation Dept., 300 One Tandy Center, Fort Worth, TX 76102. Tell her when you sent your request and for what magazine, and how many months you have coming. Don't forget to include your name, address, and phone number.

(Editors' Note: 80 Micro has received thousands of cards from Microcomputer News subscribers. Our normal order processing period is six to eight weeks; we're shipping current issues as soon as processing is complete. Unfortunately, if you're already a current 80 Micro subscriber, we can't transfer your subscription. If your subscription has expired, however, we'll extend it.)■

# Super Spring Sale

## C compiler

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

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

## Multi-Basic compiler

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

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

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

### Features Include

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

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

LC Compiler	105 secs.
Alcor C	78 secs.

### Special Bonus

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

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

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

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

BASIC Interpreter	4570 secs.
Multi-Basic	89 secs.

### Special Bonus

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

## Get Yours Today - Sale Ends June 30th

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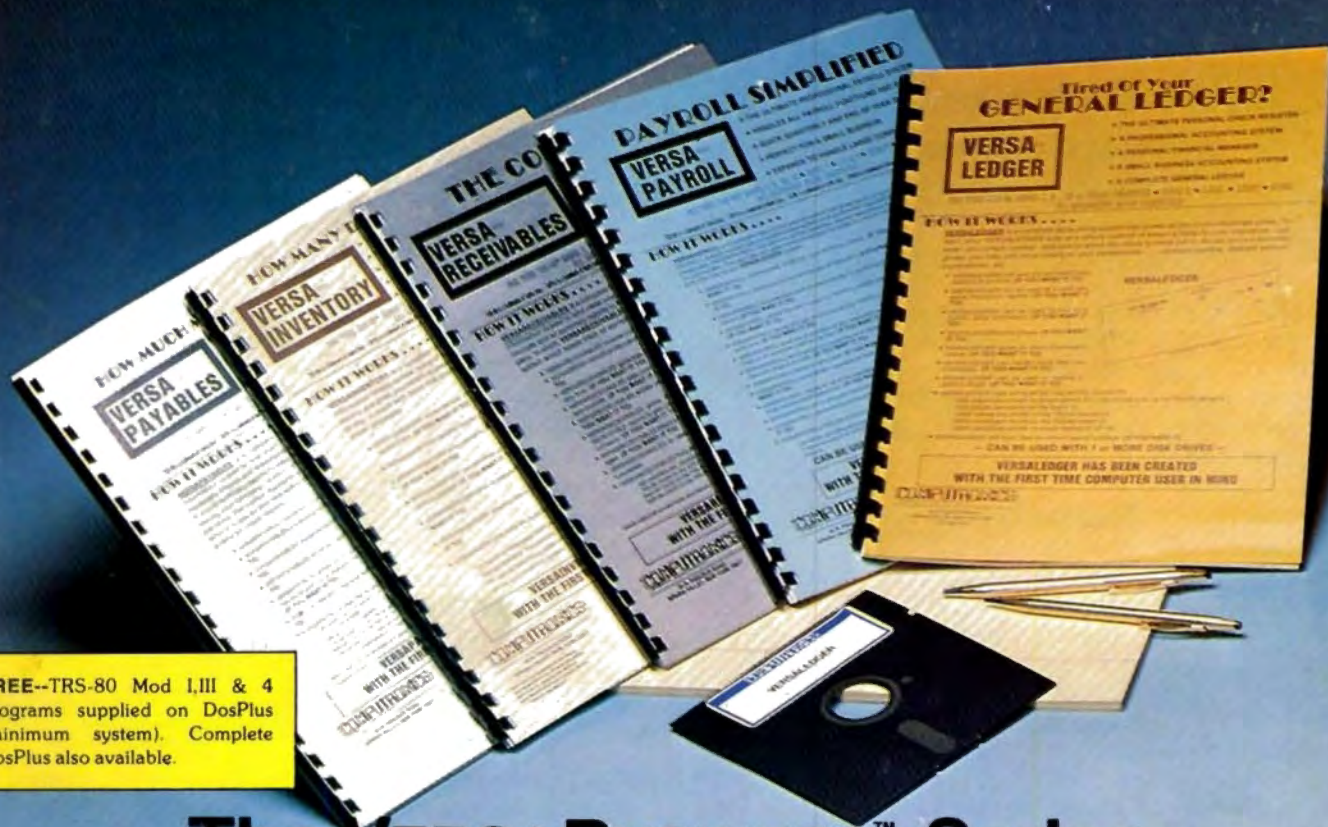
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