

**The Tandy 1000
An In-Depth Review**

April 1985
USA \$4.00
Canada \$4.50

80micro

A CWC/I PUBLICATION

the magazine for TRS-80* users

Great Graphics Hi-Res Computing On Your III or 4

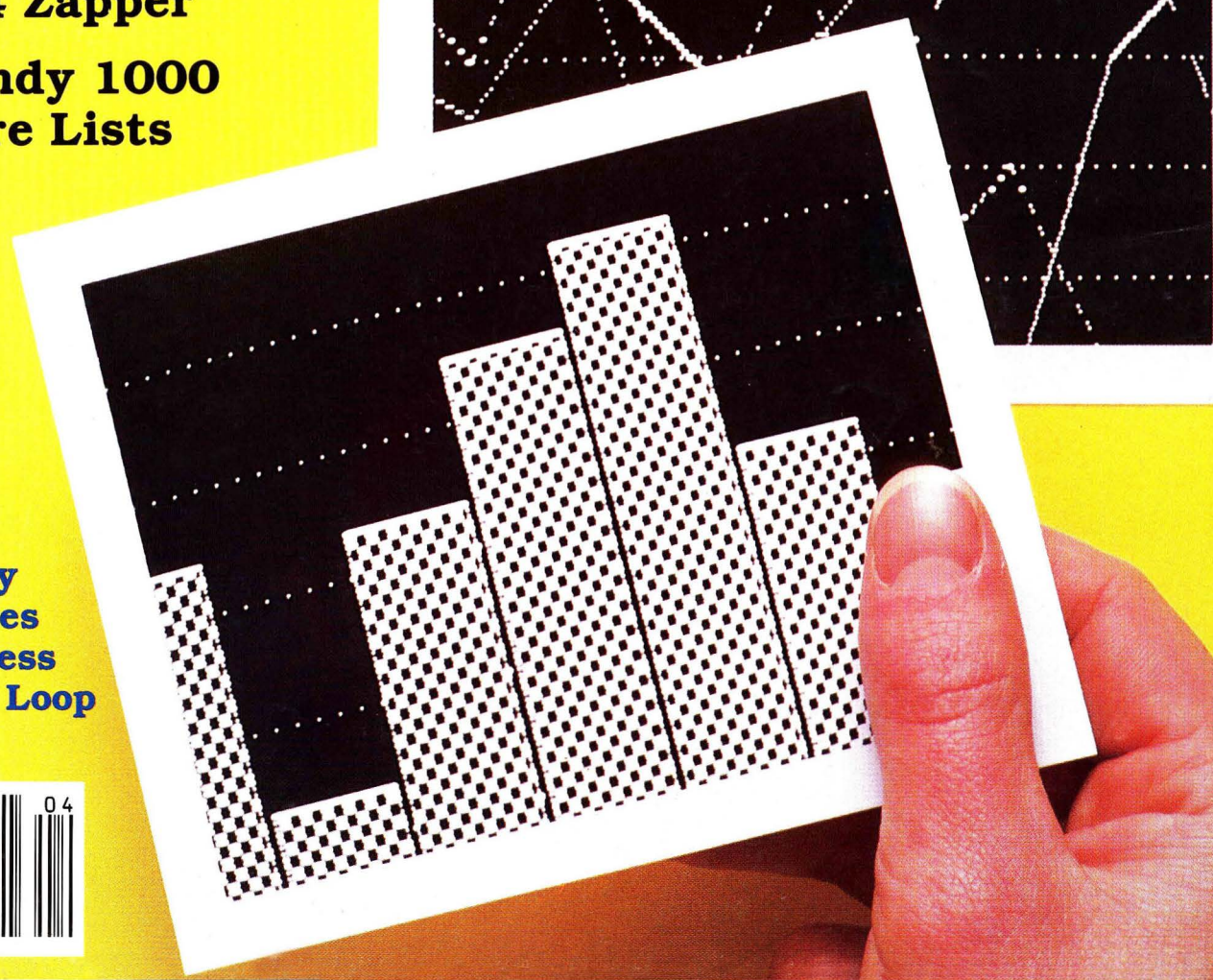
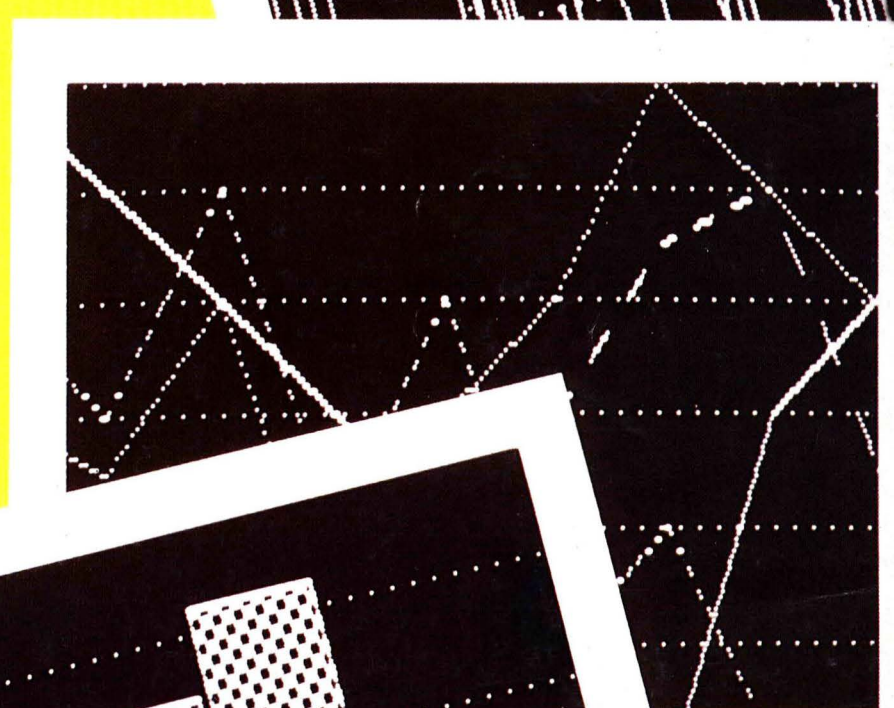
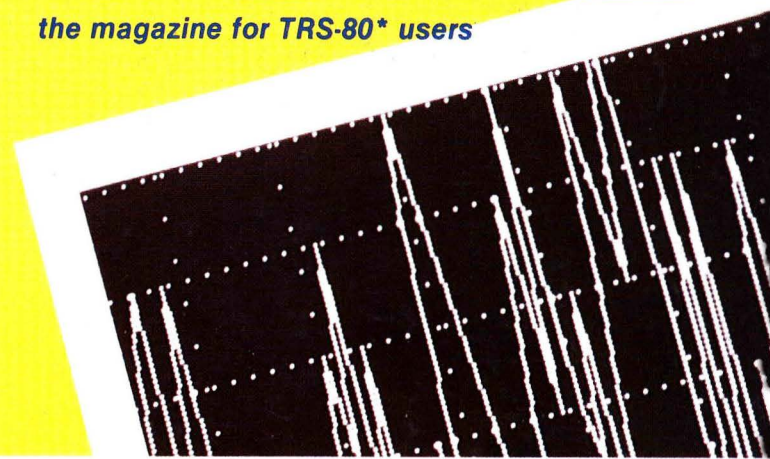
**How to Relocate
A-L Programs**

**Build Your Own
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**A New, Improved
Model 4 Zapper**

**Our Tandy 1000
Software Lists**

**Also:
Ask Tandy
Basic Takes
BBS Express
Feedback Loop**



80micro

4/85

#63

A



A NEW STAR IS BORN

Out of Radio Shack's Famed Model 100 Evolves the Advanced Technology Tandy 200

Our new Tandy 200 portable computer does what no other computer could.

It takes our amazing Model 100 one step further.



And like the Model 100, the new Tandy 200 proudly carries our Advanced Technology symbol, your assurance that the Tandy 200 includes state-of-the-art features and performance at an unmatched price.

The Next Generation of Portable Computing

The Tandy 200 represents the start of a true second generation in portable computers, with new built-in software, improved features, a bigger screen and a larger memory. All designed to make the Tandy 200 a more potent portable problem-solver.

For complex spreadsheet analysis and calculations, we put popular Multiplan software into the Tandy 200's permanent memory. Just turn on your portable Tandy 200, press a button and you've got a powerful decision-support tool at your fingertips. Now it's easier than ever to do sales forecasts, profit and loss projections, budgeting, pricing, engineering calculations and more.

Improved Word Processing Software

An improved version of the Model 100's easy-to-use word processing program makes the

Tandy 200 especially useful for journalists, students and anyone who needs to write letter-perfect memos, reports and correspondence in a hurry. Edit, delete and move blocks of text with the touch of a function key. It's that easy. The portable Tandy 200 computer gives you the convenience of a personal word processor for use anytime, anywhere.

Four other "instant-on" programs let you use the Tandy 200 as your personal appointment calendar, address and phone directory, and telephone auto-dialer (the Tandy 200 generates tone dialing pulses, so you can use it with long-distance services). A much more powerful built-in program for communications makes it easy to access other computers by phone. You can program in BASIC, too.

A Bigger Screen and a Larger Memory

The Tandy 200's new flip-up liquid crystal display has 240 x 128 resolution for big, clear graphics and easy-to-read characters. The 16-line by 40-character display makes the Tandy 200 particularly well suited to word processing and spreadsheet duties and with simple BASIC commands you can add dot-addressable graphics to your text.

To take advantage of the Tandy 200's new capabilities, we increased the standard memory size to 24,000 characters. Additional 24K expansion

modules let you increase the memory up to 72K, in banks of 24 each.

The Best in Technology for Under \$1000

Whether you're a student, scientist, busy professional or home computer user, the Tandy 200 is a smart investment. Best of all, the Tandy 200 has parallel printer, RS-232C, cassette and bar code reader interfaces for added versatility. You can even add disk storage and a monitor for a complete desktop system.

And you can start with the powerful software and impressive capabilities of the Tandy 200 (26-3860) today for just \$999.

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Welcome to our latest advertisement! Feel free to browse, take a look at our selection and our prices. We have the software for almost every purpose for TRS-80 Model I/III and 4 computers; if you see something you like, we'd be more than happy to hear from you!

GAMES!

SUPREME RULER PLUS

Our best selling game, a strategy/simulation program for one to nine players where you must control a country against human or computer opponents.
Cassette or Disk, **\$26.50**

INFOCOM™

Infocom produces an excellent line of text adventure games. Each can accept full sentence commands; the best programs of their kind anywhere.

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ENCHANTER SEA STALKER
"Intermediate Level" \$39.50 Each:
ZORK II ZORK III
SORCERER INFIDEL
"Very Difficult Level" \$44.50 Each:
DEADLINE STARCROSS
SUSPENDED (Available 3/85)

subLOGIC

FLIGHT SIMULATOR Disk \$29.50
(Reduced Cassette Version .. \$24.50)
Forest Fire Dispatcher \$26.50

OTHER GAMES

APE Arcade Game (Disk) \$14.50
Sifter Shifter (2-4 Players) \$ 8.50
Battle of Zeighty (Strategy) \$ 8.50
Galaxy Invasion (Arcade Disk) .. \$ 9.50

CASSETTE OWNERS: Super-special "Big Five Fun Pack" (Galaxy Invasion, Super Nova, Attack Force, WEERD).
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THE BOOKSHELF

Programmer's Guide to TRSDOS 6 \$14.50
ROM ROUTINES DOCUMENTED . \$16.50
Model III Assembly Language ... \$15.50
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The "C" Programming Language . \$17.50
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Basic F&B LIB or DEM disk \$16.50
Disk I/O F&B Disc..... \$23.50
Infocom INVISCLUES..... \$ 6.50
(Specify game)

TAS Journal #19 — Special Issue
Now In Stock! Special Prices:
Journal and Disk \$15.00
Journal only \$ 5.00

APPLICATION SOFTWARE HIGHLIGHTS

LESCRIPT

Our best-selling word processor, loaded with features (many not found elsewhere). Great printer support, ease of use, full Model 4 support (including 128 K RAM), and much more!
Model I/III and 4 (List \$129.50) **\$94.50**

ELECTRIC WEBSTER \$99.50

An excellent spelling checker with a 50,000 word dictionary; integrates with most word processors. Also allows you to add your own words. Special price, valid until March 15/85.
Specify Mod I/III or Mod 4 (List \$149.95) **\$99.50**
Grammar or Hyphenation Option **\$38.50 (each)**

KSoft's LOG and SUPERLOG

These "Electronic Notebook" programs are truly amazing; they can access information at the touch of a key, even when running other programs, SUPERLOG 4 contains many enhanced features for the model 4 as well.
LOG Model I or III (specify) ... **\$44.50**
SUPERLOG Model I or III (LDOS Only) **\$99.50**

DOSPLUS

DOSPLUS is an excellent alternative to TRSDOS for both Model I/III and Model 4. DOSPLUS is easy to use, and comes with many extra utility programs and enhancements that make it well worth the price.
DOSPLUS 3.5, Model I or III (specify) .. **\$ 59.50**
DOSPLUS IVa w/MZAL Model 4 **\$119.50**

HYPERCROSS/XT 2.0 \$84.50

Transfer programs and files from, to or between CP/M, PC-DOS or MS-DOS disks! Supports almost all formats; VERY powerful! (Same program as Powersoft's new "Supercross"; list \$99.95).
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The Home Accountant \$59.50

A complete personal finance package; Model III only.

DataGraph \$69.50

Prints graphs from spreadsheet data; Mod I/III, or 4 (specify Mod & printer).

The Adventure System

A program by TAS that lets you create your own "Scott Adams" type adventures. You supply the story and ideas, and then put them together into a full adventure. **\$34.50.**

JMG's GAMES TOP TEN

The top ten selling games, in order, for one month ending in December:

1. Supreme Ruler Plus \$26.50
2. Flight Simulator \$29.50
3. ZORK II \$39.50
4. PLANETFALL \$34.50
5. NUCLIEX \$14.50
6. WITNESS \$34.50
7. ZORK III \$39.50
8. DEADLINE \$44.50
9. ENCHANTER \$34.50
10. Battle of Zeighty \$ 8.50

THE SOURCE FOR TRS-80 SOFTWARE!

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".

APPLICATIONS/BUSINESS

Program Name (List) JMG		
Dotwriter w/LDS (99.95)	\$ 69.50	
(Model III or Mod 4)		
ZORLOF II (79.95)	\$ 49.50	
LESCRIPT (129.95)	\$ 99.50	
(Model III or Mod 4)		
LESCRIPT CP/M (199.95)	\$149.50	
LazyWriter (125.00)	\$ 92.50	
(Model III or Mod 4)		
NEWSRIPT (124.95)	\$ 74.50	
Typeitall (129.95)	\$ 99.50	
(Model III or Mod 4)		
MScript (79.95)	\$ 54.50	
PowerScript (39.95)	\$ 34.50	
(Scripts Modification Patches)		
POWERDOT II (59.95)	\$ 49.50	
POWERDRAW (39.95)	\$ 34.50	
TALLYMASTER (79.95)	\$ 53.50	
PowerMail Plus (150.00)	\$124.50	
PowerMail w/Txtmg (179.00)	\$149.50	
ZMAIL Mailing List (29.95)	\$ 24.50	
System Diagnostic (99.95)	\$ 79.50	
Mumford's Disk Indexer (39.95)	\$ 34.50	

TASMON — By TAS — (List \$39.95) An excellent machine language monitor/debugger, with loads of features. For Model I/III or 4 specify. Special price till 3/15/85.

NEWBASIC — By Modular Software — (List \$39.95) An enhancement package that adds many commands to your Model I/III Disc BASIC; till 3/15/85 we'll throw in a free Analyst or Collector with every order! A great bargain!

Public Domain Disks — Compiled by TAS — (List \$40.00) A set of "floppy" disks chock full of excellent programs of all types; games, utilities, more. All Public Domain too!

EDAS 4.3/PRO-CREATE — By MisoSys — (List \$74.95) An excellent Editor-Assembler with many powerful features. Now, this New Version supports all major DOSes! (TRSDOS, DOSPLUS, etc.) Also, comes with a new Full Screen editor! All this, and more, and a new lower price!

DSMBLR III/PRO-DUCE — By MisoSys — This excellent Disassembler has now received a price reduction, making it an unbeatable value. Loads of features.

IFC/PRO-IFC — By MisoSys — An "Interactive File Controller", for managing file operations. Uses a "scrolling directory", has the capability for mass operations & much more. A usefull program (LDOS or TRSDOS-6 only).

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SUPER UTILITY4/4P (Now Available!)	\$ 69.50
SUPER UTILITY 3.2	\$ 59.50
HYPERZAP 3.2	\$ 39.50
M-ZAL Macro Assembler	\$ 79.50
ALE - Assem. Lang. Editor	\$ 39.50
Mumford's Instant Assembler	\$ 44.50
Instant Assem. Model 4	\$ 59.50
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Howe's Monitor #5	\$ 19.50
TOOLBOX for LDOS	\$ 39.50
MODEL 4 TOOLBELT	\$ 39.50
TAS's Trakcess Mod 1	\$ 19.50
Trakcess Model 3	\$ 24.50
TAS's Autoloader	\$ 34.50
6.2 PLUS Enhancements	\$ Call
IMPAKT Utility	\$ 29.50
NEWBASIC Enhancements	\$ 34.50
The Analyst	\$ 19.50
The Collector	\$ 19.50
BAS 3-to-4 Converter	\$ 24.50
ZBASIC Compiler	\$ 79.50
EDX Text Editor	\$ 24.50
MTERM Smart Term	\$ 59.50
Modem-80 Term	\$ 34.50
LazyComm Terminal	\$ 29.50
Public Domain Disks	\$ 34.50
TEXTPRESS	\$ 39.50

MISO SYS UTILITIES

NEW LOW PRICES! New Programs too! Available for Mod I/III or 4 ("PRO").

EDAS 4.3/PRO-CREATE	\$ 69.50
DSMBLR III/PRO-DUCE	\$ 23.50
ADE/PRO-ADE (Disk. Emul.)	\$ 34.50
LC/PRO-LC Compiler	\$114.50
HartFORTH	\$ 69.50

The following are all \$23.50 Each, and all are available in Mode I/III (LDOS only for most) and Model 4 "PRO" versions:

CMDFILE	ZCAT	GRASP	ESP	MLIB
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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, and Gold. Please enclose \$2.50 for shipping costs. For Electric Webster and Dotwriter, please mention your word processor and printer brands.

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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THE FINE PRINT:

Shipping Charges are \$2.50 in Canada and U.S. Overseas surface shipping is \$5.00, \$10 for air mail. All prices in U.S. Funds. Add \$1.50 for COD Charges. Model III programs will all run on a Model 4 in III mode.

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All this for only **\$79.95**
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Also available for MS DOS 128K, disk. Has Function Key support and an even faster sort. Special price: \$99.95

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THIS PROGRAM IS A MUST FOR EVERYONE WHO USES "BASIC" ON A TRS-80. It reduces string compression delays by 95% or more. You suffer from these delays whenever you run a BASIC program. Your computer locks up for seconds, or minutes, and you may even think it's "crashed." TRASHMAN FIXES THE PROBLEM

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

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

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

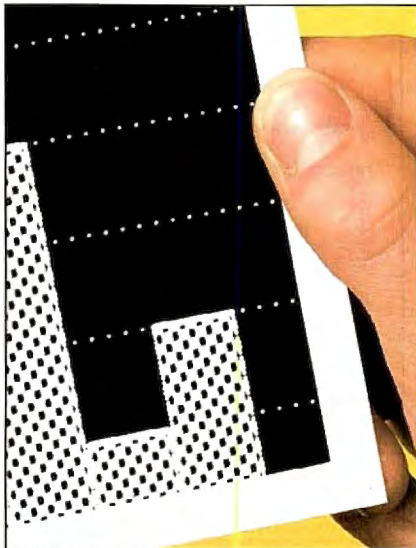
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On the Cover

40. Clear-Cut Trends

by Bruce A. and Jeffrey P. Graebner

Draw, display, and print high-resolution line and bar graphs. (Models III and 4; Load 80; Models 1000 and 1200)

50. Tandy Rides Again

by Dave Rowell

Considering price, performance, and compatibility, the Tandy 1000 may be the best in the West. Our system review includes a peripherals price list and software lists.

62. Zap Master

by David A. Williams

This Model 4 utility lets you fly through your disk sectors with the greatest of ease. (Model 4; Load 80)

Feature

72. Date Lines

by Edward M. Welch

A more convenient way to sort dates with Profile III Plus.

Departments

- | | |
|---|--|
| 6. Load 80 Directory | 73. Tidbit #19 |
| 8. Side Tracks
by Eric Maloney | 82. Project 80
by Roger C. Alford |
| 12. Input | 90. BBS Express
by J. Stewart Schneider
and Charles E. Bowen |
| 12. 80 Alert | 94. Basic Takes
by Richard Ramella |
| 14. Feedback Loop
by Terry Kepner | 98. The Next Step
by Hardin Brothers |
| 21. Pulse Train
edited by
Bradford N. Dixon | 104. 2000 Plus
by John B. Harrell III |
| 25. Reader Exchange | 120. New Products
edited by
Robert Mitchell |
| 25. Debug | 128. Ask Tandy |
| 29. Reviews
edited by
Ryan Davis-Wright | |
| Disk Term | |
| Lucid | |
| Act III | |
| Tax-Prep | |
| Vivace | |
| Crossword Master | |

LOAD 80

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

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

Using Load 80 is simple. If you own a tape system, load the Load 80 tape as per the instructions provided. If you own a Model I or III disk system, you boot the Load 80 disk and transfer the files to a TRSDOS system disk according to sim-

ple 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.

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

If you have any questions about the programs, call Keith Johnson at 603-924-9471. Yearly subscriptions to Load 80 are \$199.97 for disk, or \$99.97 for cassette. Individual loaders are available on disk for \$21.47 or on cassette for \$11.47, including postage. To place a subscription order, or to ask questions about your subscription, please call us toll free at 1-800-645-9559 between 9 a.m. and 5 p.m. Or, you can write to *80 Micro*, Subscription Department, P.O. Box 981, Farmingdale, NY 11737.

Directory

Grapher

Article: Clear-Cut Trends (p.40).
Systems: Model III, 48K RAM, Model 4, 64K RAM, high-resolution board, one disk-drive.
Language: BasicG.

Draw and print out high-resolution line and bar graphs.

Cassette filespec: B, E, F, G.
Disk filespec: GRAPHER3/BAS, GRAPHER4/BAS, PRINTR4/BAS, GCALC4/BAS.

BBS

Article: BBS Express (p. 90).
System: Model III, 48K RAM, two disk drives.
Language: Disk Basic.

The BBS data base catalog module.

Cassette filespec: H.
Disk filespec: BBS/BAS.

Zapper

Article: Zap Master (p. 62).
System: Model 4, 64K RAM, one disk drive.
Language: Assembly.

Read and modify disk sectors, remove password protection, and

patch Assembly-language programs.

Cassette filespec: DSKZAP (source code).
Disk filespec: DSKZAP/SRC (source code), DSKZAP/CMD (object code). Source code requires EDAS editor/assembler.

Filter

Article: The Next Step (p. 98).
Systems: Models I and III, 32K RAM, one disk drive.
Language: Assembly.

A video filter program.
Cassette filespec: FILTER (source code), FILTER (object code).
Disk filespec: FILTER/SRC (source code), FILTER/CMD (object code). Source code requires Apparat editor/assembler.

TapeDisk

Article: Special to Load 80.
System: Model III, 48K RAM, one disk drive.
Language: Disk Basic.

Automatically loads to disk all files from a Load 80 cassette.
Cassette filespec: I.
Disk filespec: TAPEDISK/BAS.

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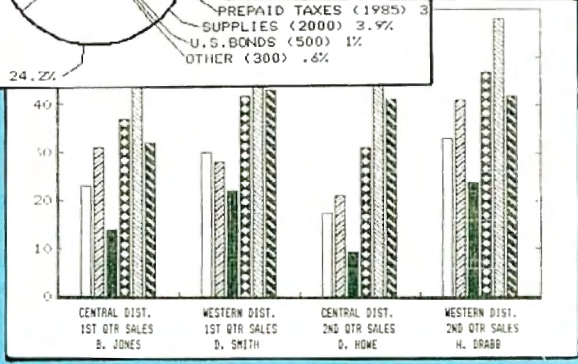
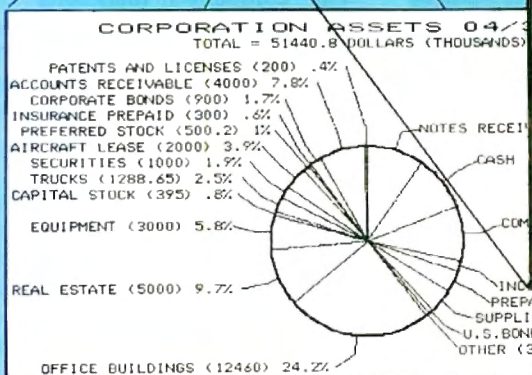
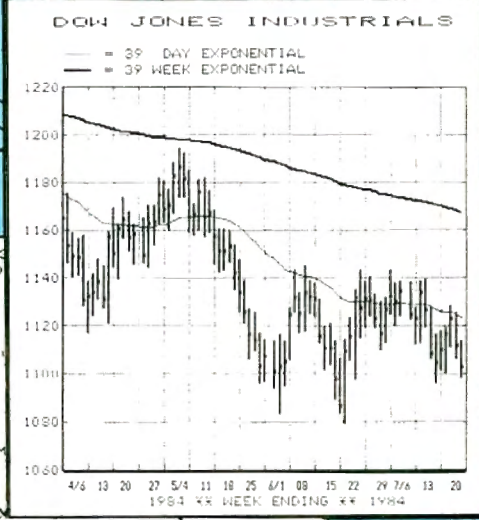
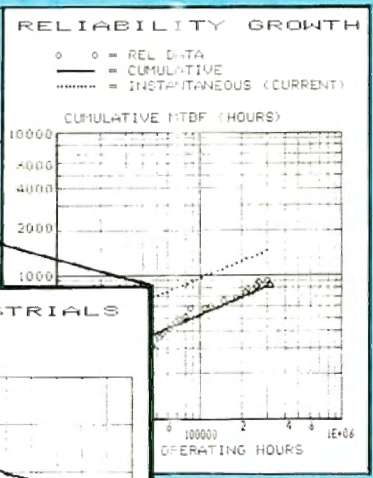
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1231	77.84	963.97	379.10	114.42	135.74	1040	573	24,838	11,305	
102	78.26	972.78	421.43	115.12	136.34	1852	475	17,275	8,405	
105	78.08	972.64	420.77	115.01	137.97	1871	433	41,159	14,669	
104	79.14	984.69	402.89	117.16	136.12	1019	640	38,443	23,709	
107	77.29	969.99	391.19	115.19	135.08	214	1535	3,961	85,844	
108	76.20	945.70	283.24	114.07	133.04	578	1029	11,759	39,075	
109	75.44	948.59	304.82	112.89	133.48	997	620	28,933	15,739	
112	76.52	963.77	388.34	112.88	133.52	928	633	23,813	19,192	
113	76.25	945.10	387.18	112.49	133.25	578	993	12,407	24,532	
114	76.55	946.47	389.95	112.38	133.47	914	612	23,382	13,773	
115	76.99	949.92	394.10	112.60	134.22	787	691	21,547	13,526	
116	77.33	973.29	401.98	113.22	134.77	880	642	23,22	14,423	
119	77.10	970.99	403.55	114.25	134.77	740	750	16,112	15,338	
120	75.81	956.68	394.89	113.80	131.65	371	1172	5,559		
121	75.37	946.25	392.46	113.00	131.34	517	551	15,787		
122	74.76	940.44	392.05	113.00	130.26	43	1824	11,057		
123	74.72	940.19	391.61	111.76	130.23	683	780	14,604		
124	74.45	938.91	389.19	111.47	129.84	564	892	14,694		
127	75.19	949.44	394.64	111.72	131.12	943	559	28,172		
128	74.79	942.53	395.43	112.49	130.34	636	788	19,433		
129	74.19	948.89	398.04	112.74	130.24	774	710	19,433		
130	74.27	947.27	402.22	112.82	129.55	727	776	16,777		

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1231	41.21	77.65	447	-1592
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105	38.61	77.78	873	-132
106	67.40	78.94	407	277
107	92.69	77.89	-1338	-1032
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Of Cabbages and Kings

There are times, I think, when the major issues of life have us so concerned that we forget the smaller ones. And yet, the petty annoyances are what most often test our irritation thresholds and drive us to madness.

Take, for instance, the case of Edward M. Roberts of Glen Head, who recently wrote us a letter that read, in its entirety, "The use of cutesey prefixes by a certain computer maker, abetted by an unnamed fast food chain, is about to make me MacBarf."

Yes, Ed, I agree. If I get one more press release for a product whose name begins with "Mac," I will not be held responsible for my actions.

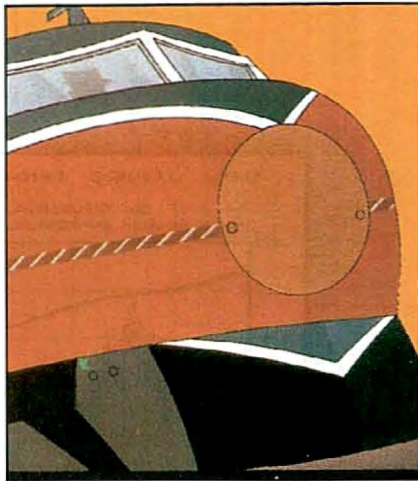
Even so, other things drive me even more batty. Like Charlie Chaplin. I've come to hate the guy. Or those silly, overblown ads from Leading Edge. Or articles on new technology that begin with, "Picture yourself in the year 2000...."

I admit these are pretty trivial matters. But they accumulate in blood like lead, causing a kind of psychic poisoning that only catharsis can cure. Mr. Roberts was wise to write his letter: It probably saved him from a case of bruxism or hives.

Like Mr. Roberts, I value my health. So I'm going to take a moment here to present my list of top five irritants, in no particular order.

Computer-generated poetry and fiction. *The Policeman's Beard Is Half Constructed* is a book of computer prose and poetry by a program called Racter. The book is filled with mind-boggling drivel like "Slide and tumble and fall among/The dead. Here and there/Will be found a utensil." Yes, as fantastic as it may seem, someone talked Warner Books into wasting Lord knows how many trees on page after page of this garbage.

Can computers create literature? Who knows? Who cares? Whatever you call it, the stuff has no redeeming social, intellectual, or aesthetic value.



The bookstalls are flooded with enough human-generated trash: We don't need computers to add their litter to the steaming heap.

Weird product names. I've gotten used to the cute little capital letters in "MultiMate" and "VisiCalc." But things have gotten out of hand. It seems that every new piece of software has a name that looks like someone threw up his alphabet soup. We've got names that are half capitalized (IDEAcomm, WordMARC), feature strange punctuation (Qubie', TK!Solver, PFS:File) or start with lowercase letters (dBASE II and family). The winner has to be xT.CAD, which creatively combines all of the above.

I don't know what companies hope to accomplish with such mutations. All they do is confuse everyone, particularly editors, who have to turn their style books upside-down to accommodate these oddities. Further, the companies risk seeing their products' names continually misspelled.

Software manufacturers could well take a lesson from other industries, whose marketing people know the value of brevity. You don't see detergent companies coming up with product names like x:CEL-lo/166 PLUS, do you? No—they stick to common words like "Breeze," "Cheer," and "All." They know what short attention

spans we consumers have. Why befuddle us more than we already are?

Apple Computer. Not the computer—some of my best friends use Apples—but the company. Apple wants to be the world's largest Yuppie cult. Don't be surprised if Cupertino is renamed Woznishpuram and we see Apples sold in airports by bald-headed guys wearing white robes.

The company's marketing campaign is slick, overbearing, self-mythologizing, and ultimately cynical. It has given me a new-found appreciation for nasal decongestants and hemorrhoid salves; their ads are infinitely more honest and tasteful.

The following words and phrases: Revolutionary, handy little utility, powerful and flexible (or versatile) tool, functionality, end user, user friendly, sophisticated, and any reference to a computer or program as "he" or "she."

Bill Bixby. I kind of like Bill Bixby. He seems like a genuinely nice guy. But let's face it—as Tandy's celebrity spokesperson, he's got no charisma.

Tandy apparently wanted someone who was inviting and trustworthy. Bixby's both—but he's also about as exciting as an overcooked egg noodle. Tandy would have been better off dressing him up as the Hulk; at least people would remember the ads.

I've been giving this last problem a lot of thought, and have come up with some alternatives. Here are my ten candidates to replace Bill Bixby:

1. Rodney Dangerfield
2. Cindy Lauper
3. Bruce Springsteen
4. Richard Gere
5. Joan Rivers
6. Eddie Murphy
7. Rocky and Bullwinkle
8. Julius Erving
9. Lech Walesa
10. Lee Iacocca

This column will gladly accept other nominations. ■

NEW!



Circle 91 on Reader Service card.

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

See What You Can Do With DOTWRITER 4.0!

Now available for the Model 4, too!

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

What is DOTWRITER?

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

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

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

ting commands, and DOTWRITER will do the rest.

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

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

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

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

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

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



Send for free print samples! We've only shown you a few of the 230 DOTWRITER fonts. If you want the best in graphics printing, we suggest you order DOTWRITER today, toll-free.

Please specify printer and computer when ordering.

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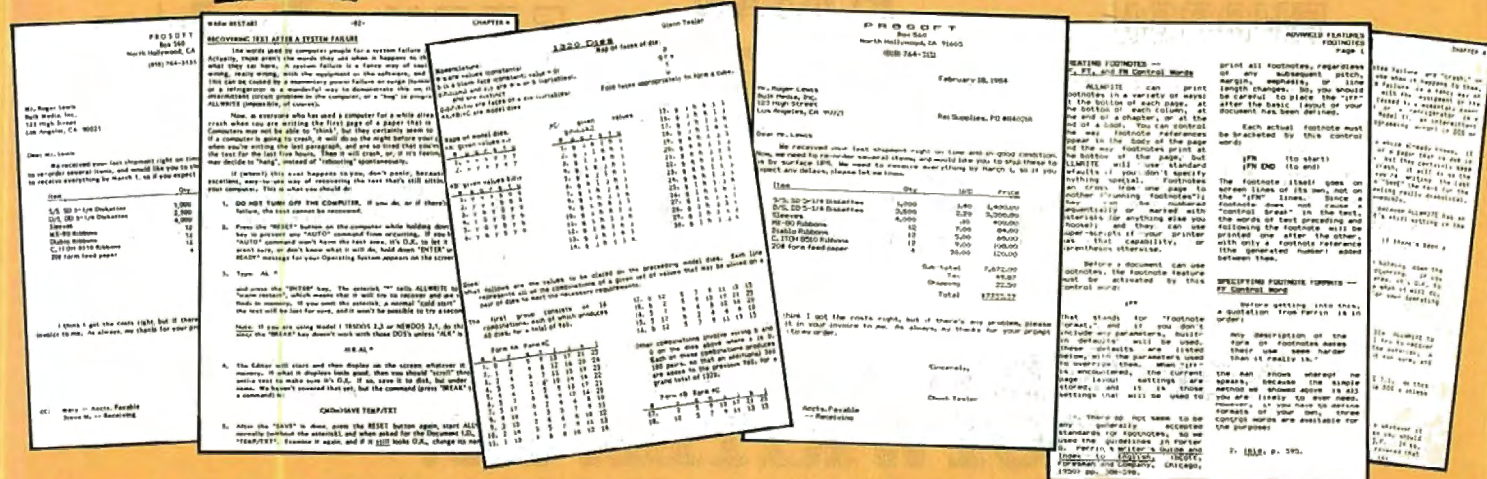


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The Premier Word Processor for Your TRS-80 Model I, III, or 4



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

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

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

Allwrite Can Save You Time!

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

ALLWRITE'S Screen Handling Makes Word Processing Easier Than Ever

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

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

ALLWRITE shows you where you forgot to turn off underlining, boldface, italics, or double-width. Special on-screen Preview feature shows page breaks and page layouts...including underlining and boldface...without annoying blinking or screen flicker. In "Summary" mode, ALLWRITE quickly flags formatting errors without

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

wasting time printing all the text. These standard features make document preparation faster and easier than ever!

State-Of-The-Art File Handling

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

ALLWRITE salvages text from bad disks! If a sector goes bad, you won't lose the entire file, because it will skip bad sectors, read the rest of the file,

TAKES FULL ADVANTAGE OF YOUR MODEL 4.

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

and then show you where the lost text belongs. This advanced error recovery turns a disaster into a feeling of profound relief.

User-Definable Soft Keys Reduce Typing Time

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

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

ALLWRITE Is Easy To Learn

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

NEWSSCRIPT's documentation was acclaimed in every review, and ALLWRITE's 350-page book is even better. Portions of it are designed for beginners, with every feature clearly explained in step-by-step tutorial style. Since you won't always be a beginner, other parts of the book offer advanced topics. There is a cross-reference summary chapter, a 14-page comprehensive index, and a detailed Table of Contents. We've been developing computer programs and manuals for over 20 years, and understand the importance of good documentation.

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

PROSOFT'S On-Going Customer Support

Perhaps the best reason of all for having ALLWRITE is the continuing support we offer you: friendly, expert, direct support that is unsurpassed in the micro-computer industry. There is no time limit to our support: if you are our customer and you need help, just call or write. We give free updates for 90 days, and charge little or nothing for minor updates thereafter.

Customer Comments

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

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

80 MICRO, Nov., 1984

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

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

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

BENEFITS OF OWNING ★ ★ ALLWRITE ★ ★

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

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

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

Circle 30 on Reader Service card.

HUNDREDS OF USEFUL CAPABILITIES

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

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War Games

Thomas Quindry's review of *Warriors and Warlocks* (December 1984, p. 175) puzzles me. While I agree that a discovery period is necessary to successfully play the game, Quindry's inability to progress to advanced characters doesn't make sense. *Warriors and Warlocks* has been played by a number of friends and acquaintances, all of whom have passed this first stage.

Unfortunately, Quindry never saw more than the surface aspects of *Warriors and Warlocks*. Apparently, he wasn't aware of the availability of a scenario with advanced characters to permit review of this later stage of play.

In addition, we've recently discovered that *Warriors and Warlocks* runs on DOSPLUS without modification, and works on the Model 4 in Model III mode with patches that are now available.

*Brian Livingston
A Division of 408614 Ontario Ltd.
Toronto, Ontario
Canada*

In Defense Of...

Terry Kepner, in his November 1984 column (Feedback Loop, p. 16) mentioned that he had trouble communicating with Holmes Engineering. I personally credit Holmes Engineering and the LNW with making a real computer out of my original Model I.

On several occasions, I have called their technical support department and received the best of service. We must realize that superior companies such as Holmes Engineering have come to the end of the proverbial rope in dealing with Tandy. Blame the Tandy Corp. for years of indifference to the buying public and give Holmes another chance—they're doing their best in spite of previous Tandy policy.

*Phillip P. Robley
Eugene, OR*



Modem Madness

The main reason a person builds his own hardware is two-fold: price and availability. Unfortunately, Roger Alford's latest Project 80 (November 1984, p. 146) offers neither of these. The Project 80 modem, at \$85 and with no power supply, no case, and no dial-through phone, is thoroughly trounced by the Radio Shack modem, available for \$99.95. I mean no slight to Roger Alford, but better research into useful projects might be in order.

*Joe Wilson
Fortuna, CA*

Roger Alford's modem, the subject of his November Project 80, isn't cost effective. I calculated the total cost, with case and +5 volt supply, at \$106.99. Check your 1984 Radio Shack catalog and you'll find a modem that's functionally the same for \$99.95. Please inform Roger Alford that the primary reason for building a project is to save money, not enjoyment.

*Randall D. Rhodes
Berkeley, MD*

Help from The Source

Thank you for Hardin Brothers' accurate review of *The Source* for TRSDOS 6.2 (January 1985, p. 159). Not mentioned in the review, how-

ever, is that the help file provided on TRSDOS 6.2 is just one of the packages available in our help system. The LSI help system was released in July 1983 and includes additional features and help files beyond what Radio Shack chose to include with TRSDOS 6.2.

*Joseph J. Kyle-Dipietropaolo
Customer Service Director
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Milwaukee, WI*

80 ALERT

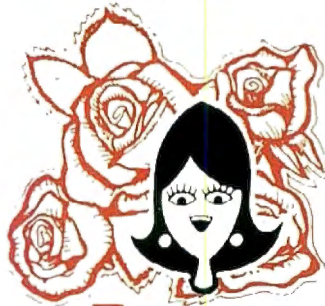
Occasionally, 80 Micro receives letters from advertisers who have changed their status, or from readers who have had difficulties with our advertisers. Most of these problems are resolved to the satisfaction of all parties, but some problems appear insoluble.

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

Argonaut Systems of Northbrook, IL, was erroneously listed in 80 Micro's advertising index (January 1985, p. 145) in the place of Argonaut Distributing of Antioch, CA. Argonaut Systems is not affiliated with Argonaut Distributing, a current advertiser.

Please note Powersoft's new address: 17060 Dallas Parkway, Suite 114, Dallas, TX 75248. Their telephone number is 214-733-4475.

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



Rose

QUALITY DISK DRIVES

These drives are complete with power supply, cover and external drive connector. For TRS-80 Model I, III, 4, IBM PC and others. All drives are Double Density and step at 6ms or less. SS means single head, DS is double head. Specify white or silver color cover. Add \$5 per drive shipping unless otherwise specified. All drives have a one year warranty on parts and labor.

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Q ■ About a year ago, I upgraded my Model III to add disk storage. My first addition was a Tandon single-sided drive with a Percom power supply and controller board. Last fall, I bought a Tandon TM100-2 double-sided drive, which I operate as drive 1.

I'd like to use the double-sided drive as two independent drives. I realize that the computer looks at only two internal and two external drives, but I know you can fool the computer into thinking that the extra side is an external drive.

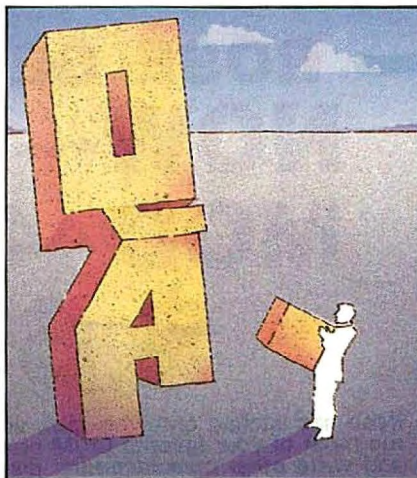
I contacted Tandon but I found their solutions didn't work, so I'm hoping that you or your readers can help me out. (*W. B. Mair, Cambridge, Ont., Canada*)

A ■ First, are you sure you did everything Tandon's technicians suggested?

Second, it's possible the drive cable inside the computer is causing the problem. Some cables are keyed for specific drive positions; for example, the teeth that select positions one, two, and three are missing from the drive-zero connector, and the teeth for positions zero, two, and three are missing from the drive-one connector.

Check the connectors for missing teeth, noting whether the same teeth are missing in all three connectors. The connector to the drive controller board should have all its teeth. Without the teeth in place, the drive connectors can't recognize the drive-two selection when you try to access that drive. The only solution is to get a new cable with nonkeyed connectors.

If you followed Tandon's instructions and the cable is nonkeyed, then



you should try another DOS; the Tandon's operation as a single-sided or double-sided drive depends on your DOS. Model III DOSPLUS currently treats double-sided drives as one drive with twice as many sectors per track as a standard drive (32 versus 18). MULTIDOS treats each side of the drive as an independent unit, while NEWDOS/80 lets you choose either way.

Q ■ I bought several commercial programs on disk, expecting to use them after I added disk drives to my Model III. Instead, I found it cheaper to trade in my III and buy a Model 4. Now that I have a computer with double-density drives, I'm wondering if I can convert those older programs to run on the Model 4. The programs are Versafile, Disk Instruction Course version 1.0, the System Doctor, and the Model I Basic programs Creator and Reportor. (*Eileen Madden, Churchill, Ont., Canada*)

A ■ If you have a Model III version of Versafile, it should work on the Model 4 in Model III mode. The same goes for the instruction courses. The System Doctor disk won't work on the Model 4, but you might be able to contact the manufacturer and arrange for an upgrade if you send them the original Model I disk. The Basic programs should work

unless they contain special PEEK and POKE commands.

If you don't have the Model III Convert utility, maybe you could arrange to use a local Radio Shack's computer and Model III DOS to convert your Model I programs to Model III format; then you can run them on the 4 in Model III mode.

Q ■ Sometimes when I list commercial programs, the computer displays graphics characters: not the characters' codes, but the characters themselves. How does that happen? Usually the program defines a string (D\$ = "whatever"), but the characters between the quotation marks are graphics instead of ASCII letters or digits. Is it possible to list the codes instead of the characters?

Also, some programs put machine code in a REM statement and then POKE it into memory. I'm familiar with POKEing code from a data statement, but I don't understand how to use a REM statement for that purpose. Can you explain? (*J. Perry Hannah, Wenatchee, WA*)

A ■ Yes, there's a special technique for putting those graphics characters in programs. It takes advantage of the fact that the Print command displays any characters between quotes instead of interpreting them, as Print does with characters outside quotes. Normally, the computer interprets characters with values greater than 127 as Basic token values.

Several programs on the market let you enter graphics characters directly from the keyboard. In fact, MULTIDOS has a keyboard driver that you can enable to do that.

If you have neither of these aids, you can use brute force. Define a string of a dozen or so characters, all the same. Use a For...Next command to scan memory for that string of characters (e.g., FOR I = 17195 TO 32000:

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PRINT I, PEEK(I):NEXT). When you see the characters, you know where to POKE your graphics characters. Naturally, you can't print these characters unless your printer supports the TRS-80 graphics characters as actual printing characters. Once you've POKEd a graphics character into a position, you can't list its numerical value to the printer.

One more thing: Don't try to use the edit mode on any program line containing graphics characters, as the editor interprets them as Basic tokens.

The advantage to storing machine-language code in REM statements is that each value takes up only 1 byte, while the same code uses 2-4 bytes in a data statement. For example, you can store the letter "z" in a remark, but in a data statement you'd have to use z's ASCII value, 122.

You can also gain speed by using remarks; Basic doesn't have to convert the ASCII value to a binary number for the POKE. The REM statement is one of the few commands that force Basic to ignore case distinctions and leave the line unchanged. The only problem with this method is that you must avoid using the values 00 and 13, as Basic interprets them as the end of the remark.

Like the graphics codes, these REM machine-code lines won't list properly on a printer. If you can put up with this inconvenience, the RAM savings and faster initial execution are well worth it.

Q I'd like to respond to Richard Ball's question about double-strike capability for the Line Printer VI in normal mode (August 1984, p. 16). The program line:

```
10 LPRINT "DOUBLE STRIKE"; CHR$(27);
CHR$(14); CHR$(27); CHR$(15);:GOTO10
```

makes the printer print the phrase "double strike" continuously on the same line.

When in condensed mode, change CHR\$(14) to CHR\$(15) and change CHR\$(15) to CHR\$(114). It also works in elongated mode. (Popco Jacobi, Drachten, Holland)

A Thank you very much for your help.

Q What's the problem with writing to the top 2 bytes of memory from within Basic? Basic

won't touch any memory set aside by the system's HIMEM address, at least under a DOS. (Loren Pechtel, Phoenix, AZ)

A Not quite: Basic isn't supposed to touch any memory above the address HIMEM sets, but it does. According to Radio Shack, Basic uses the top 2 bytes of RAM for its own purposes regardless of the HIMEM and MEM values. If you're using TRSDOS 2.3, set HIMEM and then use Debug to POKE data into those 2 bytes. Load Basic and run a program or two, then check to see if the data you put in those bytes is still intact. The odds are that Basic will have altered them.

Q I bought the Tandy RS-232C serial board for my Model I and found operation unreliable. My supplier/installer temporarily fixed the problem by spraying the 40-pin connector and cleaning it with a rubber eraser. However, it failed again and again.

I got fed up with repeatedly cleaning the board, so I sought a more permanent fix. I sacrificed a large eraser (two by one by one-half inch) by cutting its length to a bit more than the distance between the connector top and the access cover. I cleaned the connection one last time, placed the eraser on the connector midway between the two connector screws, and then secured the access cover. The eraser, held by the cover, keeps enough pressure on the connector to maintain good contact. It's worked ever since. (James Gerrard, Hawthorn, Victoria, Australia)

A An ingenious solution, much simpler than the one I've been suggesting: Make a small bar that will fit over the connector, secured by the screws themselves. Thanks for sharing your solution.

Q I read with interest the exchange in the October 1984 Feedback Loop about the MEMTEST program's checksum (p. 16). I own a Model 4, and the results I get differ from those mentioned in your column. What is ROM C's normal value on the Model 4? Does anyone have a patch to make the test show this value? Can I patch MEMTEST to run

under LDOS 5.1 instead of TRSDOS? (Gary W. Shanafelt, Abilene, TX)

A The Table lists all the checksums (ROM A's are always pairs). I don't know of any patches to make MEMTEST work under LDOS 5.1.

Model III		
ROM A	ROM B	ROM C
BBC4	407C	2B91 (Early production)
DA75		278A (Rev. A)
		2EF8 (Rev. B)
		2F84 (Rev. C)
		2764 (Network 3)
		276A (Network 3, Rev. A)
Model 4		
ROM A	ROM B	ROM C
BBC4	407C	1591
DA75		48BC (Network 3, EPROM)
B523		
DA42 (Network 3, version A EPROM)		
B504		
DA42 (Network 3, version B EPROM)		

Table. Model III and 4 ROM checksums.

Q I have a CP/M board on my Model III, and I'm looking for a utility to transfer programs from TRSDOS- or LDOS-format disks to CP/M format. I know that Model III Basic has a lot in common with the Microsoft Basic I got with CP/M, so I should be able to make the changes necessary to run them. Would it be possible to transfer them by downloading the non-CP/M files via the RS-232 port? (William R. Alsing, St. Louis, MO)

A I believe that only Montezuma Micro has a utility to read TRSDOS disks and transfer the programs to CP/M disks. But you have to use Montezuma's CP/M 2.2.

Yes, you can download the files via the RS-232, but you'll need two computers to do it. If you're a CompuServe member, you can use TRSDOS to upload the programs into your user area, then use CP/M to download them again. However, you must keep your program lines to fewer than 128 characters. CP/M has a tendency to

Check these features:

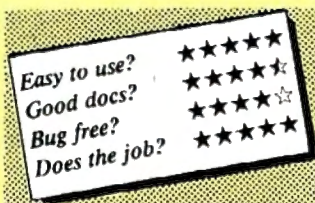
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choke if you try to send longer lines, even though Basic supports line lengths in excess of 200 characters.

Q■ I'm looking for a Model I/III disk drive cleaning program. Did *80 Micro* ever publish such a program, or is a commercial one available? How often is it necessary to clean disks? (*Darrell A. Sherrin, Kelowna, HI*)

A■ To clean drives, you need a hardware disk cleaning kit with a fluorocarbon cleaning liquid and a special disk to apply the fluid to the drive heads.

The September 1981 *80 Micro* has a short Model I program that loads the drive head when you have the cleaning disk in place ("Head Bright," p. 327).

However, I just use the DIR command to force the computer to drop the head against the cleaning disk. For drive zero, I use the reset button. In both cases, it takes the computer about four or five seconds to determine that the cleaning disk isn't a real disk, unload the drive head, and report the failure to the monitor.

Q■ I have some suggestions for D.M.W. of Lake Charles, LA, who had trouble with the USR function (September 1984, p. 16). First, the ROM chips may indeed cause problems. To check them, run a small Assembly-language program. POKE an Assembly-language return, 201 decimal, C9 hexadecimal, to an address above the Basic program, then define that location as the user routine. If problems persist when you call that location with the USR function, you've probably got a bad ROM.

Second, I have a hint: When interfacing Assembly-language routines with Basic, you should always PUSH all the registers on entering your routine, then POP them out just before returning to your Basic program.

On another subject, many people have had questions about upgrading their Model III with Radio Shack's 5-megabyte hard drive. I was pleased with the way LDOS worked after upgrading, but like all operating systems, it has its drawbacks.

After installing Holmes Engineering's VID-80 board for an 80-column display, I found that LDOS's memory areas conflicted with the VID-80

board. After checking with Logical Systems, I attempted to set high memory and then reconfigure the system, but I saw no improvement; LDOS uses the same area for the configuration file each time.

On a tip from Holmes, I ordered DOSPLUS 3.5 and the DOSPLUS hard driver. This was just what I needed. You can set high memory above where you want it, then configure the hard drive. I now have eight configurations files available for different uses.

However, one small difficulty remains. I upgraded my Profile III Plus to hard disk (LDOS) and find it doesn't run under DOSPLUS. Does anyone out there have a patch that modifies the floppy or hard drive version? I have the hard drive sectored so I can still boot up LDOS and use it, but I'd prefer not to have to take this additional step. (*C.D. Robertson, Fort Worth, TX*)

A■ I suggest contacting the DOSPLUS people directly and seeing if they can help you with Profile III Plus. And thanks for the suggestions and hard disk report.

Q■ I want to buy the Holmes VID-80 package to convert my Model III 48K to CP/M operation. Will I be able to write Basic programs under CP/M using Model III Basic? How do I know if a software package advertised to run under CP/M will run on my converted computer? Is it best to buy the VID-80 with extended memory option (total 128K)?

Another problem: After I installed a Compulogic RS-232 on my Model III, the disk drives wouldn't work. I took the computer apart and found the disk power supply's fuse had blown. New fuses blow frequently. Is it possible installing the RS-232 brought on this problem? Will Radio Shack repair technicians check the problem out, seeing as the RS-232 is a non-Tandy product? (*Patrick Berry, Kansas City, MO*)

A■ You can't use Model III ROM Basic under CP/M because CP/M operates by turning off your Model III's ROM chips.

Most CP/M software packages will list any restrictions about the computers they operate on, but there's no sure way to know beforehand what will and won't work. I've tried about

100 CP/M programs on my CP/M computer and found only one or two didn't work (and I'm still not sure that it wasn't just me messing things up).

I'm not sure that the extended memory is really worthwhile; I have a 128K CP/M machine and I almost never use the extra RAM.

I doubt that the RS-232 board did anything to your computer, but it's possible. If removing the board doesn't solve the problem, I think you might have accidentally shorted two leads together while you were working on your computer, causing the fuses to blow.

Radio Shack technicians will work on your computer, but they'll unplug your RS-232 board before actually doing anything. If they find a problem with your computer after removing the board, they'll fix it. However, if the RS-232 board is causing the problem, all they'll do is tell you to remove the RS-232 board.

Q■ Is it possible to use disk drives from a Model I with a Model III or 4? If I understand correctly, the number of tracks is primarily a function of the software. (*Daniel C. Warren, Fort Benning, GA*)

A■ Yes, you can use Model I drives with a III or 4: All you need is the external drive extension cable. When using the external drives, make sure that the last drive in the chain has the terminating resistor pack in position. This is usually a blue integrated circuit package, with the name "Beckman" on top. If you aren't sure what I'm talking about, have a Radio Shack technician install the resistor pack for you.

The number of tracks allowed is not a function of software, it's the physical limitation of the disk drive design. Drives are designed as 40-track, 35-track, or 80-track units. The software determines how many of the physical tracks your system uses in a particular disk drive. Your Model I drives could be either 35-track or 40-track; you'll have to test them to find out which they are. ■

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

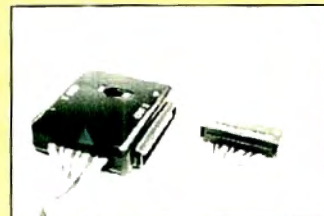
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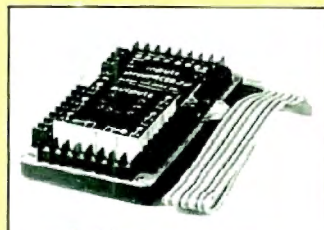
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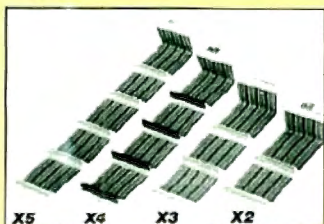
Disk drive cable (34 pin): • 2-drive...C162:\$32 • 4-drive...C163:\$45

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

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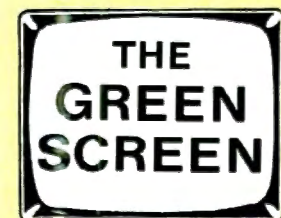
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for the model 1 or 3 using TRSDOS, LDOS, NEWDOS, DOSPLUS, or MULTIDOS; includes full screen text editor and advanced development package

List Price ~~\$250.00~~
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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

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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.

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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.

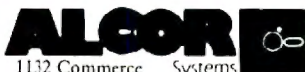
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The Many Facets Of DRI's GEM

Update

As mentioned last month (p. 22), Microsoft's long-delayed MS-Windows program may be in for some stiff competition from GEM, Digital Research Inc.'s Macintosh-like graphics environment manager for MS-DOS computers. It's possible that GEM, announced long after MS-Windows, may debut in Radio Shack stores before Windows makes its appearance.

GEM, an icon and pull-down-menu operating system, will run on most MS-DOS computers, including Tandy's. DRI introduced

two applications programs with GEM last November. GEM Desktop contains a clock, a calculator, and space for four other programs that you can call, display on-screen, and run concurrently (see Photo 1).

GEM Draw is like the Macintosh's MacPaint, with the added feature of color graphics. Considering GEM's use of color and the color capabilities of Tandy's MS-DOS machines, the program just might cure acute Mac-Envy among Tandy 1000/1200 and 2000 owners.

Tandyland

Add another model to Tandy's growing list of new computers. Its latest machine to hit the market is the Tandy 6000, a dressed-up version of the Radio Shack Model 16B multiuser system.

The existence of the 6000 was still a rumor when someone at Tandy spilled the beans, inadvertently sending out 1985 catalogs listing the new computer in place of the 16B. Tandy formally

edited by Bradford N. Dixon

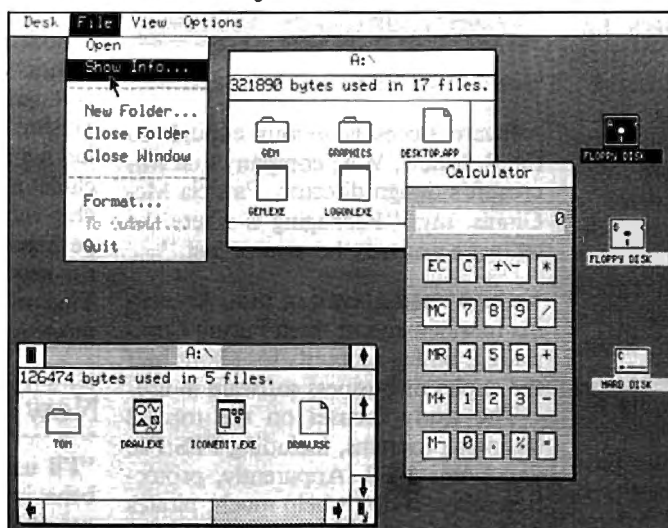


Photo 1. GEM's Desktop program.

introduced the 6000, along with the Tandy 200, on Jan. 4, 1985.

Although functionally similar to the 16B, the 6000 has two noticeable differences. First, the Radio Shack logo is out and the Tandy logo is in. The Fort Worth company is obviously serious about polishing its image, and that apparently means getting the word "shack" off its hardware.

The second big change is the keyboard. The layout is the same but, in keeping with Tandy's latest trend, the keyboard and keys are all white. The keyboard also carries a Tandy logo.

Inside, the 6000 is still Tandy's Xenix powerhouse, but now it has 512K RAM standard instead of the 16B's 256K. With expansions, the 6000 provides up to a megabyte of memory.

How is the multiuser micro market shaping up in 1985? According to the research firm Strategic Inc., changes are in store.

Strategic reports that Convergent Technologies led the multiuser market

in 1984 with a 26 percent share, followed by IBM and AT&T with a 21 percent share each, and Altos, with 13 percent. Tandy earned a respectable 7 percent share.

1985 doesn't look as good for Tandy, however. Strategic predicts that Convergent Technologies and Tandy will drop out of the running altogether while AT&T and IBM capture 25 and 30 percent of the market respectively.

Meanwhile, Tandy's making new moves in Europe. Last December, Tandy and Great Britain's Applied Computer Tech-

niques (ACT) announced a joint venture to form a microcomputer retail chain, called TA Computerworld.

The deal called for 70 TA Computerworld stores and 430 Tandy outlets to stock both ACT and Tandy computer products starting in February 1985. ACT currently markets its MS-DOS Apricot F-1 computer as an entry-level system and is expected to benefit greatly from increased exposure through Tandy outlets.

Asked about the arrangement, Tandy's director of market planning, Ed Juge, told *80 Micro*, "TA Computerworld is a joint venture which will take over both stores to make a new chain. As a result, we will be part of the largest computer retail chain in Europe and the U.K." Juge added that the venture was unlikely to affect Tandy's financial picture this fiscal year, which ends June 30, 1985.

TA Computerworld stores will carry the Tandy 1000 and 2000, the Model 4/4P, and the Model 100. ACT's only entry in the TA Computerworld stores is the Apricot F-1. Juge

felt there would be little competition between the Apricot and the Tandy machines, but if there is, Tandy's wider distribution of its machines is expected to more than make up for it.

Juge said, "You won't see any of ACT's machines in U.S. Radio Shack Computer Centers." But he indicated that nothing was cast in stone and that Tandy is willing to listen to any proposal that will enhance its position in the market.

Since April 1982, Radio Shack has sponsored a quarterly grant program to promote computers in education. The Tandy TRS-80 Educational Grants Program has awarded over \$850,000 worth of hardware and software to 79 individuals and institutions to date.

Tandy presents the awards to individuals or schools that submit the best research proposals on a topic Tandy chooses. For example, the 10th quarterly cycle of the program, which ended December 31, 1984, accepted outlines on the topic "Managing Instruction with Microcomputers."

The 11th cycle of the Tandy program will award prizes on the best proposals for "Applications of Microcomputers in Special Education." Proposals are due March 31, 1985.

You can get a grant application, including format and content procedures, by writing Tandy c/o The TRS-80 Educational Grants Program, Radio Shack Education Division, 1400 One Tandy Center, Fort Worth, TX 76102.

MicroTrends

In the past, finding software from Microsoft Corp. on retailers' shelves was easy—you just had to look for the forest green packages. But according to some marketing consultants, the green packages weren't catching many consumers' eyes. In fact, studies show that consumers more frequently associate green with frozen vegetables or chewing gum.

Microsoft is taking the cue. The high-tech software company is about to become more visible with new crimson red and royal blue packages for their products.

The matter of making Microsoft's products stand out from the crowd in



Photo 2. Texas Instruments' Pro-Lite portable.

software stores is serious enough to the Bellevue, WA, company that Microsoft's design director, Patricia McGinnis, says "Packaging is where the software war may be won or lost."

Yo ho ho and a bottle of rum. According to a new report from Future Computing, piracy accounts for about half the copies of business software in use.

The study focuses on the top 12 business programs, including PFS:File and Lotus 1-2-3. Apparently, protection schemes don't help much; pirates copy protected software at almost the same rate as unprotected programs.

Future Computing estimates piracy cost software publishers \$1.3 billion in sales from 1981-1984, and predicts 1985's losses will be at least \$800 million. Dr. Joe Curry, who directed the study, points out that piracy hurts in other ways, too, making it harder for entrepreneurs to raise venture capital and driving up software prices for more honest computerists.

Hot Items

Texas Instruments is taking a stab at the portable computer market with a new 10½-pound computer called the Pro-Lite (see Photo 2).

Based on the 80C88 microprocessor, the Pro-Lite comes with 256K of RAM, a 3½-inch floppy disk drive, an 80-column by 25-line tile-up liquid crystal display, and a 79-key keyboard with 12 function keys. The TI portable also has two expansion slots to accommodate an RS-232 board or internal 300-baud modem.

Like most of the newer briefcase computers, this one's not aimed at

the mid- to low-range market; at \$2,995, it costs three times as much as the Tandy 200.

The day of the dirt-cheap modem may be dawning. Sierra Semiconductor, American Micro Devices, and other microprocessor companies are completing research and development efforts to produce Bell 212A-compatible chip sets by the end of 1985.

The new technology could bring the price of modems down to a level where computer manufacturers will bundle a "modem on a chip" free in their machines. Commodore could be the first company to introduce this type of product commercially—its forthcoming Amiga computer is rumored to include a Bell 102-compatible modem chip set. Apple, IBM, Compaq, and perhaps even Tandy are investigating the new telecommunications chip sets. That may not bode well for current modem manufacturers.

New Threads

"I'll use it on my kids. They'll start behaving and never know what happened." "The subliminal messages let me work on my personal problems while I do my office typing." "It's an outrage. It's mind control. It should be banned." These are just a few comments from people who've been introduced to a program from the New Life Institute of Santa Cruz, CA, called Subliminal Suggestions and Self-Hypnosis Programs for Your Computer.

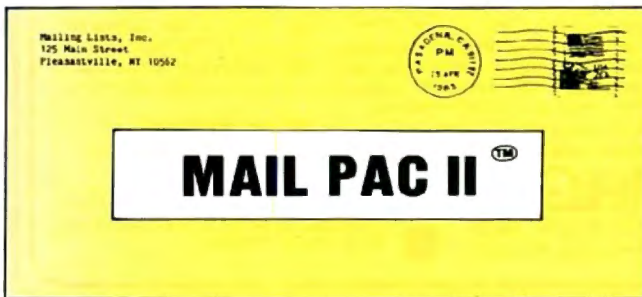
The program is designed to change your habits, behaviors, or beliefs while you work. The method is one tried by advertisers in the 1960s: User-defined messages flash on the screen for a fraction of a second, supposedly influencing the subconscious. According to Joel Amkraut, director of the New Life Institute, computerists can use the program to deal with anything from smoking and obesity to sexual hang-ups and irrational fears. Perhaps Amkraut uses it to make himself believe his program will sell. ■

On p. 21 of the March Pulse Train, we incorrectly identified one line in the Fig. The yellow line labeled "phones, intercoms" should be labeled "1984."—Eds.

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

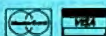
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Networking Works

I have a TRS-80 Model III with two disk drives and a Network 1 controller that's connected to 16 Model III computers without disk drives. I use the following procedure to load machine-language programs from disk, sending them to the 16 stations that use the network.

First, make sure the power is on at each of the stations, respond with the letter L at the cassette prompt, press the enter key at the memory size prompt, and type in SYSTEM. If, for example, you want to transmit Scripsit throughout the network, at each station type in Scripsit after the asterisk and question-mark prompt (*?) appears. Now, as the master computer operator, you type in TAPE (S=D, D=T), press the enter key, answer with L at the cassette prompt, and type in Scripsit/CMD at the file name prompt. The blinking asterisks at each of the stations indicate that the master computer is transmitting the program. After the transmission, type in a slash and run the program.

*Judy Carswell
Route 4, Box 4080
Pearland, TX 77581*

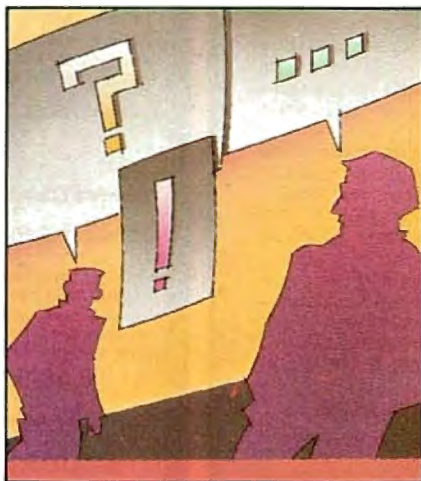
Quick Boot

Each time I try to boot up Multiplan on my Model 4P, the disk looks for a ROM image on drive zero. To correct this, boot up any working TRSDOS 6.X disk and copy the BOOT/SYS.LSIDOS file from your working system disk onto the Multiplan disk using the Copy command.

*Rick Stickers
P.O. Box 767
St. Joseph, IL 61873*

Send for Help

Jim Clark's clever program, Draw ("Drawing Boards," July 1984, p. 64), applies only to Radio Shack printers—rare beasts in my part of the



world. My brother, however, wrote a machine-language program that modifies Clark's program for the Star Gemini-10X.

The changes are too extensive to print here, but we'll make arrangements to supply you with the changes if you send two international reply coupons to cover an airmail reply to: Mr. B.N. Briggs, 14 Allenbery Ave., Napier, New Zealand.

*Anthony G. Briggs
580 Lowe St.
Hastings
New Zealand*

Robert K. Fink modified Draw for the Epson printers. For a copy of these changes write to Reader Exchange, c/o 80 Micro, 80 Pine St., Peterborough, NH 03458.

—Eds.

Reader Aid

Does anyone know of a way to program graphics routines into SuperScripsit? I'd like to use control-X to call Basic Graphics programs and incorporate them into my text. Unfortunately, I don't know anything about machine-language programming.

*Larry D. Hollan
156 Lee Ave.
Vidalia, LA 71373*

In order to memory map WordStar, I need to know the address of the screen RAM in the Model 4 or CP/M mode as well as the special control codes necessary to access screen RAM. Also, can anyone assist with a decent BIOS for CP/M 3.0 that would enable the use of double-sided 80-track drives?

*Michael L. Stern
P.O. Box 166
Mt. Lawley, 6050
Western Australia*

DEBUG

Line 200 of my program, Chilly ("A Chill Wind Blows," December 1984, p. 120), should read:

```
200 DATA 34,28,22,16,10,3,-3,-9,-15,
-22,-27,-34,-40,-46,-52,-58,
-64,-71,-77
```

*Don DeJarnette
1913 6th Avenue East
Tuscaloosa, AL 35401*

Please note the following changes in my game program, "Touchdown!" (December 1984, p. 103). First, there's no limit to the number of times a penalty occurs. Also, line 4240 of the Program Listing should read:

```
4240 POKEC9,32:I=RND(4):YG=10
```

This variable resets the yards-to-go to 10 after a punt.

*Wayne Blair
P.O. Box 811
Dadeville, AL 36853*

The correct address for the drive select function discussed in Tidbit #18 (February 1985, p. 118) is 37E1H, not 37E0H.

*Paul E. Eriksen
13 Stalwart Drive
Newark, DE 19713*

Incorporate the following changes into my program, Finder ("Basic Changes," November 1984, p. 56). Assembly-language programmers should add the lines in the Fig. immediately after the PSECT in line 880.

Also, change the start equate address in line 840 (Assembly-language program) to OFBB4H. All users should change the start address of the For...Next loop in line 150 from 64448! to 64436! and add line 155 as shown below:

```
155 DATA 24,10,255,255,3,72,73,33,0,0,0
```

In addition, change the Dump command to read as follows:

```
DUMP FIND/CMD:0 (START = X'FBB4',  
END = X'FFFF', TRA = X'FBC0')
```

Next, change the memory command to MEMORY (HIGH = X'FBB3'). Once you've incorporated these changes, repeat the instructions noted in the article and the KSM filter should install properly.

*Raymond C. Boggs
4735 Feigly Road S.W.
Port Orchard, WA 98366*

Jeff Squyres' Tidbit #15 (December 1984, p. 101) doesn't work as stated. Instead of using the method described, use the format indicated below to condense three Basic program lines into one. You can also apply the same principle to other situations when you put multiple If...Then statements in one line under the assumption that a program executes all lines.

```
1760 ON -(X)50 OR X(0) GOSUB  
(subroutine) :  
ON -(Y)75 OR Y(-5) GOSUB  
(subroutine) :  
ON -(W)16 OR W(1) GOSUB  
(subroutine) :
```

The expressions in parentheses re-

turn a Boolean true (-1) or false (zero). Thus, the negative sign in front of the quantity returns a 1 or a zero. "On 1 GOSUB" executes the desired subroutine and continues to the end of the line, including the colon. "On 0 GOSUB" skips over the subroutine and continues to the colon and the end of the line.

*Darryl J. Engler
RD 1, Box 276
Glen Rock, PA 17327*

Send correspondence to Reader Exchange, c/o 80 Micro, 80 Pine St., Peterborough, NH 03458.

	MEMHDR	JR	INIZ	;DUMMY RELATIVE JUMP FOR MEMORY HEADER
			DEFW 0FFFFH	;HIGHEST BYTE OF MEMORY USED BY FIND'
			DEFB 03H	;LENGTH OF DUMMY MEMORY MODULE NAME
			DEFM 'HI'	;DUMMY MODULE NAME
MODDCB			DEFW 0000H	;DUMMY DCB POINTER
			DEFW 0000H	;SPARE SYSTEM POINTER (RESERVED)

Figure. Add these lines to "Basic Changes".

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NAME	DESCRIPTION
1 RULE78	Interest Apportionment by Rule of the 78's
2 ANNU1	Annuity computation program
3 DATE	Time between dates
4 DAYYEAR	Day of year a particular date falls on
5 LEASEINT	Interest rate on lease
6 BREAKEVN	Break-even analysis
7 DEPRSL	Straightline depreciation
8 DEPRSY	Sum of the digits depreciation
9 DEPRDB	Declining balance depreciation
10 DEPRDDB	Double declining balance depreciation
11 TAXDEP	Cash flow vs. depreciation tables
12 CHECK2	Prints NEBS checks along with daily register
13 CHECKBK1	Checkbook maintenance program
14 MORTGAGE/A	Mortgage amortization table
15 MULTMON	Computes time needed for money to double, triple, etc.
16 SALVAGE	Determines salvage value of an investment
17 RRVARIN	Rate of return on investment with variable inflows
18 RRCNST	Rate of return on investment with constant inflows
19 EFFECT	Effective interest rate of a loan
20 FVAL	Future value of an investment (compound interest)
21 PVAL	Present value of a future amount
22 LOANPAY	Amount of payment on a loan
23 REGWITH	Equal withdrawals from investment to leave 0 over
24 SIMPDISK	Simple discount analysis
25 DATEVAL	Equivalent & nonequivalent dated values for oblig.
26 ANNUDEF	Present value of deferred annuities
27 MARKUP	% Markup analysis for items
28 SINKFUND	Sinking fund amortization program
29 BONDVAL	Value of a bond
30 DEPLETE	Depletion analysis
31 BLACKSH	Black Scholes options analysis
32 STOCVAL1	Expected return on stock via discounts dividends
33 WARVAL	Value of a warrant
34 BONDVAL2	Value of a bond
35 EPSEST	Estimate of future earnings per share for company
36 BETAALPH	Computes alpha and beta variables for stock
37 SHARPE1	Portfolio selection model-i.e. what stocks to hold
38 OPTWRITE	Option writing computations
39 RTVAL	Value of a right
40 EXPVAL	Expected value analysis
41 BAYES	Bayesian decisions
42 VALPRINF	Value of perfect information
43 VALADINF	Value of additional information
44 UTILITY	Derives utility function
45 SIMPLEX	Linear programming solution by simplex method
46 TRANS	Transportation method for linear programming
47 EOQ	Economic order quantity inventory model
48 QUEUE1	Single server queueing (waiting line) model
49 CVP	Cost volume-profit analysis
50 CONDPFOT	Conditional profit tables
51 OPTLOSS	Opportunity loss tables
52 FQJQJQ	Fixed quantity economic order quantity model
53 FQJQJQSH	As above but with shortages permitted
54 FQJQJQPB	As above but with quantity price breaks
55 QJUEJQCB	Cost-benefit waiting line analysis
56 NCFANAL	Net cash-flow analysis for simple investment
57 PROFIND	Profitability index of a project
58 CAPI	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 BUSBKID	HOME business bookkeeping system
77 TIMECLCK	Computes weeks total hours from timeclock info.
78 ACCTPAY	In memory accounts payable system-storage permitted
79 INVOICE	Generate invoice on screen and print on printer
80 INVENT2	In memory inventory control system
81 TELDIR	Computerized telephone directory
82 TIMUSAN	Time use analysis
83 ASSIGN	Use of assignment algorithm for optimal job assign.
84 ACCTREC	In memory accounts receivable system-storage ok
85 TERMPAY	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 LOANAFDD	Loan amount a borrower can afford
97 RENTPRCH	Purchase price for rental property
98 SALELEAS	Sale-leaseback analysis
99 RRCONVBD	Investor's rate of return on convertible bond
100 PORTVAL9	Stock market portfolio storage-valuation program

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Disk Term: Your Ticket To File Transfers

by David Dalton

edited by Ryan Davis-Wright

★★★★★

Disk Term runs on the Model III (48K) and the Model 4 (64K). It requires one disk drive. Indiana Software Development Co., 723 Franklin Square, Suite 502, Michigan City, IN 46360. \$69.

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

Disk Term is the most advanced TRS-80 communications program I've seen. It automatically transfers disk files from one TRS-80 to another. You preprogram the software with all the details of

the transfer and Disk Term does the rest—it calls the receiving computer, sets communications parameters, makes the file transfer, and hangs up. It even handles busy telephones and error-checking. In addition, you can use Disk Term as an everyday terminal board program with your local bulletin board system (BBS) or for electronic mail services like MCI Mail. And you can't beat its \$69 price tag.

On the dark side, Disk Term (especially the early versions) has been plagued with bugs. Indiana Software is currently tracking them down and correcting them, supplying registered owners with corrected versions of the program for \$2.50.

Automatic Operation

On boot-up, Disk Term displays a menu with 26 choices (the menu won't quite fit on the Model I or III, but will fit on the Model 4's 80-character screen). The bottom six lines of the screen display the program's status: baud rate, current RS-232 parameters, amount of buffer free, amount of



buffer used, and the time. You execute the commands with a single keystroke (see Table 1).

You can set Disk Term to operate on its own. Say your business's home office wants to transfer 14 disk files to each of 10 branch offices. To save on telephone tolls, you want to send the files in the middle of the night with unattended computers. The key to doing so is what Disk Term calls an auto file, a set of commands that Disk Term executes one by one. You create an auto file with a special command Disk Term provides or with a word processor (the auto file is a standard ASCII text file).

A simple auto file might look like this:

```
! 23:05:00
# 19199223308
? SALES1/DAT
? SALES2/DAT
$
```

The first command tells Disk Term to wait until 11:05 p.m. before doing anything. The second instruction tells

it to call 1-919-922-3308. The next two commands give the names of files you want transmitted, and the "\$" hangs up on the phone.

With a number of tasks to complete, an auto file can get long and complex. For greater flexibility, you can embed one auto file within another, or have a master auto file call several other auto files.

Disk Term copes with most transmission problems. If it can't complete a call because the receiving computer is busy or someone forgot to leave it in the answer mode, Disk Term dials the computer a preset number of times, then continues with the auto file, calling the next com-

puter on its list. It records a report of its operations and sends it to the printer. The receiving computer must also be running Disk Term and, of course, it must be in the receive mode.

Disk Term uses checksum and check-product algorithms in error-checking and operates much like XMODEM file transfer protocol. It divides transmitted files into 256-byte blocks and checks each block for errors after it transmits them. If noise on the phone line spoils a block of data, Disk Term retransmits that block until it judges it to be correct.

You can transmit any type of TRS-80 disk file—simple ASCII text files, random-access data files, or even CMD files. Disk Term transfers any number of files of any length, with available disk space the only limitation. As with XMODEM file transfer, you don't have to convert non-ASCII files to ASCII format before you transmit them.

Disk Term also works nicely linking two TRS-80s in the same building

Command	Description
L	Terminal mode. For transmitting and receiving data.
A	Dials a number from the telephone list and puts you in terminal mode when the computer answers.
F	Loads an ASCII disk file into the buffer.
T	Transmit mode. Automatically transfers files to another computer running Disk Term.
N	Executes auto files.
R	Receive mode. Answers the phone and automatically receives files from another computer running Disk Term.
P	Turns on the printer.
Q	Executes a DOS command.
B	Turns on the buffer and saves incoming data.
J	Splits the screen in terminal mods, with incoming data on the bottom of the screen, and outgoing data at the top.

Table 1. Disk Term commands.

through an RS-232 cable (also called a null modem cable, in which you connect two computers by a special cable with no need for modems).

I tested Disk Term with a Model III and a Model 4 connected by a 50-foot cable. I found that it worked reliably at speeds of up to 9,600 baud. This could be a fast and convenient way to swap files between computers in the same building without swapping disks, and it doesn't matter if the two computers are different models or are running different DOSes.

Other Niceties

Disk Term can save eight telephone numbers in an auto-dial directory. (To transfer files unattended, you need an auto-dial modem; Disk Term supports U.S. Robotics, Hayes, and Hayes-compatible modems, as well as the Radio Shack Modem II.)

Disk Term supports eight macro keys, with which you can save eight long strings of control codes and send them with one keystroke. You can execute DOS commands without exiting Disk Term. It provides complete data translation tables for keyboard input, display screen output, printer output, RS-232 input, and RS-232 output.

Most users need not understand or alter these tables, but you can use them to filter all Disk Term input/output. The program comes with a table called EBCDIC/DAT, which makes the necessary translations for communicating with an IBM mainframe in EBCDIC instead of ASCII format. You can save different Disk Term configurations (baud rate, buffer status, and translation tables) to its data file for the different computers you call.

Terminal Transmissions

In addition to file transfers, you can use Disk Term as a standard terminal program. If you use it only to call your favorite BBS, it operates at 1,200 baud without losing characters. In addition, you can send up to 2.5K of data to a printer buffer to accommodate a slow printer. As long as the printer never gets more than 2,560 characters behind, you won't lose any data. And since Disk Term is interrupt-driven, it can handle several tasks at once.

Disk Term saves incoming data in a memory buffer and sends the buffer to a disk file. If the buffer runs out of room, Disk Term sends the host computer a pause control code and saves the buffer to a disk file. Then it restarts the host computer with another control code. Disk Term even allows an extremely long incoming file to span more than one disk.

Don't confuse Disk Term's buffer-handling features with automatic file transfers; they aren't the same. As a regular terminal program, Disk Term communicates with any host computer—micro or mainframe—and transmits ASCII text from its buffer or receives ASCII text in its buffer. You can print out the received text or save it to disk.

Disk Term is a bargain even if you never use its more advanced features. If your most complicated requirement is calling MCI Mail and uploading a message, Disk Term handles it easily.

Models and DOSes

The Models I, III, and 4 versions of Disk Term are individual programs, and a version for one model won't run on another. Indiana Software supplies

a single manual for the Models I and III version, and a different manual for the Model 4. Disk Term for the Model 4 is a true Model 4 program, using features like the 80-column by 24-line display and any extra memory you've installed. If you have a 128K Model 4, Disk Term uses the extra memory to increase your buffer size.

The Model III version supports several DOSes: TRSDOS 1.3; DOSPLUS 3.4, 4.0, and 3.5; LDOS 5.1.4; and NEWDOS/80 2.0 and 2.5. The Model 4 version supports Model 4 TRSDOS and Model 4 DOSPLUS. An automatic patch file is included for Model 4 DOSPLUS. I did not test the Model I version, but Indiana Software says that the Model I version runs under the same DOSes as the Model III.

The Bugs

One reason for the many bugs in this program is that Indiana Software offered three versions of the program for different DOSes. While it's commendable that they remembered everyone, they did so at the expense of an error-free package.

For instance, Indiana Software didn't support NEWDOS/80 on the Model III for several months after they first released the program. When it was released, the program crashed constantly, especially if you tried to execute a DOS command. The company is working on the problem, and they should have it corrected by the time you read this. I never had a crash under TRSDOS.

The early releases of the Models I and III versions set the DTR (data terminal ready) lead on the RS-232 line low. Most modems wouldn't allow communications because this signal indicated that the computer couldn't communicate. I recognized this problem only because my modem has a DTR light. I had to patch a byte in Disk Term's configuration file (the UART status byte) to correct it. Indiana Software has since corrected this problem and offers updates for \$2.50.

The Model 4 Disk Term had a pesky bug in a nice feature not generally offered in terminal programs: nulls after carriage returns. This isn't something you need to understand, but it means that you can order the computer to send one or more ASCII 00 bytes (nulls) after each carriage return in the terminal mode. You sometimes need

nulls at higher baud rates to insure against Disk Term's losing incoming characters while the computer's processor scrolls the screen.

The problem with Disk Term was that you couldn't instruct it to stop sending nulls. This made the package useless with MCI Mail and some bulletin boards, because those systems considered the nulls part of a command string and they wouldn't recognize names, passwords, or commands because of the spurious (but invisible) characters.

The Disk Term patch for Model 4 DOSPLUS didn't work correctly on the version I tested; the patch utility displayed a "String not found" error. The patch changed only 3 bytes, and Disk Term seemed to work fine under Model 4 DOSPLUS without the patch. Indiana Software says that without the patch, Disk Term under Model 4 DOSPLUS adds an extraneous sector to the end of a disk file. They're supposed to correct the patch.

In some places, Disk Term doesn't accept lowercase input when it prompts you for information.

The length of the file name saved to buffer is arbitrarily limited to 11 characters, even though you need 14 characters for an eight-character file name, an extension, and a drive number.

Several months after Disk Term's initial release, Indiana Software made substantial changes to improve the reliability of the transmit and receive modes. These changes made it impossible for new versions of the program to transfer files to the earlier versions. Indiana Software sent registered owners letters offering upgrades to their master disks for \$2.50.

Both the Model I/III and Model 4 manuals have several pages of corrections and cautions in the front. You can lose data if you don't heed the cautions.

Skimpy Documentation

Disk Term's documentation is skimpy and somewhat inelegant. The 70-page manual comes printed on 5½-by 8½-inch paper in a three-ring binder. It includes a table of contents, but no index. While the manual contains a good many typographical mistakes and misprints, the major errors seem to have been rounded up in the errata at the front.

The manual describes each com-

Disk Term's automatic file transfer is a reliable feature and long overdue.

mand in adequate detail. I found a technical section in the back of the manual useful in patching the configuration file to overcome a bug.

All that can be said for the manual is that it seems to contain all the information essential to running Disk Term. It isn't pretty, and someone using a computer and modem for the first time will need extra help.

Copy Protection

Disk Term comes on an unprotected disk, so you can make as many back-up copies as you please. The only copy protection is a serial number embedded in the code. Disk Term will not transfer a disk file to a copy of the program with the same serial number. If you attempt to do so, the file transfer aborts. If you want to use Disk Term to transfer files between several computers, you must buy a separate copy of the program for each computer.

Conclusions

Disk Term's automatic file transfer is its best feature. It's reliable and is long overdue in the TRS-80 world. If you've ever spent several hours slaving over a hot computer transferring a long list of files using an XMODEM program, you'll quickly see the value in being able to give the computer a list of programs and walk away.

If you're looking for a good terminal program with all the bells and whistles, Disk Term is a good buy. This is especially true if you have a Model 4 and you want a terminal program to take advantage of your 80-character screen and extra memory. Disk Term is far easier to use than the awful communications program that comes with Model 4 TRSDOS.

On the other hand, if you're new to data communications and your needs are simple, you may want to purchase an easier-to-use program.

One caveat: I recommend that if you're thinking of buying Disk Term, contact Indiana Software and ask them if they've ironed out all the bugs. ■

Lucid: Clearly a Winner

by Terry Kepner

★ ★ ★ ★ ☆

Lucid runs on the Model 100. Portable Computer Support Group, 11035 Harry Hines Blvd. #207, Dallas, TX 75229, 214-351-0564. \$149.95.

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

If you want the best spreadsheet program possible for your Model 100, get Lucid. It's expensive, but it's more than worth the money in capability and convenience. It can do almost everything that the Lotus 1-2-3 spreadsheet can do. And, since it uses the Model 100's ROM socket, you can put it in place and forget about it.

Lucid is unique in that empty or unused spreadsheet cells use no memory (all other spreadsheets require 4 or 5 bytes of RAM per cell). This gives Lucid a clear advantage, considering the premium on memory in a portable computer. Lucid uses anywhere from 10-80 percent less RAM than the same spreadsheet on another computer, by far Lucid's most important advantage.

Using Lucid

Lucid presents the easiest program installation I've ever seen for the Model 100. First, you take off the expansion ROM cover, plug in the Lucid ROM, replace the cover, turn over the computer, and turn it on. Go into Basic, type in CALL 65012, return to the computer's main menu, and Lucid's ready to use.

After you execute the call, Lucid appears on the Model 100's main menu. You boot it up just as you would any other ROM-based Model 100 program: position the cursor over Lucid and press the enter key. Lucid prompts you for a file name, then puts you in the spreadsheet you specify. Alternatively, you can put the cursor over the spreadsheet file name and press the enter key. Lucid will automatically load itself and put you in the spreadsheet.

With Lucid, you don't have to go through a spreadsheet definition stage to tell the system how many rows and columns you want to reserve. Every

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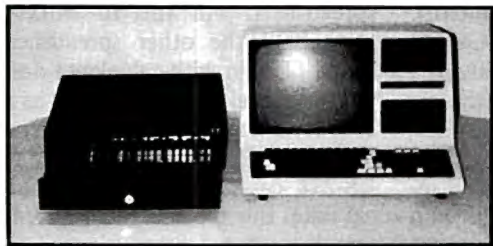
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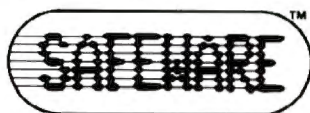
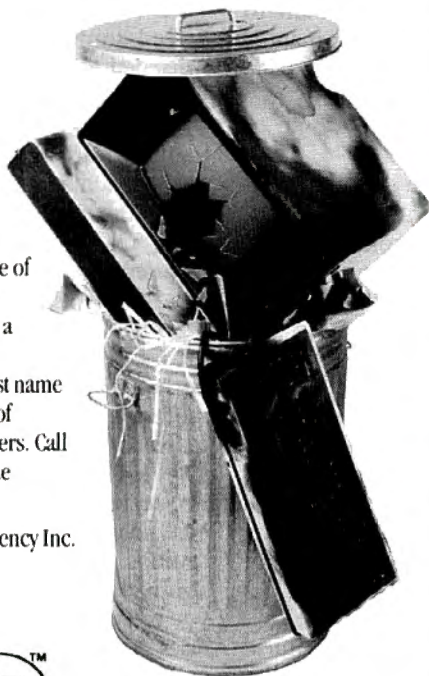
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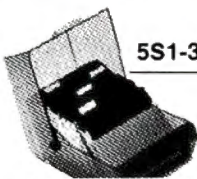
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Lucid spreadsheet automatically gives you 126 columns by 254 rows (when printing, you have to define the columns and rows you want printed. Lucid doesn't automatically print a spreadsheet of 126 by 254 cells). You don't have to worry about exceeding the defined limits of a spreadsheet when inserting rows or columns (except the maximum allowed limits of 126 and 254).

While other spreadsheets limit column titles to the width of the column itself, Lucid lets you use column titles of up to 36 characters in length, regardless of the actual column width. Extra-long titles print over following column's spaces, if the space is free. If the title for column A overlaps column B and column B already has a title, Lucid displays only the portion of the title that matches the width of column A. But you can change the width of column A to whatever width you want, so even if column B has a title, you can separate the columns enough to display the titles without overlap.

Changing the column width (up to a maximum of 26 characters) affects only the LCD or printed spreadsheets; it doesn't affect the amount of memory each column uses. The cells use memory only if they have data in them, and even then the amount is determined by the size of the data itself. Additionally, you can center or right-justify column titles you specify with simple one-character parameters.

Features

The more complex spreadsheets let you use tables of figures, located to the side or bottom of the spreadsheet, as reference sources. Most of them are one-dimensional: you look up a value using a row or column specification. Lucid lets you use a two-dimensional table look-up. Specify the two input parameters and the table location and Lucid will find the correct matching value. You can set up a questionnaire on the visible portion of the spreadsheet with a look-up table hidden off-screen. Based on the answers you give, Lucid looks up data in the table and returns with the appropriate response.

In the Lucid booklet, Portable Computer Support Group (PCSG) uses a simple two-question weight-and-age example to demonstrate this. Depending on the answers you type in, the spreadsheet recommends times to

spend in aerobic exercise (or even not to do it at all without consulting a doctor).

Another useful feature is the GOTO command. You can jump directly to a particular cell instead of using the arrow keys to scroll there. All spreadsheets have such a command, but what makes Lucid unusual is that it remembers your last location, so you can easily return to it. You can bounce back and forth between two locations all day without having to retype any directions. This is a useful function, especially if you're at the bottom of a spreadsheet and need to refer to the top for column titles.

And More

Other standard spreadsheet features Lucid supports are individually variable column widths; write-protected cells (so others can't accidentally change labels, formulas, or constants); long labels that can spill over column boundaries; inserting, deleting, replicating, and copying rows or columns to other locations or spreadsheets; absolute and relative cell references (important for use with replication, copy, and cut-and-paste); the standard mathematical and trigonometric functions (square root, sine, cosine, tangent, arctangent, logarithms, exponentiation, random number generation, summation, cell count, and maximum and minimum values in a range); natural order of recalculation (recalculation from left to right as you enter new values); manual recalculation; and reformatting wide spreadsheets for narrow paper.

Cut and Paste

Lucid also has all the important features you need in a spreadsheet, particularly for a portable computer. Lucid's cut and paste ability mimics that of Text. You can cut and paste portions of the spreadsheet to other sections, other spreadsheets, or even text files. The Lucid paste buffer is separate from Text's paste buffer, so you can paste a spreadsheet into a Text file, then use the paste buffer there for text work. When you return to the spreadsheet, the paste buffer there still contains the information you put into it.

You are also able to reference cells in other spreadsheets. When Lucid hits one of these references, it looks up the specified cell value in the other

spreadsheet and puts it into the present spreadsheet. For this to work, you must have the other spreadsheet in RAM filled in with calculated data.

The Model 100 is flexible in its ability to send and receive data from any of its different ports (modem, bar code, RS-232, cassette, and RAM), and Lucid takes this flexibility to heart. It lets you direct its output routines to any of the Model 100 devices. You can save formatted copies of your spreadsheet straight to cassette, RAM, or whatever you want.

At first glance, Lucid doesn't appear to support certain mathematical functions like averages, percentages, or arc cosines. While these don't appear as express commands, you can create all of them by formula. For example, average is just sum/count, percentage is X/100, and arc cosine is 1/SIN(X). In fact, the Lucid manual lists the formulas needed for the arc, inverse, arc inverse, hyperbolic, and inverse hyperbolic trigonometric functions as well as their limits.

Also, Lucid supports conditional cell formats. You can specify how many decimal places should follow the decimal, the trailing minus sign for accounting, the use of the dollar sign, and commas in numbers greater than 999.

Better than 1-2-3?

PCSG says that not even Lotus 1-2-3 can match Lucid's capabilities. Since I don't believe everything I read, I decided to compare the two and see for myself.

Lotus 1-2-3 offers many capabilities that Lucid doesn't have: windowing; keyboard macros; naming blocks of cells; the Boolean logic operators And, Or, and Not; scroll-protected column titles; standard deviation; and a host of others. Comparing Lotus 1-2-3 with Lucid is a bit like comparing a Corvette with a Ferrari: They're both great cars, but one clearly offers more than the other. Lotus 1-2-3 requires a 16-bit computer with over 194K of RAM just to run a small spreadsheet. And it gives you a database program and a graphing program to boot.

Lucid comes as a plug-in ROM that you can use in an 8K 8-bit computer. It doesn't have either a data base program or a graphing program, but it matches Lotus in its spreadsheet func-

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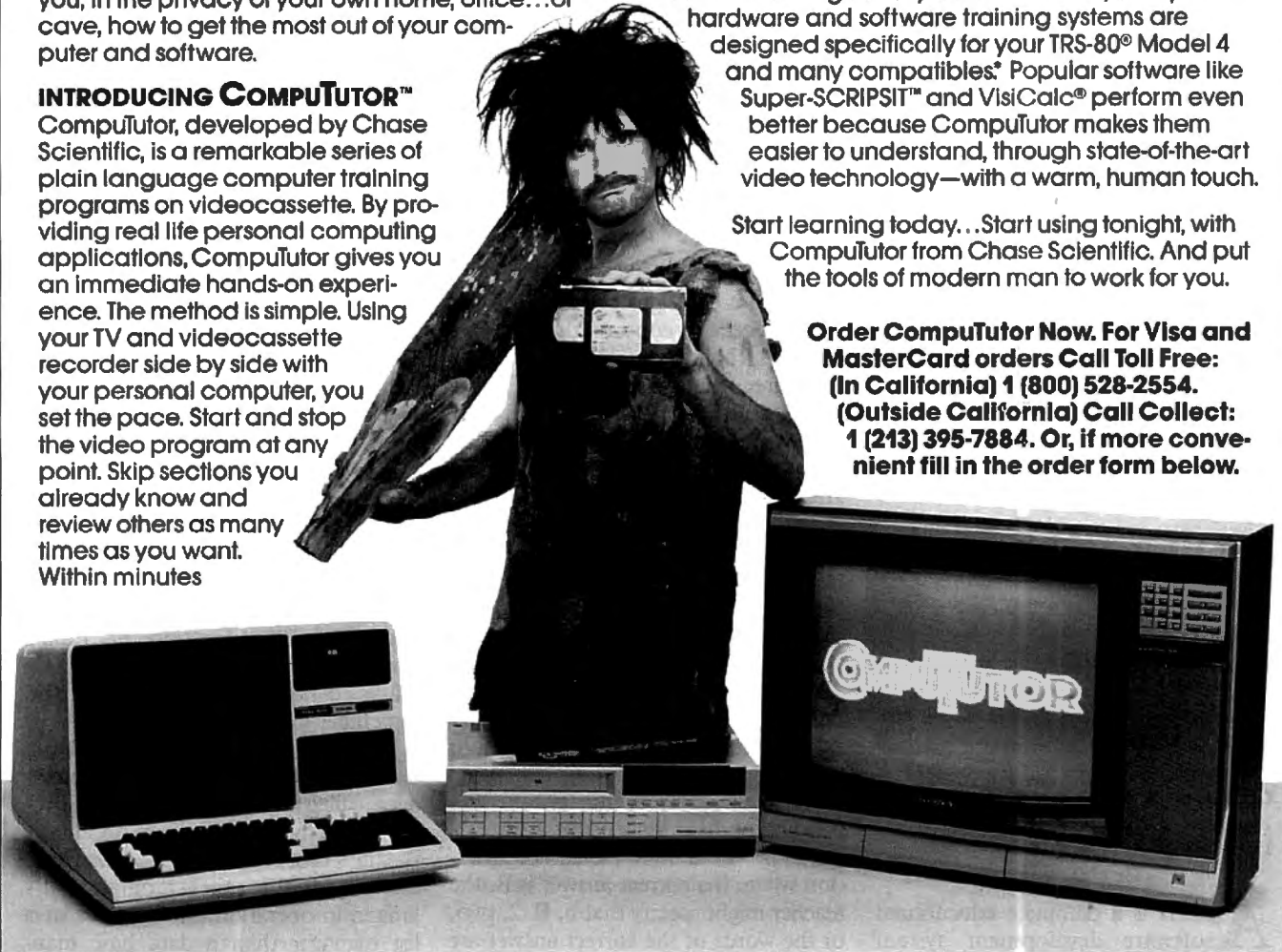
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tions. It just takes a bit more thought and programming skill to do it. Plus, Lucid offers a few features not available on Lotus or other spreadsheet programs.

The last comparison is speed; how does Lucid stack up when matched against Lotus 1-2-3? It depends on what you're doing. Summing 600 cells takes two seconds with Lucid, 1.4 seconds with Lotus 1-2-3. Inserting a column takes a half second with Lucid, 2.4 with Lotus 1-2-3. Replicating 100 rows takes Lucid 20 seconds, Lotus 1-2-3 1.5 seconds. So, speed comparisons really depend on what you're comparing (PCSG supplied these figures). I've never been bothered by the time it takes Lucid to perform a calculation.

PCSG is now supplying personality modules that load into RAM and give Lucid even greater capabilities: row and column sorting, bar and line graphing, more powerful financial reporting, DIF and SYLK data conversions, and others. Contact PCSG for more details. ■

Act III Passes the Test

by Annette Hinshaw

★★★★★

Act III runs on the Model III (48K) and requires two disk drives. Avanti Associates, 9 Marietta Lane, Mercerville, NJ 08619, 609-586-7749. \$400.

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

Act III is a complete educational software development system that lets you design computer-run lessons and tests. You can present text in 100 different ways, add graphics for interest or instruction, and record student performance. The program includes features that make it suitable for all grade levels, from kindergarten to college. Teachers and therapists for the disabled child or adult can adapt this powerful and flexible system to a person's individual needs. Businesses that train several people a year can profitably use Act III to develop effective interactive training sessions for new employees.

Beginners should be able to understand the basics of Act III almost im-

Act III is suitable for all grade levels, from kindergarten to college.

mediately. However, mastering its most powerful features, like test display, the "cloze" function, conditional branching, and especially the graphics, requires hours of working with it. While the system is supposed to require no programming, Act III has over 100 commands and control codes. I found it as complex to learn as other "nonprogramming" applications, such as VisiCalc and dBase II.

The Package

Act III is copy-protected and comes with a back-up copy of the program disk, which includes DOSPLUS and the three major programs: Editor, Artist, and Display. Editor, the main system program, is a text editor that accepts programming commands and graphics data you develop with Artist. Artist is the graphics utility for assembling TRS-80 special characters into display screens. Display takes the files created under Editor and displays them to the student according to control commands you embed in the text.

Conditional branches allow a lot of flexibility. The computer can load and run a remedial or an advanced lesson, as appropriate. The lesson can jump to different parts of the system, depending on how the student answers a question. In a multiple-choice question where the correct answer is B, the teacher might specify that b, B, 2, two, or the words of the correct answer are all correct. Since computers can only compare one string to another, this feature reduces student frustration by anticipating the ways people interact with the system.

Act III also lets you give several hints and finally disclose the right answer. It imposes no size limit on lessons either, since you can chain the lesson files. Act III can also turn an audio cassette player off and on for cassette access, and you can password-protect files from the student.

The program has full printer capabilities, and you can specify what information the student and the teacher can print out.

Learning to Act

All the commands in Act III are labeled simple, intermediate, or advanced. The beginner knows right away whether a particular function is within his skill level. Although it's easy for a beginner to get started, most people will be more comfortable if they've had computer experience.

The biggest problem in learning to use Act III is its size. It has so many features and capabilities that it seems overwhelming. It will take at least an hour to read the manual to gain an overview of the program. People planning to use the system should allow for at least 20 hours of work before creating a working lesson. While you can create small lessons with less time, you wouldn't be doing the system justice.

Most of Act III's 200-page manual is written simply, with examples for you to follow. The package also contains a tutorial disk that gives lessons on Act III's most important commands, illustrating many of their features. Some of the lessons use display formats like showing only one sentence at a time, or blinking key words in an explanation. Others show how Act III's features can enhance a lesson. For example, a lesson on Marco Polo includes an outline map of Italy and shows the location of Polo's home city, Venice. The city name blinks to help the student locate and remember it.

The final program in the Act III system is a stand-alone data base manager called INFOSCAN. While Act III's main menu includes an option for the data base, INFOSCAN doesn't interact with the other programs. It's limited in operation, and is more of a list manager than a data base manager. While it records student performance, it can't do math problems, such as preparing grade averages or a distribution of group performance.

INFOSCAN is the weakest component in the system. Even its documentation is less accessible to novices than the material on Editor and Artist. It provides little information on how to design and use data bases. People inexperienced in data bases are likely to make many false starts with INFOSCAN. Some general material on applications (with examples specific to teachers' needs) would improve this part of Act III.

Continued on p. 110

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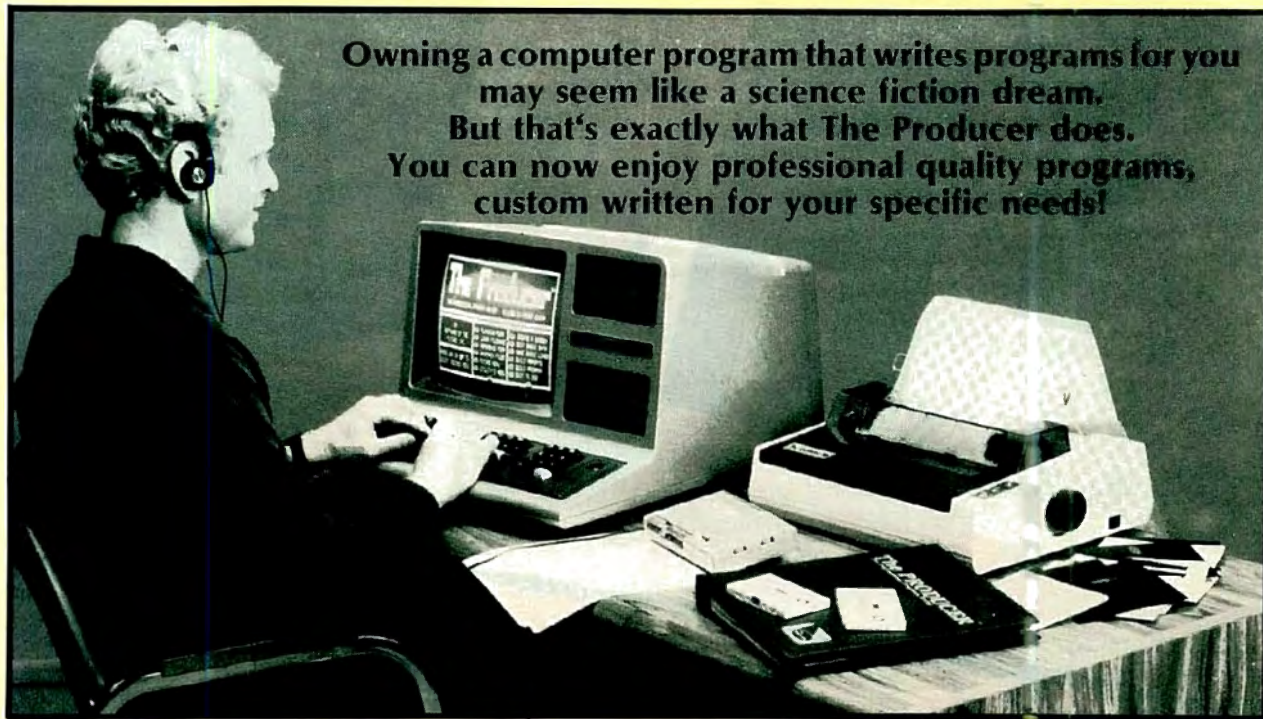
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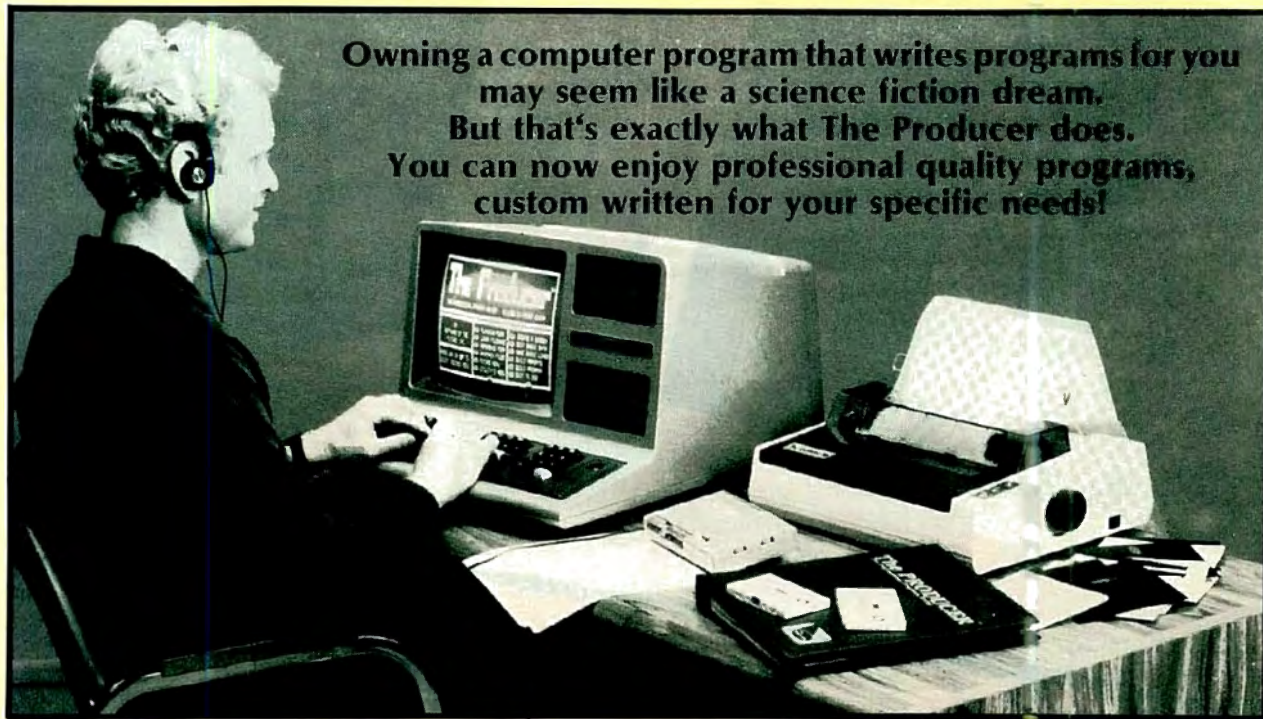
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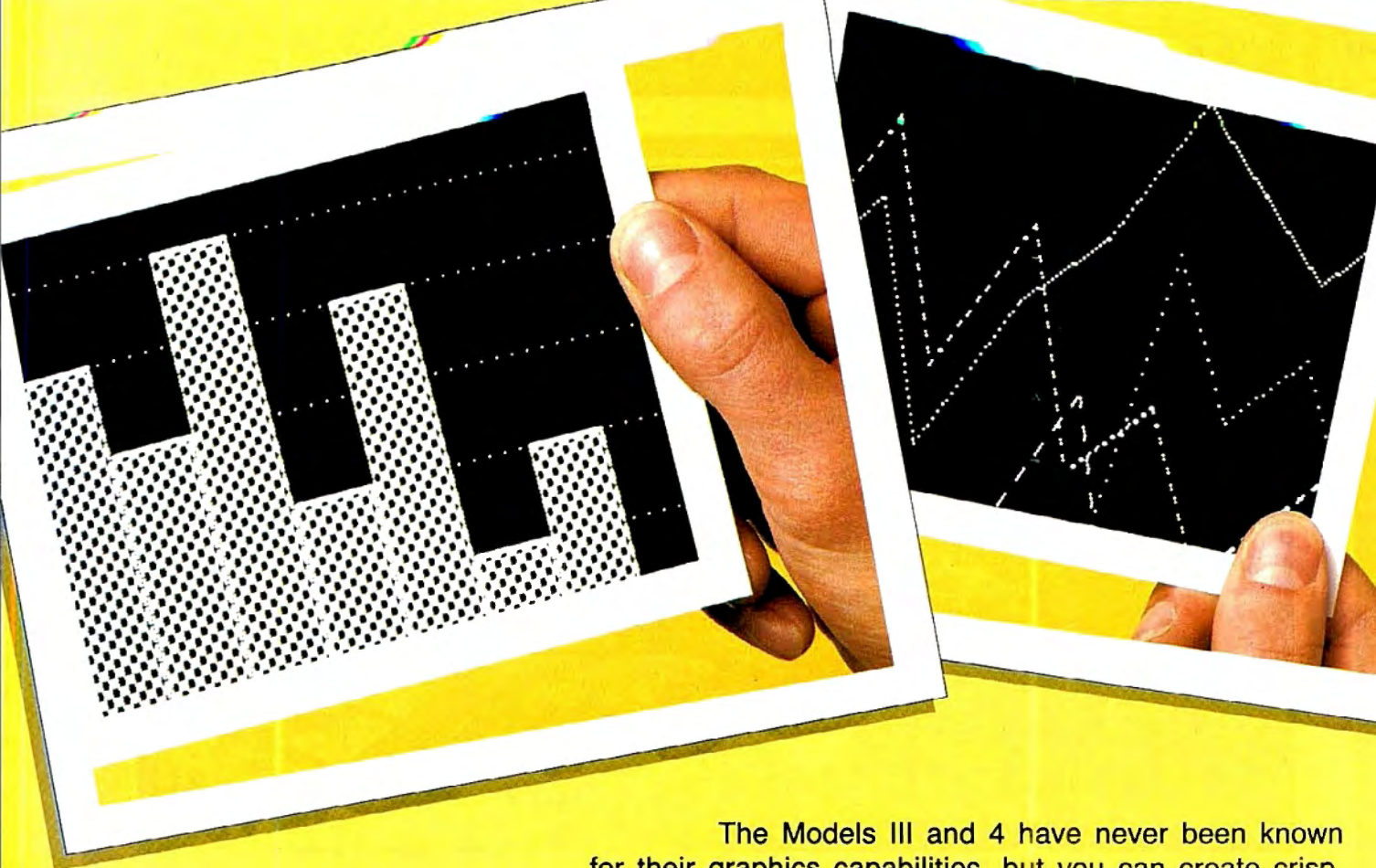
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The Models III and 4 have never been known for their graphics capabilities, but you can create crisp, clear line and bar graphs with Grapher and Radio Shack's high-resolution graphics board. Grapher works on the Tandy 1000/1200 as well.

Clear-Cut Trends

If you own a Radio Shack high-resolution graphics board for your Model III or 4, you're probably wondering when you'll see some software for it. Your wait is over: Grapher produces high-resolution line and bar graphs you can produce on any graphics printer. It also works on the Models 1000 and 1200.

Grapher lets you draw and display four kinds of graphs in high-resolution mode: line graphs for monthly data and for a 10-year data summary, and bar graphs for monthly data and for annual averages. You can enter data in single-precision (under nine digits) or double-precision (under 12 digits) format.

Grapher isn't a statistical analysis program; it's capable of monthly/annual data displays only. Also, you won't be able to graph the national debt (or any other number over 999,999,999.99).

Getting Started

Grapher, the main program, appears in Program Listing 1 (p. 46). Program

Listing 2, Printer (p. 79), provides all Grapher's print functions. GraphCalc, in Program Listing 3 (p. 80), calculates scales for the X axis on each graph. Figure 1 lists the primary routines in each of these programs. See Program Listing 4 (p. 81) for Model 1000/1200 changes.

Printer and GraphCalc cannot reside in memory at the same time. To coordinate control of these two modules, Grapher uses a flag (SWFLG) to load the modules (via the chain merge command in lines 5870-5890) and keep track of which module is in memory.

You must save Listings 2 and 3 in ASCII format (SAVE "PRINTR",A) and you shouldn't renumber any of the listings as the line numbers are important for merging procedures. Save Listing 1 with Listing 3 merged into it.

Running Grapher

Type in and run Grapher, in Listing 1, using BASICG on the disk that came with your high-resolution graphics kit.

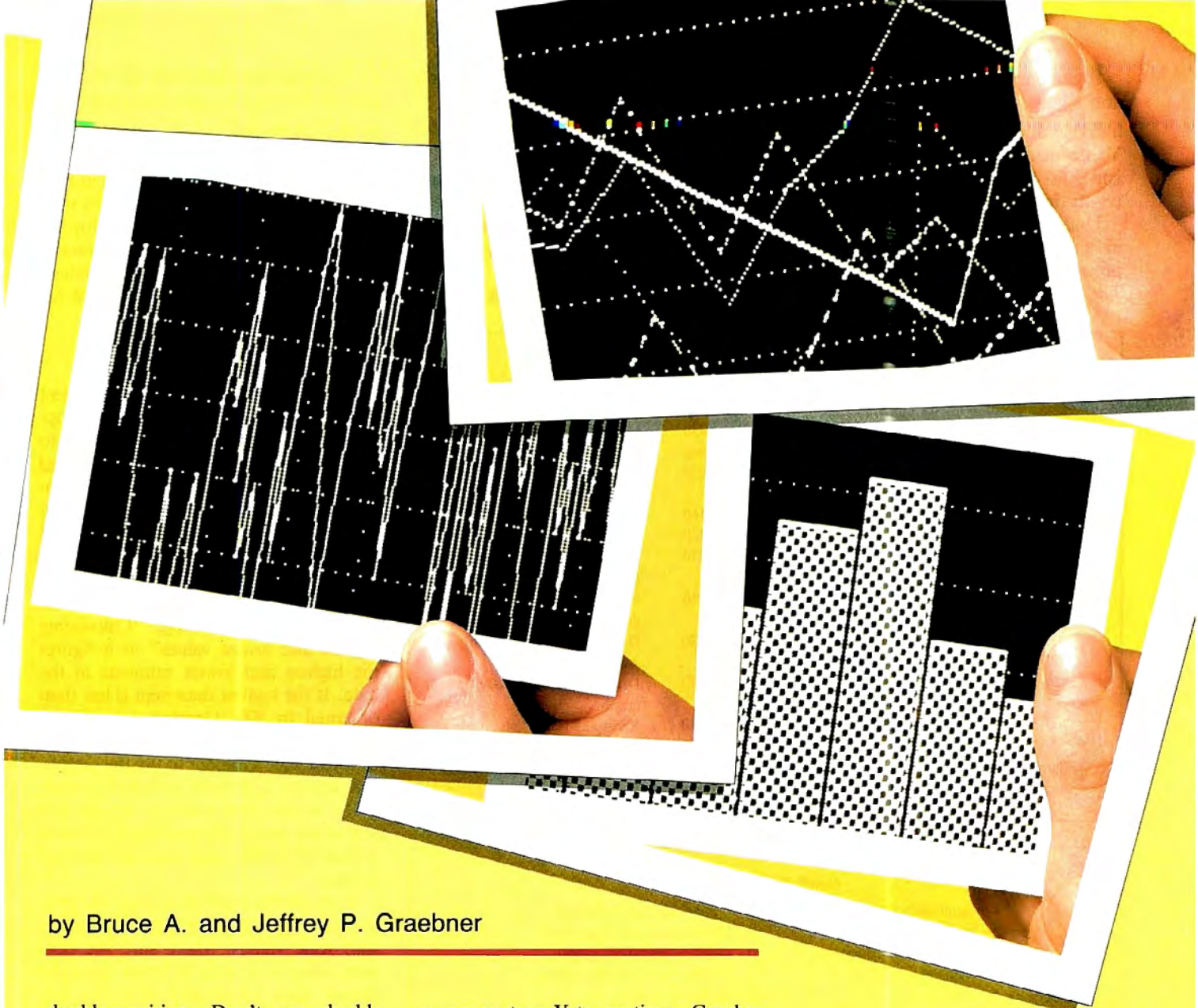
Grapher displays a main menu as shown in Fig. 2. You don't need to reserve any memory to run the program and you have to open at least one file. Once running, the program is self-explanatory.

Inputting Data

The first option on the menu accepts data from the keyboard. Press the 1 key and Grapher tells you that it's clearing old data. Then it prompts you to enter the title you want displayed on the graph. Enter an appropriate title of up to 55 characters.

Grapher prompts you to enter a label of up to 10 characters you want to appear above the X axis (e.g. Percent, Billions). The program then requests the first year for which you're entering data.

Grapher prompts you to choose single- or double-precision format. If your numbers are all shorter than seven digits, use single-precision. If any numbers exceed seven digits, you have to use



by Bruce A. and Jeffrey P. Graebner

double-precision. Don't use double-precision unless necessary, because it slows program execution.

After you choose the precision you can start entering data. Don't include commas or dollar signs in your entries. Press the enter key after entering each item.

Grapher prompts you for each month and year. Be sure to watch that you and the computer remain synchronized. Also, sometimes the computer takes a moment between entries to catch up. You can drop a digit in an entry without knowing it if you're not careful. When you're finished entering data, type in -99, an end-of-data control code.

Editing the Data

Option 4 lets you edit data. When you select this option, the program displays the current title and asks if you want to change it. Press the N key to go to the next prompt; press Y to change the title.

Grapher then asks if you want to edit data. Hit the N key to return to the

menu, or type Y to continue. Grapher prompts you for the month and year of the data you want to change, then displays the old data and prompts you for changes. Finally, Grapher asks if you want to return to the main menu or edit more data. If the data is correct as shown, press the N key to return to the menu.

Adding Data

Select option 5 to add data. The program automatically locates the last item entered so you can start from where you left off. Grapher handles 10 years' worth of data. When you reach the 11th year, Grapher drops the first-year data, but not before displaying a warning to that effect.

If you want to drop the first year and add a new one, answer yes at the prompt. Grapher deletes the first year of data, moves all remaining data up one year, and waits for you to enter the new year's data. Enter the new figures and type in -99 when you're finished.

Loading and Saving Data

Options 2 and 6 load and save data, respectively. To load or save a file, enter the file name (up to eight characters long) at the prompt. Don't include an extension: Grapher automatically adds the extension /GDT.

The program prompts you for a drive number between 1 and 3. Pressing the enter key defaults to drive 1 (you can change the default drive in lines 4720, 4730, 4990, and 5000). Grapher then writes to or reads from the appropriate disk.

System Requirements

Models III and 4
High-Resolution Board
Models 1000 and 1200
Printer optional



If you enter a number for a drive you don't have, Grapher displays an error message and returns you to the menu. You can modify lines 4710, 4750, 4980, and 5020 to reflect the maximum number of drives in your system.

Under the Load option, you can type in a question mark at the file name prompt to display the disk directory. The Save option defaults to the last

name you used to load data if you don't enter a file name.

Displaying and Printing Data

Option 3 displays your first five years' worth of data per screen (see Fig. 3). Press any key to display the next five years' worth, then press any key to return to the menu.

Option 7 prints out the data (see Fig.

4). The program asks you if you want to print in 12 characters-per-inch (cpi) mode or 16.7 cpi mode.

For this routine to work you might need to change the control codes in lines 2190 and 2200. The variable TS sets your printer's type style. I have it set for the Radio Shack DMP-2100. If necessary, change them to match your printer's codes (consult your printer manual for more details).

Plotting the Graph

Options 8-11 plot the four different graphs. When you select any of these options, the program prompts you to decide if you want grid lines displayed on the graph. You can choose horizontal or vertical lines, both on the summary line graph (option 9). If you select option 8, 10, or 11, you automatically get horizontal grid lines.

After you select grid lines, the program displays the message "Calculating highest and lowest values" as it figures the highest and lowest numbers in the data. If the highest data item is less than or equal to 500, Grapher asks if you want to manually determine scale values, or if you want Grapher to use the Graph-Calc routine to determine them (the scale is the incremental numbers up the left side of the graph). If your highest value is greater than 500, you must use manual scaling.

If you select manual scaling, the program prompts you for the top and bottom scale values. Make sure the bottom value you enter is lower than the lowest data value and that the top value is higher than the highest data value.

The program then plots the type of graph you specified. Grapher pauses after drawing each line. Press the M key to return to the menu, the E key to erase the previous line and plot the next one, or any other key to plot the next year's data with the previous line(s) on the screen.

Option 8 displays an annual line graph (see Photos 1 and 2) with separate lines for each year. Option 9 displays a summary line graph (see Photo 3). This routine plots all ten years' worth of data on one line.

Option 10 plots a 12-month bar graph for any year (see Photo 4). After you set up scaling, this routine asks you for the year you want to plot. Grapher draws one bar for each month. After the program finishes plotting, you can press any key to return to the menu.

Option 11 plots a bar graph of the yearly averages for 10 years (see Photo

File Maintenance

Line Number	Function	Line Number	Function
360-640	Menu	5710-5750	Error handling
650-1130	Keyboard input	5840-5860	End
1140-1340	Screen display	1810-2720	Calculate graph scale (Listing 3)
1350-1800	Data editing	2730-3160	Draw basic graph
5320-5420	Calculate position to add data	3170-3220	Select graph type
5150-5310	Drop first year data	3230-3670	Draw/display annual line graph
4900-5140	Save data to disk	3680-3910	Draw/display summary line graph
4590-4890	Load data from disk	3920-4230	Draw/display annual bar graph
1810-2040	Print graph on graphics printer (Listing 2)	4240-4580	Draw/display summary bar graph
2050-2440	Print data (Listing 2)	4550-4580	Redisplay last graph
2450-2510	Routine to check printer status (Listing 2)		
5760-5830	Set precision for data		

Figure 1. Location of the graph programs' primary subroutines. Unless otherwise noted, line numbers refer to Program Listing 1.

Graph Display—Menu

1	Input data from keyboard	8	Display annual line graph
2	Input data from disk	9	Display summary line graph
3	Display data on screen	10	Display annual bar graph
4	Edit data	11	Display summary bar graph
5	Add data	12	Redisplay graph
6	Save data on disk	13	Print graph
7	Print data	14	Exit

Selection?

Figure 2. Main menu display.

Data Display—Five Years Per Screen

Month	1974	1975	1976	1977	1978
Jan.	186,600.00	179,300.00	190,000.00	197,000.00	204,300.00
Feb.	170,300.00	174,000.00	192,300.00	194,600.00	205,500.00
Mar.	176,500.00	172,800.00	185,200.00	194,800.00	203,100.00
Apr.	182,100.00	173,300.00	188,400.00	195,200.00	205,600.00
May	183,800.00	179,900.00	190,900.00	201,900.00	206,300.00
Jun.	184,400.00	181,800.00	191,800.00	203,100.00	209,700.00
Jul.	180,500.00	179,300.00	185,700.00	196,500.00	208,500.00
Aug.	178,800.00	177,500.00	190,000.00	198,000.00	197,100.00
Sep.	194,400.00	186,000.00	196,300.00	206,700.00	209,000.00
Oct.	193,900.00	186,800.00	197,100.00	207,700.00	212,100.00
Nov.	193,400.00	189,300.00	199,700.00	208,700.00	213,500.00
Dec.	191,000.00	191,500.00	202,400.00	205,800.00	216,700.00

To Continue Press any Key!

Figure 3. Screen display of data.

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Flint Michigan Area Unemployment Rate
Data represents percent

Month	1974	1975	1976	1977	1978
Jan.	9.20	14.90	11.40	8.50	8.70
Feb.	16.20	16.70	10.80	8.70	7.20
Mar.	16.80	17.40	11.00	7.80	7.30
Apr.	13.30	16.60	9.80	7.00	6.90
May	12.10	13.60	9.60	6.60	6.90
Jun	13.70	15.10	9.60	7.00	7.30
Jul.	11.80	13.90	11.60	9.40	7.90
Aug.	12.90	14.70	8.80	8.80	11.30
Sep.	8.70	10.90	8.20	5.90	7.70
Oct.	6.80	10.80	8.20	5.50	6.20
Nov.	7.60	10.60	7.90	5.30	7.20
Dec.	9.70	10.40	7.80	7.00	7.00

Figure 4. Example of a data printout (menu item 7).

5). For each year, Grapher displays the average of the year's data in a bar.

Option 12 redisplay the last graph plotted. This is useful if you accidentally hit a key before you're done examining the graph. It's also useful for examining the graph before dumping it to the printer.

If you choose this option without first plotting a graph, you'll see a blank screen. Press any key to return to the main menu. Your data is still intact.

Printing Graphs

Option 13 dumps a graph to any graphics printer. It uses the print routines on the disk that comes with the high-resolution graphics board. Select the print routine (GPRINT/CMD, GPRT2/CMD, or GPRT3/CMD) you want to use.

When you first choose this routine, it displays a warning that you might lose your data, and prompts you to continue, save your data and continue, or return to the menu. Using this routine probably won't damage your data, but I recommend saving it to be sure.

Exiting the Program

Option 14 exits the program and returns you to Basic Ready. If you select this by accident, you can return to the menu with your data intact by typing GOTO 360.

If an error occurs in the program, Grapher displays the error number and the line number in which the error occurs, then returns to the menu.

Modifications

I disabled the break key to protect against accidentally erasing the program. To reenable the break key, remove the remark prompts in lines 160 and 5850.

This program is a good foundation for additional features. You might want to graph running averages, calculate and print a table of seasonal indexes, or calculate and print nonseasonal data. You might also want to modify the graph labels to allow other than annual and monthly data. ■

Contact Bruce A. Graebner and Jeffrey P. Graebner at 3357 Jacque St., Flint, MI 48504.

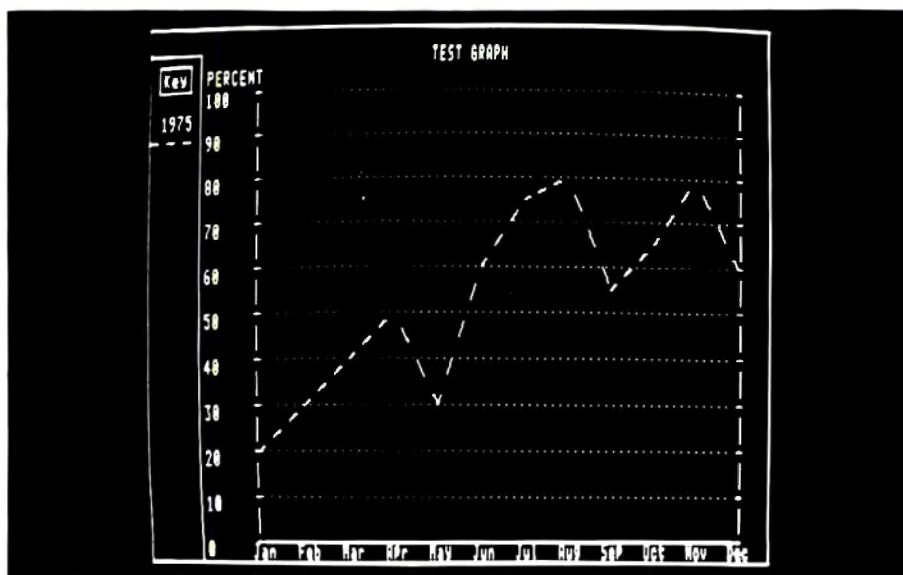


Photo 1. Line graph of annual data.

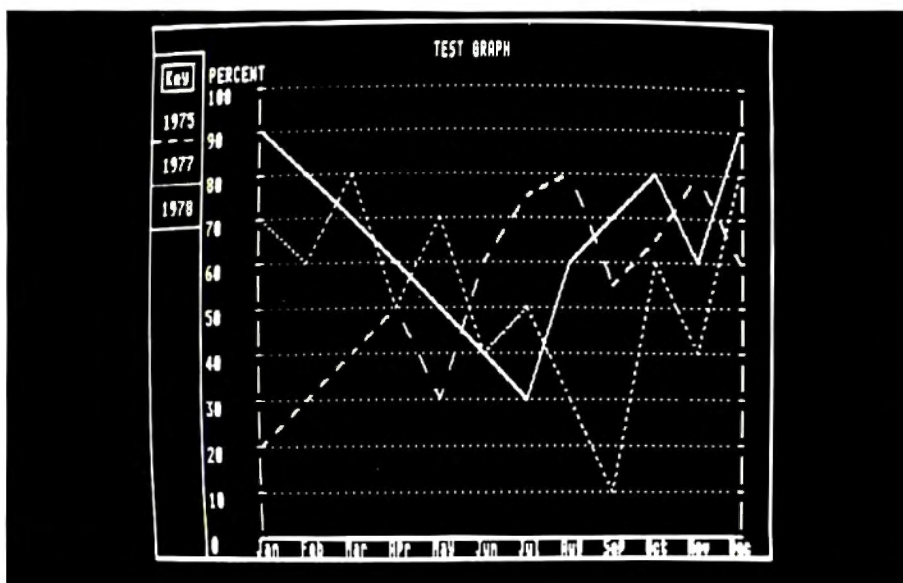


Photo 2. Line graph with three years of annual data.

Related Article

Corbani, John. "Business Graphics," May 1983, p. 326. A Model I/III business graphics utility.

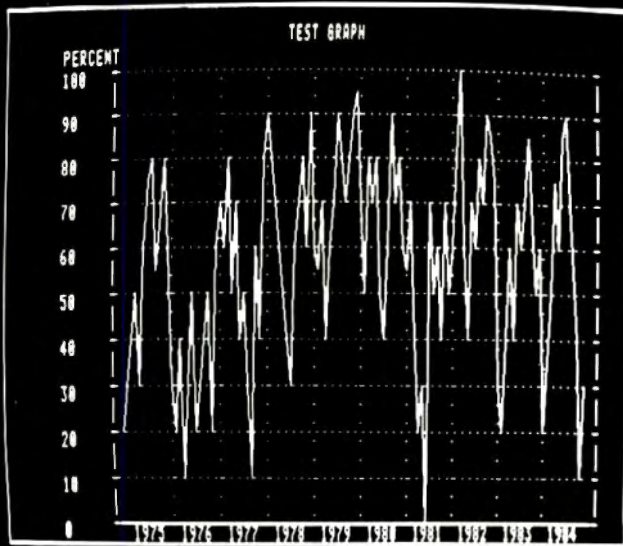


Photo 3. Line graph for a 10-year period.

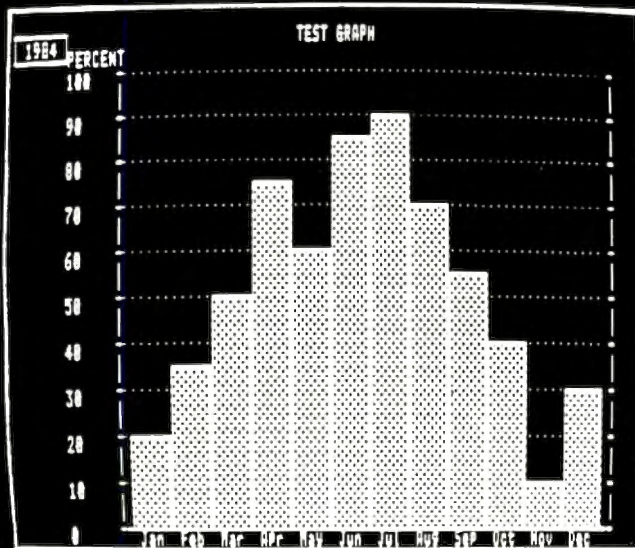


Photo 4. Bar graph of monthly data.

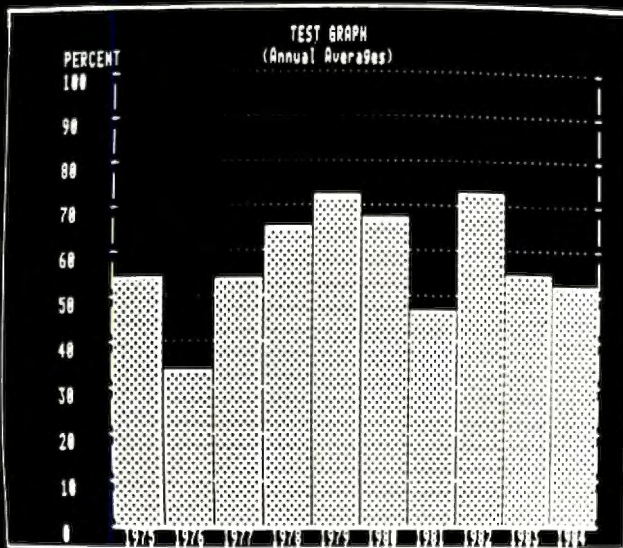


Photo 5. Bar graph of annual data.

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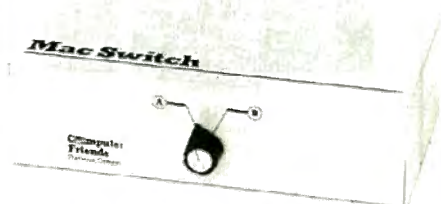
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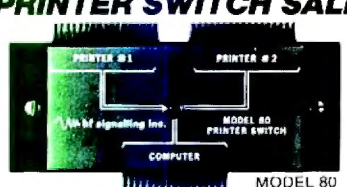
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Program Listing 1. Grapher's main program module.

```

10 ' LBGRAH/GRA
20 ' Graph Program for Radio Shack High Resolution Graphics
30 ' by Bruce A. and Jeffrey P. Graebner
40 ' 3357 Jacque St., Flint, MI 48504 (313) 232-2877
50 '
60 ' Model IV conversion by David Engelhardt
70 '
80 ' Input and Stored variables
90 ' DA(YR,MO) - Data for each Year and Month
100 ' ST$ - Scale Title
110 ' Y1 - First Year of Data
120 ' GT$ - Graph Title
130 ' DP$ - Flag to determine precision of DATA variables
140 CLS
150 ' Disable Break Key
160 'SYSTEM "SYSTEM (BREAK=NO)"
170 DEFDBL S:DIM LI(10),M$(12),DA(10,12):SWPLG=0
180 US$ = "#,###,###.##" : UPS$ = "###,###,###.##"
190 ON ERROR GOTO 5720
200 ' Set up variables for Line Styles
210 LI(1) = &HFF
220 LI(2) = &HF0F0
230 LI(3) = &HCCCC
240 LI(4) = &HFFFF
250 LI(5) = &H5555
260 LI(6) = &H888
270 LI(7) = &H8888
280 LI(8) = &H8FF8
290 LI(9) = &H2D
300 LI(10) = &H6060
310 ' Set up variable for Bar Graph Painting
320 PT$ = CHR$(&HF0)+CHR$(&HF0)+CHR$(&HF0)+CHR$(&HF0)
330 ' Set up array for month name labels
340 FOR I = 1 TO 12 : READ M$(I) : NEXT I
350 DATA Jan, Feb, Mar, Apr, May, Jun, Jul, Aug, Sep, Oct, Nov, Dec
360 ' Menu Routine
370 CLS
380 TT$ = "Graph Display - Menu"
390 TB = (80-LEN(TT$))/2
400 PRINT TAB(TB) ; TT$
410 PRINT
420 PRINT "1 - Input Data from Keyboard" ;
430 PRINT TAB(40) ; "8 - Display Annual Line Graph"
440 PRINT
450 PRINT "2 - Input Data from DISK" ;
460 PRINT TAB(40) ; "9 - Display Summary Line Graph"
470 PRINT
480 PRINT "3 - Display Data on Screen" ;
490 PRINT TAB(40) ; "10 - Display Annual Bar Graph"
500 PRINT
510 PRINT "4 - Edit Data" ;
520 PRINT TAB(40) ; "11 - Display Summary Bar Graph"
530 PRINT
540 PRINT "5 - Add Data" ;
550 PRINT TAB(40) ; "12 - Redisplay Graph"
560 PRINT
570 PRINT "6 - Save Data on DISK" ;
580 PRINT TAB(40) ; "13 - Print Graph"
590 PRINT
600 PRINT "7 - Print Data" ;
610 PRINT TAB(40) ; "14 - Exit"
620 PRINT @ 1288 , " " : PRINT TAB(58) " " ; : INPUT "Selection" ; AA
630 ON AA GOTO 670, 4680, 1150, 1360, 5330, 4910, 5870, 5890, 5890,
5890, 5890, 4560, 5880, 5850
640 GOTO 370
650 ' Data Input from Keyboard
660 ' Clear out old DATA
670 CLS : PRINT @ 585 , "Clearing old Data!"
680 FOR YR = 1 TO 10
690 FOR MO = 1 TO 12
700 DA(YR,MO) = 0
710 NEXT MO : NEXT YR
720 FFS$ = " " : GT$ = " " : ST$ = " " : Y1 = 0
730 ' Input Graph Title
740 CLS : PRINT : PRINT
750 PRINT "Enter the title to be displayed on the Graph"
760 LINE INPUT GT$
770 IF LEN(GT$) > 55 THEN PRINT @ 892 , "Title Too Long - Try Again!" : FOR I =
1 TO 500 : NEXT I : GOTO 740
780 ' Input Scale Title
790 CLS : PRINT : PRINT
800 PRINT "Enter the Scale Title to be used on the Graph."
810 PRINT "(ie - 'Percent' - 'Billions $') : INPUT ST$
820 IF LEN(ST$) > 10 THEN PRINT @ 892 , "Scale Title Too Long - Try Again!" : FOR
I = 1 TO 500 : NEXT I : GOTO 790
830 ' Input Starting Year for DATA ie. 1983
840 CLS : PRINT : PRINT
850 INPUT "Enter the number of the first year of Data -- (ie 1983) ; Y1
860 IF Y1 < 1000 OR Y1 > 2000 THEN PRINT @ 890 , "Should be a year between 1000 and
d 2000 - Try Again!" : FOR I = 1 TO 500 : NEXT I : GOTO 840
870 ' Determine need for double precision
880 CLS : PRINT "Do you need DOUBLE PRECISION accuracy?"
890 PRINT "Type <Y> if your data will exceed 7 digits."
900 PRINT "Type <N> if your data will be within 7 digits."
910 PRINT : PRINT "Note that double precision will slow down procedures."
920 DP$ = INKEY$: IF DP$ = " " THEN GOTO 920
930 IF DP$ = "y" OR DP$ = "Y" THEN GOTO 970
940 IF DP$ = "n" OR DP$ = "N" THEN GOTO 970
950 GOTO 920
960 ' Go to routine to set double or single precision
970 GOSUB 5770
980 ' Input Monthly DATA
990 MO = 1 : YR = 1

```

Listing 1 continued

Listing 1 continued

```

1000 ' Set maximum flag to control screen and printer routines
1010 DM = 0
1020 Y2 = Y1 - 1
1030 CLS : PRINT "Data Input Routine - Enter -99 to end!" : PRINT
1040 PRINT "Enter "ST$" for " ; M$(MO) ; " of" ; Y2+YR ;
1050 INPUT DA(YR,MO)
1060 IF (DP$ = "N" OR DP$ = "n") AND DA(YR,MO) > 99999.99000000011# THEN PRINT "To
o High! - Graph will not handle values over 99,999.99." : GOTO 1040
1070 IF DA(YR,MO) > 99999999999.9906# THEN PRINT "Too High! Graph will not handle
values over 999,999,999.99." : GOTO 1040
1080 IF DA(YR,MO) = -99 THEN GOTO 370
1090 IF DA(YR,MO) < 0 THEN PRINT "Too Low! - Graph not equipped to handle negative
numbers." : GOTO 1040
1100 IF DA(YR,MO) > DM THEN DM = DA(YR,MO)
1110 MO = MO + 1
1120 IF MO < 13 THEN 1040
1130 CLS : MO = 1 : YR = YR + 1 : IF YR > 10 THEN GOTO 5150 ELSE GOTO 1020
1140 ' Routine to Display Data on Screen
1150 ' First check to see if there is Data to display
1160 IF DA(1,1) = 0 THEN CLS : PRINT @ 912 , "No Data" : FOR I = 1 TO 500 : NEXT I
: GOTO 370
1170 ' Check to see if data exceeds room on screen
1180 IF DM > 9999999.990000011# THEN CLS : PRINT @ 892 , "Data value exceeds capac
ity of screen." : FOR I = 1 TO 500 : NEXT I : GOTO 370
1190 CLS : SS = 1 : YY = Y1 : Z = 1 : ZZ = 1
1200 TT$ = "Data Display - Five Years Per Screen"
1210 TB = (80-LEN(TT$))/2
1220 PRINT TAB(TB) ; TT$
1225 PRINT
1230 TB = 10 : PRINT "Month" ; : FOR I = Z TO Z + 4 : PRINT TAB(TB) YY ; : YY = YY
+ 1 : TB = TB + 12 : NEXT I
1235 PRINT:PRINT
1240 FOR MO = 1 TO 12 : PRINT M$(MO) ;
1250 PRINT TAB(4)""; : FOR YR=ZZ TO ZZ+4:IF DA(YR,MO)--99 THEN PRINT USING U$;0; EL
SE PRINT USING U$;DA(YR,MO);:NEXT YR
1255 PRINT
1260 NEXT MO
1270 TT$ = "To Continue Press any Key!"
1280 TB = (80-LEN(TT$))/2
1290 PRINT
1300 PRINT TAB(TB) ; TT$;
1310 IF INKEY$ = "" THEN 1310
1320 IF SS = 2 THEN GOTO 370
1330 IF DA(YR,MO-1) = 0 THEN GOTO 370
1340 SS = SS + 1 : Z = 6 : ZZ = 6 : YY = Y1 + 5 : CLS : GOTO 1200
1350 ' Routine to Edit Data
1360 CLS : PRINT : PRINT "Editing Routine"
1370 ' Edit the Graph Title
1380 PRINT : PRINT "Do you wish to edit the title?"
1390 PRINT : PRINT "The title is now - "
1400 PRINT : PRINT TAB(10) ; GT$
1410 IN$ = INKEY$ : IF IN$ = "" THEN GOTO 1410
1420 IF IN$ = "N" OR IN$ = "n" THEN GOTO 1500
1430 IF IN$ < > "y" AND IN$ < > "Y" THEN GOTO 1410
1440 CLS : PRINT : PRINT "The title is now - "
1450 PRINT : PRINT TAB(10) ; GT$
1460 PRINT : PRINT "What do you want it to be?"
1470 PRINT : PRINT "Type in your new title!"
1480 LINE INPUT GT$
1490 IF LEN(GT$) > 55 THEN CLS : PRINT @ 892 , " Title Too Long - Try Again!" : FO
R I = 1 TO 500 : NEXT I : GOTO 1440
1500 CLS : PRINT @ 892 , "Do you want to edit DATA?"
1510 IN$ = INKEY$ : IF IN$ = "" THEN GOTO 1510
1520 IF IN$ = "N" OR IN$ = "n" THEN GOTO 370
1530 IF IN$ < > "y" AND IN$ < > "Y" THEN GOTO 1510
1540 ' Edit DATA
1550 CLS : PRINT @ 908 , "Enter year to be edited"
1560 PRINT @ 992 , Y1 ; " - " ; Y1+9

```

Listing 1 continued on p. 76

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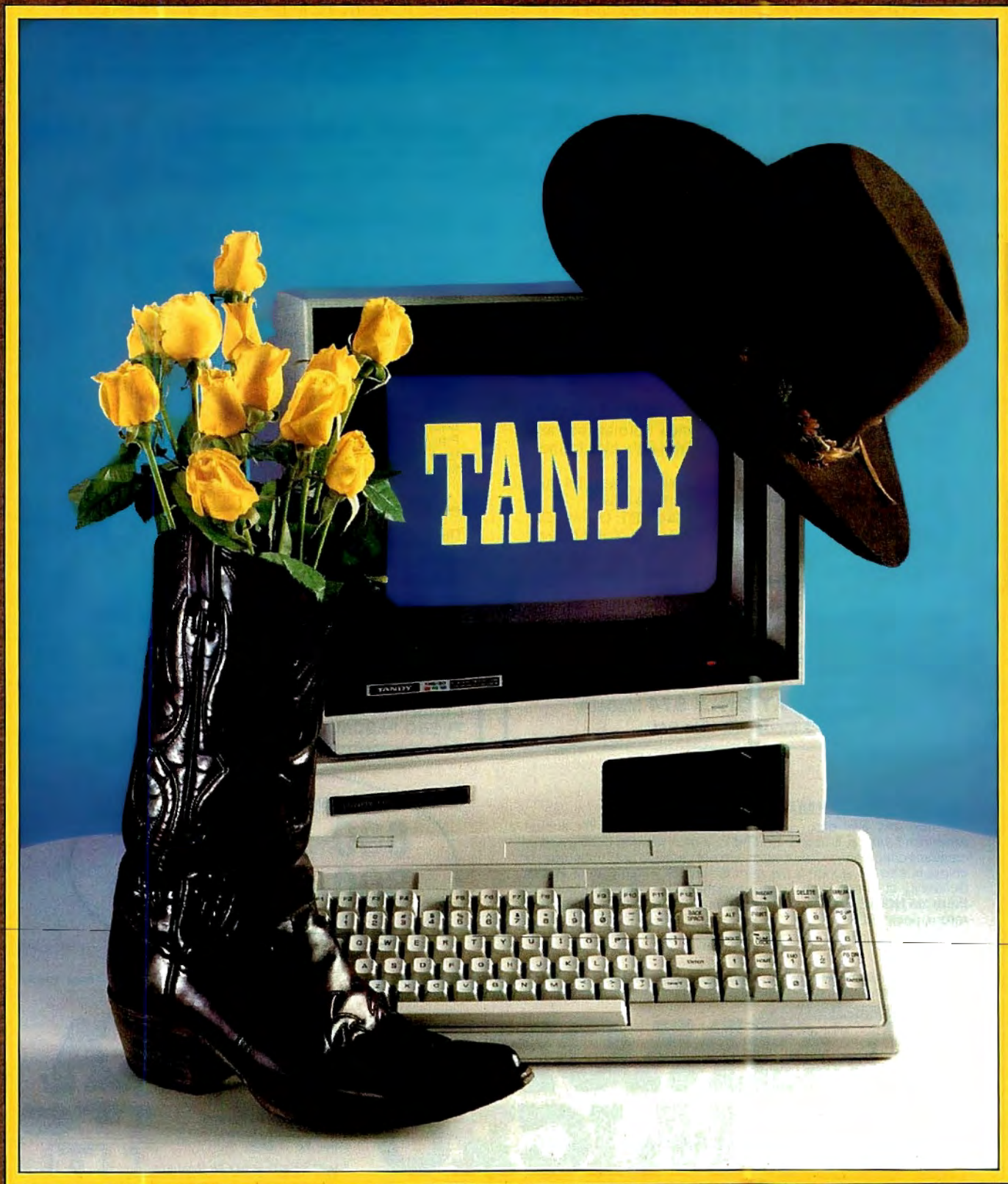
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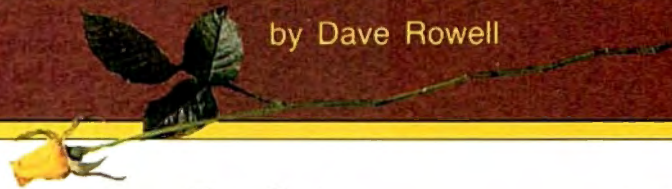
The Model 1000 represents Tandy's bid for a share of the IBM PC-compatible market. Here's a roundup of the 1000's features and a comparison with Big Blue's machine.



Photograph by Edward Judson

TANDY RIDES AGAIN

by Dave Rowell



When my Tandy 1000 arrived from Fort Worth, I moved the IBM PC from my desk and set up Radio Shack's clone as a daily work machine. I never did miss the IBM. The 1000 ran all the software I normally use and I found no obvious differences in the way the two units worked.

Besides running my usual workhorses (WordStar, ThinkTank, and SideKick), I tested other IBM PC software for Model 1000 compatibility, turning only occasionally to the displaced IBM to verify differences between the two computers.

The differences are so few that the average IBM user won't notice them. This is due to an almost perfectly compatible BIOS (ROM-based input/output system) in the two systems. Tandy's machine closely emulates the most basic functions of an IBM PC, and it does so at an affordable price (\$1,199 for the base system).

For the money, the Tandy compares favorably with the IBM. You get MS-DOS and access to the IBM-PC's large software library at a reasonable cost, along with the security of Tandy's substantial support network.

On the down side, you need at least 256K of memory to run most applications that use the 1000's RAM-based Basic and graphics, and its expansion slots accept boards only 10 inches or shorter, ruling out many IBM PC-compatible boards. In addition, I found the 128K Model 1000 slower than the IBM PC in some tests I ran.

When it was introduced last November, the 1000 cost \$1,000 less than a similarly equipped IBM PC. With recent IBM price drops, that difference is shrinking. But despite its drawbacks and diminishing price advantage, the Tandy 1000 is still a computer of choice.

Clean Design

The basic Model 1000 comes with one disk drive, 128K of RAM, and bundled software that includes MS-DOS and GW-Basic. For this review, I used a Model 1000 with two disk drives, 384K of RAM, and a color monitor.

The 1000 shares the keyboard and white plastic design of the more advanced Model 2000. Tandy's attention to the 1000's exterior gives it a feeling of quality and competence. Since the 1000 is smaller than most desktops, you gain a bit of work-space. But the trade-off for the 1000's reduced size and weight is that it only accepts IBM PC-compatible option boards of 10 or fewer inches; many useful expansion boards, like the Quadboard II and MegaPlus II multiFunction RAM boards, take the whole 13 inches the IBM PC provides.

From the front, the 1000's main unit is about the width of its own keyboard, several inches narrower than the 2000 and the IBM PC (see Photo 1). The horizontal slimline drives are stacked one over the other on the right-hand side of the unit's front, with a recessed lower panel containing an orange reset button, the keyboard plug, two joystick ports, and a ventilation grille.

If you're a former or current IBM PC user, you can still reset the machine by pressing the control/alternate/delete keys simultaneously. But when the PC's keyboard hangs up, the reset button provides a handier option than turning the machine off and then on again.

The 1000's lighted power switch is on the unit's right side at the rear. The back of the 1000 holds the expected power socket, video and audio ports, expansion board slots, and an opening for its quiet fan (see Photo 2). While it lacks a power outlet for your monitor, you do get

a parallel printer port and a light pen port.

The feeling of clean design extends to the computer's inside (see Photo 3). The circuit boards have only three jumper wires, compared with the usual Tandy tangle. The double-sided, double-density disk drives come in their own metal enclosure, as does the power supply. The remaining space looks almost empty, giving the impression of careful planning and manufacture.

What You Get

Like the IBM PC, the 1000 uses an 8088 central processing unit (CPU) with 16-bit addressing and 8-bit data bus, running at a 4.77 MHz clock speed. Both computers store data on 360K-capacity floppy disk drives.

Unlike the five-slot IBM PC, the 1000 has only three expansion slots. This is deceiving, however. The 1000's built-in parallel printer port, video interface, and floppy drive controller don't take up slots as they do in the IBM PC. Consequently, the 1000's three slots are equivalent to the IBM PC's five (except that they're 3 inches shorter).

While the parallel and video interfaces come standard with the Model 1000, they're options with an IBM PC. Other Model 1000 features missing from the IBM PC are the light pen port, two joystick ports (for Radio Shack joysticks), and the bundled software (the MS-DOS operating system, GW-Basic, and

★ ★ ★ ★ ★

The Tandy 1000 is an MS-DOS PC-compatible computer. The base unit comes with one disk drive and 128K of RAM. A second disk drive, monitor, and extra memory are optional. Tandy/Radio Shack, Fort Worth, TX 76102, \$1,199.

Easy to use: ★ ★ ★ ★ ☆
Good docs: ★ ★ ★ ☆ ☆
Well-made: ★ ★ ★ ★ ★
Does the job: ★ ★ ★ ★ ☆



Photo 1. The 384K Tandy 1000 used in this review with CM-2 color monitor. Model 2000 styling includes the 2000's keyboard. The horizontal slimline drives are to the right. Along the bottom recess, from left to right, are the orange reset button, the keyboard plug, two joystick ports, and a ventilation grille.

DeskMate, an integrated package of six applications). Tandy must have surmised that customers might resent buying a new computer without an operating system and Basic.

The 1000 runs any standard RGB color monitor, monochrome monitor, or color TV, but it doesn't support the Model 2000 monitors (the CM-1 or VM-1).

The lightweight keyboard feels good, with an easy typing action. Basically, it's the Model 2000 keyboard with a plus and a minus symbol added to the numeric keypad. IBM PC users might feel uncomfortable when first using the different key pattern, but it's functionally equivalent.

The 1000's 12 function keys stretch out in a single row along the top of the keyboard (rather than in the IBM pattern of 10 keys in two vertical columns to the left), and the much-used left-shift and enter keys are easier to reach than on the IBM PC.

The numeric keypad has suffered the most change. Tandy moved the arrow keys into a separate cluster, and put the backslash and vertical bar (both used in DOS commands) on the keypad (a mild inconvenience). Red lights now indicate when you've engaged the "Caps" and "Num Lock" keys, and the break key does just what it's supposed to; you don't have to hold down the control/break keys at the same time to stop program execution as you do on the IBM PC.

The Tandon flip-locks on the drives sound a little tinny when twisted open or shut (I'd worry if it were a car), but they function properly. Unlike other computer manufacturers, Tandy still recommends that you take your disk out of the drive when powering the 1000 on or off. I'm not sure that's necessary, but it's something old Radio Shack users do as second nature, even on Apples and IBMs.

Color and Sound

While the 1000 is IBM PC-compatible, it offers the enhanced graphics capabilities of the PCjr. You can display text in 40- or 80-column format with a choice of three graphics resolutions (192 by 200 pixel, 320 by 200 pixel, and 640 by 200 pixel). You choose from a palette of 16 colors in medium-resolution mode, four in

Product	Price
Basic unit (main unit and keyboard, 128K, one drive)	\$1,199
VM-2 Monochrome monitor (26-3211)	159.95
CM-2 Color monitor (26-3212)	549.95
Monitor pedestal (26-5115)	89.95
Second disk drive (25-1005)	299.95
256K expansion board with DMA (25-1004)	299.95
128K RAM upgrade kit (26-5162)	149.95
512K expansion board (25-1009)	249.95
300-baud direct connect modem (25-1003)	179.95
RS-232C interface (25-1006)	99.95
Touch Pad (26-1185)	59.95
Joystick (26-3012)	39.95
RF modulator (15-1273)	24.95
Hard disk interface board (25-1007)	329.95
Hard disk driver software (25-1157)	19.95
Digi-Mouse (26-1199)	99.95
Digi-Mouse controller/clock/calendar board (25-1010)	99.95
Network board (26-1221)	499.95
Light pen (release date to be announced)	
MS-DOS Reference Manual (25-1501)	34.95
GW-Basic reference manual (25-1502)	34.95
Programmer's reference manual (25-1503)	14.95
Technical reference manual (25-1504)	29.95
Learning Basic (25-1500)	19.95

Table 1. Model 1000 price list (Tandy catalog numbers appear in parentheses).

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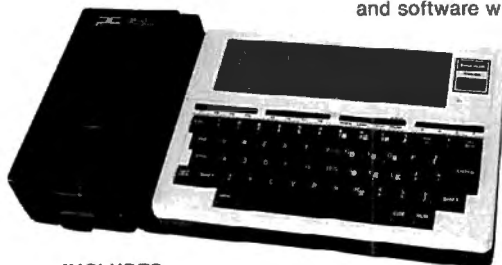
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Photo 2. Rear view of Tandy 1000 (showing lighted power switch on side). The printer port edge connector is under the power plug on the left. To its right, along the bottom, are user ports for a light pen, RGB monitor, and the video and audio signals. To the right of the fan exhaust are covered openings for the three expansion slots.

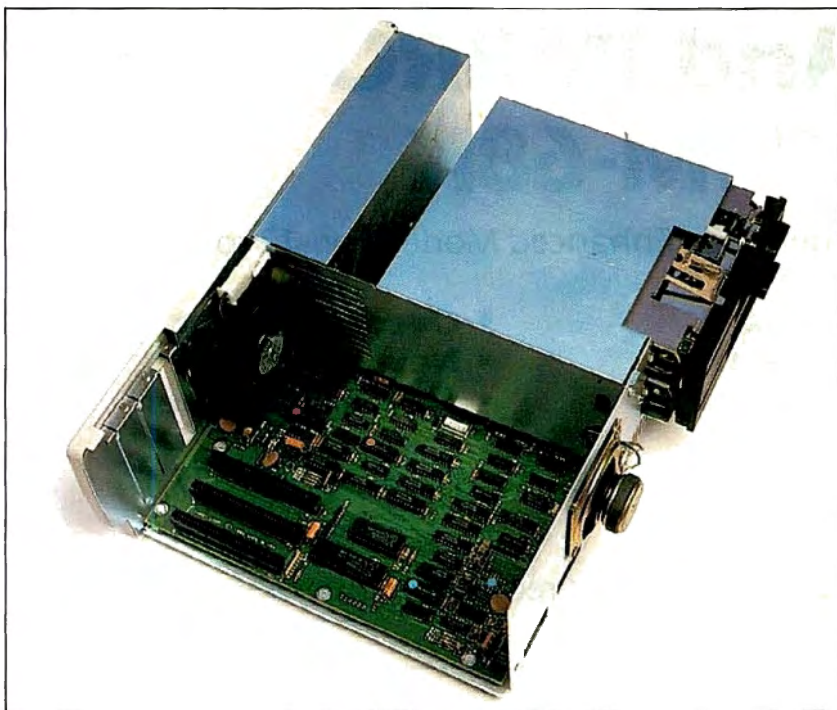


Photo 3. Left-front view with cover removed. The vertical panel at the front supports the internal speaker and the floppy drives. The power supply is behind the larger metal housing for the disk drives. The rear panel supports three expansion slot openings (one uncovered) and the fan. Below the three-slot openings on the motherboard are the actual expansion slots. Just in front of the middle slot is the 8088 CPU.

high-resolution mode. Monochrome monitors can display reverse and blinking text, and shades of gray.

For the high-resolution display, you can use either a color RGB or a monochrome monitor. Tandy sells the CM-2 color monitor (\$549.95) and the VM-2 monochrome monitor (\$159.95). Both produce a more-than-adequate display. The monochrome monitor plugs into the video jack at the rear of the 1000.

If you don't need high resolution, you can even use a color TV as a monitor, but you'll have to buy a special RF modulator that plugs into the 1000's video and audio jacks (available from Tandy).

The 1000 can simultaneously produce three tones and white noise (it has a noise generator), thanks to its Texas Instruments sound chip (another feature found in the IBM PCjr but not the PC). The internal speaker produces multiple voices with machine-language programs, but not with the Basic sound commands. If you want full sound capability from your Basic programs, you'll have to hook up an external speaker to the audio port.

Tandy mounted the internal speaker magnets-forward against the front panel, so be careful where you put your disks.

Software Included

The Tandy 1000 comes with MS-DOS 2.11 (IBM PCs use version 2.10) and GW-Basic. In addition, you get DeskMate, an integrated package of six applications: a word processor, a spreadsheet, a telecommunications program, a file manager, a calendar, and a message center. Tandy intends DeskMate as an introduction to business/productivity software, but also expects many users to find it adequate for their needs. While the word processor is primitive (an enhanced version of the Model 100 text processor), the telecommunications program should be powerful enough for most people. (*80 Micro* will review DeskMate next month.)

As with all MS-DOS versions 2.00 and later, the 1000's disk operating system formats floppy disks with 40 tracks per side, each track consisting of nine 512-byte sectors. MS-DOS provides commands for creating

fairly sophisticated batch files, and Unix-like features such as a tree-structured directory and I/O redirection. MS-DOS also includes a simple text editor (EDLIN), and an assembling debugger and a linker for machine-language programming.

Tandy patched a number of extra programs onto the MS-DOS system disk, several of which they don't mention in the DOS manual. The documented extras include one batch file that lets you produce bootable program disks and another that sets up your system disk to add or omit a line feed with carriage returns. (Some Radio Shack printers add a line feed automatically, while IBM printers [and most others] don't. The 1000 comes configured the IBM way). Although the printer configuration batch file is described, some of the subprograms it uses aren't.

Among the undocumented extras are two filters, one that makes the keyboard and screen follow ANSI conventions (also found on PC-DOS), and another that makes the 1000's keyboard act more like an IBM's. This could be useful in some applications. For example, Think-Tank, an outlining program for the IBM, works better if you use the second filter.

The 1000's GW-Basic (like the IBM PCjr's) has graphics and sound enhancements superior to the IBM PC's Advanced Basic. In high-resolution mode (640 by 200 pixels), for instance, you can use any four of the 16 available colors. On the IBM PC, high resolution is strictly black and white. Programs written in IBM PC Basic will run on the 1000, but not vice versa.

TRSDOS users will find the 1000's Basic familiar except for the graphics and sound commands, which are similar to Color Computer Extended Basic commands. GW-Basic also adds new features like a While... Wend structure and event-trapping commands.

The Basic is powerful, but since it resides totally in user memory (unlike Model III/4 and IBM Basics, which reside partially in ROM), you need about 25K more RAM for Basic applications than with Advanced Basic. The enhanced graphics capability also uses up RAM; with medium- and high-resolution color

graphics, you need either an additional 16K or 32K RAM. (You can use the Clear statement to reserve more or less video memory.) Most Basic applications will therefore require a 256K machine.

The early version of Basic that came with the 1000 was incomplete; it lacked a few of the more exotic options, such as the light pen commands. The new (and speeded-up) Basic should be ready by the time you read this review.

***TRSDOS users will
find the 1000's
Basic familiar except
for the graphics
and sound commands,
which are similar
to Color Computer
Extended Basic
commands.***

The Docs

The Model 1000 documentation is on the skimpy side. While DeskMate has a manual, tutorial, and quick-reference guide, Basic has only a command-summary booklet, and MS-DOS gets nothing. The user's guide/DeskMate tutorial contains enough information on MS-DOS to get you started, but if you need to do more than format disks and copy files, you have to buy the MS-DOS manual.

The MS-DOS and Basic manuals sell for \$34.95 each. While both are little more than adequate, IBM manuals aren't much better. It's difficult figuring out the finer points of the Basic graphics and sound commands. By the time you read this, you should be able to buy a Basic tutorial for \$19.95 and two other manuals, a technical reference manual (\$29.95) and a programmer's reference manual (\$14.95).

Add-On Potential

You can put any of several option boards in your three expansion slots (see Table 1 for a current list of Tandy options). Tandy offers those most

commonly needed and even encourages you to install them yourself.

Tandy also claims that any IBM PC-compatible board of 10 inches or shorter will work in the 1000. I tried the IBM RS-232 board and it worked fine. However, I had to snip 1/2 inch from the metal tab on the bottom of the card's frame to make it fit. According to Dave Frager, the Model 1000 product manager, Tandy changed the design of the 1000's slots to provide better grounding.

You can expand memory from the standard 128K up to 640K with two Tandy RFI-shielded memory boards. Each board comes with 128K (\$299.95 for the first board, \$249.95 for the second), and each board can take an additional 128K of chips (\$149.95). Two loaded memory boards will cost you about \$850, leaving you with one empty slot to fill.

When you upgrade the memory with the first board, you gain the advantage of direct memory access (DMA), which speeds up data transfer. The memory board incorporates a DMA controller chip that efficiently takes over the process of moving large blocks of data for the CPU. A 256K 1000 runs faster than a 128K because of the speed advantage the DMA confers.

If you need to communicate with another computer or the outside world, you'll need a serial port and/or a modem. Tandy sells an RS-232 board (\$99.95) with a data transfer range of 50-9,600 bits per second (bps), and a 300 bps modem board (\$179.95). If you want a faster modem (phone rates are expensive), buy the serial board and an external modem.

You can add a second floppy drive for \$299.95. While Tandy recommends that they install it (\$15), it's an installation you can easily make yourself. If you really want storage, you can buy a hard drive controller board (\$329.95 plus \$19.95 for software) that runs either of Radio Shack's hard drives (15 or 35 megabytes).

This spring, Tandy will make available a dual-purpose mouse controller/clock board with battery back-up (\$99.95) for use with Tandy's Digi-Mouse (\$99.95) or any other optical mouse. I tried out a

DOS Type Command

Displayed a 106K text file to the screen using PC-DOS (MS-DOS 2.10) and MS-DOS 2.11 with five buffers. The 128K Tandy 1000 is decidedly faster by 24 percent. The DMA has a slight effect. The older PC-DOS is faster than the newer MS-DOS 2.11.

Model	Memory	MS-DOS Version	Time (in seconds)
1000	128K	2.10	3.29
1000	384K	2.10	3.25
IBM PC	128K	2.10	4.36
1000	128K	2.11	3.35
1000	384K	2.11	3.50

DOS Copy Command

Copied a 106K file to an existing copy of file. Configured for five buffers. The DMA doesn't seem to make a difference. The PC is slightly faster with both using PC-DOS (the 1000 is 3 percent slower). But the 1000 with its own DOS is faster by quite a bit (11 percent).

Model	Memory	DOS Version	Time (in seconds)
1000	128K	2.10	18.0
1000	384K	2.10	18.0
IBM PC	128K	2.10	17.5
1000	128K	2.11	15.5
1000	384K	2.11	15.5

WordStar Search and Replace

Changed 1000 b's to a's (and vice versa) in a file from drive B (typical use situation). All under PC-DOS 2.10. The times varied depending on how the file had been previously used. Under standardized conditions, I took an average of various times.

Model	Memory	DOS Version	Time
1000	128K	2.10	25 percent longer than IBM
1000	384K	2.10	8 percent longer than IBM (DOS 2.10)

Basic Loop

Basic loop 20,000 times (note that the Basics are different). The DOS version didn't matter with the 1000. DMA matters quite a bit providing a 17 percent advantage. The 128K 1000 is 39 percent slower than the PC, the 384K 15 percent slower.

Model	Memory	DOS Version	Time (in seconds)
1000	128K	2.10	23.0
1000	384K	2.10	19.0
IBM PC	128K	2.10	16.5

Prime Number Generator

Basic sieve of Eratosthenes. This generates 1,651 prime numbers up to 13,999. DMA makes the 384K 1000 14 percent faster than the 128K. Compared to the PC, the 128K 1000 is 30 percent slower, the 384K is 12 percent slower.

Model	Memory	DOS Version	Time (in seconds)
1000	128K	2.10	3.02
1000	384K	2.10	2.37
IBM PC	128K	2.10	2.20

Table 2. Performance trials for the Tandy 1000 and IBM PC.

Mouse Systems rodent connected to the 1000's RS-232 port and it worked just fine.

While Tandy doesn't yet offer an 8087 math processing chip, they say they're looking into it.

Doing It Yourself

The Tandy 1000 is the easiest computer to open up since the Apple II. Two screws on the front panel come out with remarkably few turns, and the case lifts off without a bind. It's not as easy removing the expansion card frame screws; the slots have depth only around the rim, requiring a wide-bladed screwdriver. Also, the right-hand screw of the three slots is a little hard to get to. Without a magnetic screwdriver, you have a good chance of dropping the screw inside the machine.

Expansion board installations are simple. All require setting a jumper to indicate whether the board is the first or second of its type installed. The instructions are exact, helpful, and take nothing for granted.

Installing a second floppy drive is only slightly more difficult. As with the expansion boards, there's a jumper to indicate whether it's the first or second drive. The new drive slips right into the enclosure (over its twin) with the power and data cables right in position to connect to it. There are four screws, including one with a long shaft for easily getting into a hard-to-reach hole.

The only hitch is removing the black cosmetic panel from the front of the case. I broke off both plastic holding posts using the suggested pushing method. Next time, I would use a small screwdriver to pry the metal holdfasts off the posts. You'll never use them again anyway.

Performance Trials

According to Tandy's tests, the 128K base Model 1000 is slower than an IBM PC, but a 1000 with extra memory (and a DMA controller) is slightly faster. The Norton Utilities 3.0, the Super Utility of the MS-DOS world, runs a simple test comparing the processing speed of any MS-DOS computer to the IBM PC. It gave the 128K Tandy 1000 a rating of 0.9 (slower than the PC) and the 384K 1000 a 1.0 (equal). (The Model 2000 scored a rousing 3.8.)

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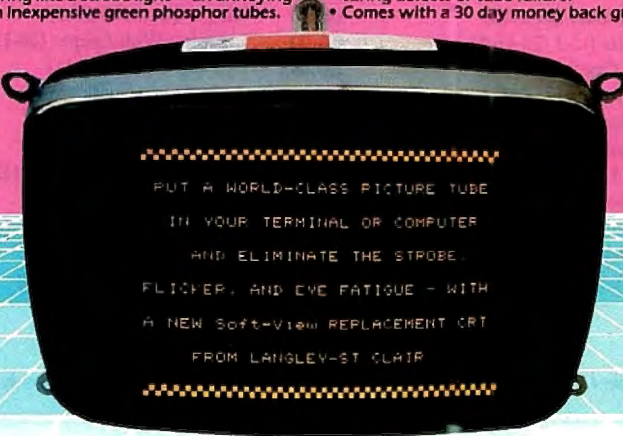
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Wordstar 3.3	MicroPro International Corp.	Monty Plays Scrabble	Muse Software
Easywriter 1.1	Information Unlimited Software	Creative Filer	Creative Software
VisiCalc	Software Arts Inc.	Run For the Money	Scarborough Systems Inc.
Perfect Writer 1.0	Perfect Software Inc.	Remote Control	Kensington
Perfect Writer 2.0	Perfect Software Inc.		Microware Ltd.
Perfect Calc 1.0	Perfect Software Inc.	Night Mission	Sublogic Corp
Perfect Writer 2.0*	Thorn/EMI Software	Pinball	
Let's Talk	Good Software Inc.	Turtle Power	IBM
Sidekick*	Borland International	Adventures in Math	IBM
Norton Utilities 2.0, 3.0	Peter Norton	Convert 3 to 2000	Educational Microware Inc.
Infocom Series of Games (IBM)	Infocom		

*Includes Perfect Speller and Thesaurus
†(autodial function not tested)

Table 3. Programs that run on the Model 1000 unmodified.

Business Packages	Price	Business Packages	Price
Friday! (25-1149)	299.95	Macro Assembler (26-5252)	99.95
Quartet Integrated Accounting (25-1146)	399.95		
Portfolio Decisions (25-1147)	149.95	Education and Game Packages	
Finance Manager (25-1148)	99.95	The Witness (25-5376)	49.95
Scriptit 1000 (25-1155)	299.95	Planetfall (26-5377)	49.95
HomeworD (25-1116)	69.95	Call to Arms (26-5382)	34.95
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Videotex Plus (26-1150)	49.95	Kindercomp (25-1102)	29.95
pfs: File (25-1140)	140.00	Fraction Fever (25-1103)	29.95
Report (25-1141)	125.00	Alphabet Zoo (25-1103)	34.95
Graph (25-1143)	140.00	Kidwriter (25-1105)	29.95
Write (25-1142)	140.00	Trains (25-1107)	29.95
Microsoft Word (25-1153)	395.00	Wizard of Id's Wiz Type (25-1114)	34.95
dBase II (26-5352)	495.00	BC's Quest for Tires (25-1115)	34.95
dBase III (25-3190)	695.00	King's Quest (25-1117)	49.95
Multiplan (25-1152)	195.00	Learning With Leeper (25-1118)	34.95
Lotus 1-2-3 (25-1145)	495.00	One-On-One (25-1111)	34.95
DR Graph (25-1151)	195.00	Pinball Construction Set (25-1112)	34.95
WordStar (25-3170)	395.00	Demon Attack (25-1110)	29.95
Framework (25-3160)	695.00	Touchdown Football (25-1123)	29.95
Graphics Master (25-3044)	695.00	Lode Runner (25-1113)	29.95
DR Logo (26-2783)	125.00	Pipes (25-1108)	29.95
Cobol Compiler (26-5257)	595.00	Cutthroats (25-1121)	39.95
Pascal Compiler (26-5256)	299.95	Micro Illustrator (25-1120)	29.95
Fortran Compiler (26-5255)	349.95		
C Compiler (26-5254)	499.00		

Table 4. Software available for the 1000 from Tandy (with catalog numbers in parentheses).

I performed a few tests of my own, running DOS functions, WordStar search and replace, and two Basic routines. In running the tests on the Model 1000, I used both PC-DOS and the 1000's MS-DOS 2.11, each with five file buffers available. In testing the IBM PC, I used PC-DOS only, since the PC won't run the Tandy DOS.

The results are inconsistent (see Table 2). When I used the Type command to display a 106K text file, the 1000 was decidedly faster than the IBM PC (24 percent faster for the 128K model). The DMA had a slight positive effect, and PC-DOS (MS-DOS 2.10) is faster on the 1000 than the 1000's MS-DOS 2.11.

The IBM PC catches up with file I/O; it's slightly faster than the 1000 in copying the same 106K text from one file to another, when both use the same DOS (version 2.10). The DMA made no difference. However, the 1000 is 11 percent faster with its own DOS.

The IBM PC dominated the WordStar test, which consisted of replacing 1,000 b's with a's. The DMA made a big difference here.

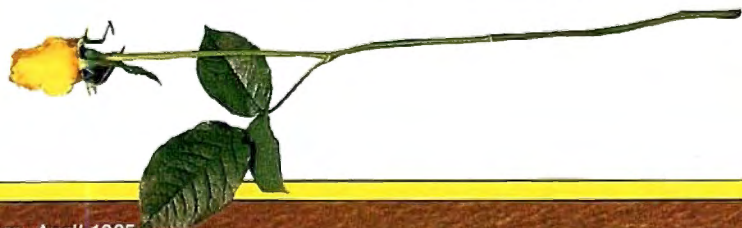
The two Basic tests told the same story as the WordStar test, but they don't really say much about machine speed because of the differences in the Basics.

Overall, the 128K 1000 is slower than a 128K IBM PC, but it's hard to draw other conclusions with so many variables to consider. It definitely depends on the task you want performed. If the 384K Tandy 1000 is slightly slower overall than the IBM PC, it isn't by much.

Compatibility

If all IBM PC programs used proper MS-DOS channels to access the hardware, you wouldn't find much of a compatibility problem. However, many popular IBM programs, Microsoft's Flight Simulator and Lotus 1-2-3 for example, make direct calls to ROM or to the hardware to increase their performance. The result is a spectrum of compatibility, which depends on how closely a given computer mimics particular IBM hardware controllers and the IBM's ROM (see Table 3 for a list of 1000-compatible software).

WordStar 3.3, for instance, writes



directly to the screen, bypassing DOS. Since the 1000 runs this version of the popular word processor, that means that it uses the same memory mapping for video. Some copy-protected programs test the compatibility of the disk controller with their copy protection systems. The 1000 hasn't failed with any protected disk I've tried.

From all indications, the 1000 is as compatible as they come. It has successfully run most of the IBM PC software I tried, and Tandy is marketing versions of many popular IBM PC packages to remove any doubts.

No clone can be completely IBM PC-compatible, and the 1000 has its own set of compatibility problems (mostly minor). You can, however, alleviate some of them.

When you turn on the 1000, it's in the black-and-white mode. Color programs don't boot up in color on a color monitor and black-and-white text appears at half intensity on monochrome monitors. When you change the 1000's system mode to color, a monochrome monitor does work at full intensity. I haven't yet figured out the function of the black-and-white mode. Perhaps it's meant to handle an as-yet nonexistent IBM-type monochrome monitor. Color programs also show up well on a monochrome monitor because textures and shading substitute for color.

My solution to the power-on/color problem is to add the Mode command for color to the AUTO-EXEC.BAT batch file that executes when I boot up my system. However, this doesn't work with protected application disks that boot themselves, such as the Infocom interactive fiction series.

On an IBM, the IBM PC versions of these games ask whether or not you want color. On the 1000, the IBM PC version of Infocom doesn't even ask; it automatically comes up in black and white. I would guess that the Infocom programs check for the type of monitor you're using but don't receive the right information. (The print option in the IBM PC versions didn't work on the 1000 either.) Curiously, the Tandy versions of this series aren't self-booting and only display in black and white by design.

I've also noted some video differ-

ences when using the screen attribute program in the Norton Utilities. This program changes the video attributes (colors, blinking, and so on) of the foreground, background, and border on the screen. First of all, you have to install the MS-DOS ANSI filter for the Norton Utilities to work at all. Version 2.0 of the Norton Utilities changes the attributes of text already on the screen, but any new material appears in black and white.

The 1000 is as compatible as they come. It has successfully run most of the IBM software I tried, and Tandy is marketing versions of many popular IBM PC packages.

The new MS-DOS-compatible version (3.0) works slightly better. The set attributes are permanent; the borders, text, and any background directly behind text are properly colored, but any clear space on the screen is black until you scroll it off. The DOS Clear Screen command (CLS) temporarily returns the black space to the screen.

The altered 1000 keyboard arrangement causes some compatibility problems (beyond getting used to it). ThinkTank uses the IBM PC's plus and minus keys to expand and collapse sections of the outlines it creates. On the 1000, the program doesn't respond at all to them. Similarly, Gato, a submarine simulation game, works properly only when you engage the "Caps" and "Num Lock" keys.

Luckily, you can solve both these problems by installing an undocumented keyboard filter found on the DOS disk (KEYCNVRT.SYS). When you do so, the 1000's number keys become arrow keys (as they are on the IBM PC) and the 1000's arrow keys don't work at all, among other changes.

One more difference to watch out for is the hold key, placed strate-

gically above the arrow key cluster, just where you're likely to accidentally hit it. Pressing the hold key stops the computer cold. While this can be useful, sometimes you don't know when you've hit it. I've thought several times that a program bombed when I inadvertently pressed this key.

Incompatibility

You can't do much about several sources of incompatibility. Software that directly accesses the IBM PC keyboard won't get much useful information from the 1000 keyboard. Also, while the two units' clock speeds are the same, differences exist in processing speed that will cause problems with any programs using software timing loops. That's why IBM PC games that use joysticks won't work on the 1000, even though the joystick interface is IBM PC-compatible.

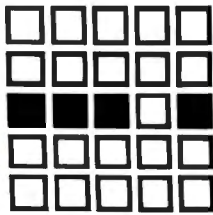
A last consideration is memory space. The 1000's improved graphics take up more RAM than the IBM PC's, so any program that fills a 128K IBM PC will actually require a 256K 1000. This applies even more to Basic programs because GW-Basic is completely RAM-based. The new MS-DOS 2.11 also takes up more disk space than its predecessor. You won't be able to put it on an application disk to make it bootable, because you usually have just enough space reserved for the smaller version 2.10 in the system area.

Tandy vs. IBM?

The Tandy 1000 is as powerful as the IBM PC and it's cheaper. Its most important drawbacks are the 10-inch slots (limiting your selection of expansion boards) and, of course, its less-than-total compatibility. The 1000's advantages are price and Radio Shack's service and support.

While the 1000 is a good machine and deserves success, its sales may depend less on Tandy's marketing and more on how fast IBM drops the price on the IBM PC. The question is, will people buy the 1000 if the IBM PC's price is comparable? ■

Write to Dave Rowell c/o 80 Micro, 80 Pine St., Peterborough, NH 03458.



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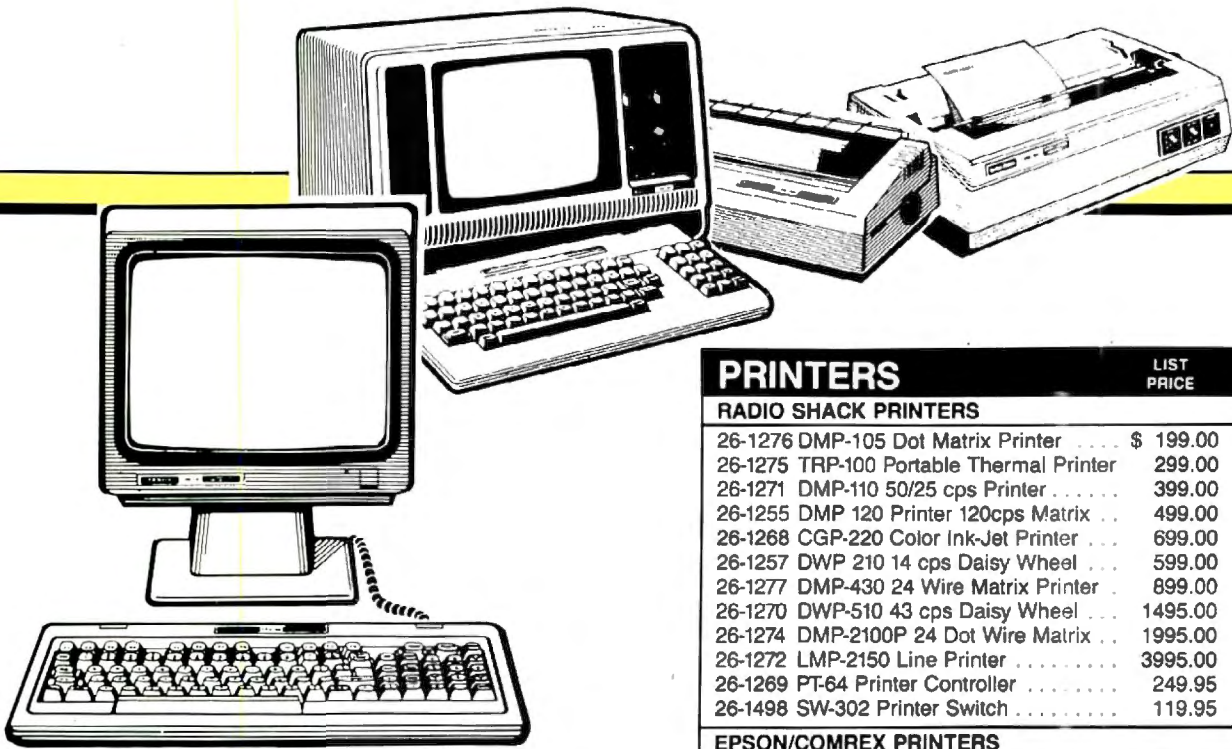
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ZAP

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Disk Zapper gives you a refined Model 4 Debug—it's easier to use and self documenting, and you can read and change disk sectors to remove passwords and add Assembly-language patches.

by David A. Williams

The Model 4 debug utility is a considerable improvement over that of the Model III: It can read and modify disk sectors, including the directory. But using it is cumbersome, to say the least.

My utility, Disk Zapper, is fast, easy to use, and self-documenting (see the Program Listing). With Disk Zapper, you can read and modify any sector on a Model 4 disk and remove password protection or add simple patches to Assembly-language programs.

Running Disk Zapper

Disk Zapper runs on any Model 4 with 64K RAM under TRSDOS 6.X. You need an editor/assembler to assemble the Listing source code.

The program loads in about two seconds, then prompts you for a drive, cylinder, and sector number (in decimal). Disk Zapper displays the contents of the cylinder you select as shown in Photo 1.

For comparison, a similar display for Model 4 Debug appears in Photo 2.

You can read adjacent sectors using the plus and minus keys. If you use the plus key to move past the last sector on the disk, Disk Zapper wraps around to the first sector.

Press the M key to modify the sector contents. The prompt line changes (see Photo 3) and the program displays the cursor. To make a change, use the arrow keys to move the cursor to the byte you're modifying and type in a two-digit hexadecimal (hex) number. When you type in the second digit, the new entry appears and the cursor moves to the next byte.

If you make a mistake, move the cursor back and correct it. When you're satisfied that the data is correct, press the W key. Disk Zapper asks you to confirm that you're ready to change the disk data. Press the Y key to write the data to disk and display the contents of the modified sector.

Press the break key or the N key at the warning message to exit the modify mode and display the original sector contents.

Inside Disk Zapper

TRSDOS 6.X has several supervisor calls (SVCs) that make reading from and writing to disk easy. Four SVCs handle each read from or write to disk, one for the directory cylinder and one for the other cylinders for each task. Disk Zapper automatically uses the correct SVC, depending on the cylinder

number you select, and puts the data in a 256-byte buffer labeled DSKBUF.

The program uses three SVCs to convert the data to a form suitable for display. As Disk Zapper converts the data, it loads it in the VIDBUF buffer and transfers it as a block to video memory using the @VDCTL SVC.

The conversion subroutine, CONV1, displays the cursor if required, and the IX register keeps track of the cursor location. If the program isn't in the modify mode, it sets IX to 0000 to blank out the cursor.

Using Disk Zapper

The *Model 4 Technical Reference Manual* provides a complete description of disk format. However, I'll demonstrate how to use Disk Zapper to find a file and override its password.

Your computer numbers cylinders (or tracks) from zero to 39 and sectors from zero to 17. The directory records begin on cylinder 20, sector 2, and each record comprises 32 bytes. The first byte (byte zero) contains attributes of the file, including whether or not it's protected.

System Requirements

Model 4
64K RAM
Assembly language
Editor/Assembler
TRSDOS 6.X



Bytes 16 and 17 contain the hash code for the owner password, and bytes 18 and 19 contain the hash code for the user password (refer to the description of the ATTRIB command in the *Disk System Owner's Manual* for a definition of these passwords).

The hash code for a blank password is 96 42. The following entries, therefore, override any password protection:

Byte	Entry
0	10
16	96
17	42
18	96
19	42

Compare the records for SYS8 (protected file) with unprotected Disk Zapper (labeled ZAP4) in Fig. 1. Setting the second digit of byte zero to zero overrides the owner password, but not the user password. If the first digit of the first byte is zero, the file has been removed.

Byte 22 is the cylinder number (in hex) where the file begins. For example, Format/CMD begins on cylinder 0E hex, or 14 decimal. Byte 23 gives the granule number, but you have to work for it (a granule comprises six sectors, and files always begin in a granule's first sector).

To find the sector number, take the first digit of byte 23, divide by 2, discard any remainder, and multiply by 6. For example, a first digit of 0,1 gives a sector number of zero, first digit 2,3 equals sector 6, and so on.

A file can have more than one extent, or segment. In such a case, bytes 24-29 give the starting locations for the extents in the format described above.

One last caveat: Be careful when changing directory records. Work on a back-up copy if possible, preferably one you can afford to ruin. ■

You can reach David A. Williams at 2452 Chase Circle, Clearwater, FL 33546.

Related Articles

Beebe, James A. "Floppy Fixer," December 1981, p. 326. Examine your Model I disks with these disk I/O routines.

Payne, Douglas. "That Sinking Feeling," March 1985, p. 38. An explanation of Model III/4 disk error messages.

Safford, David. "Simplezap," November 1981, p. 360. A Model I Basic utility that allows direct sector input, examination, modification, and output.

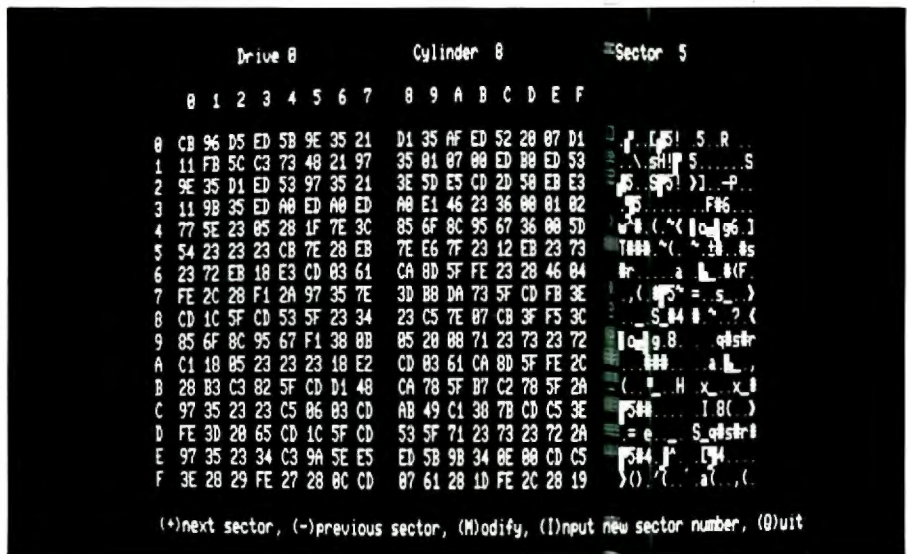


Photo 1. Disk Zapper's display format.

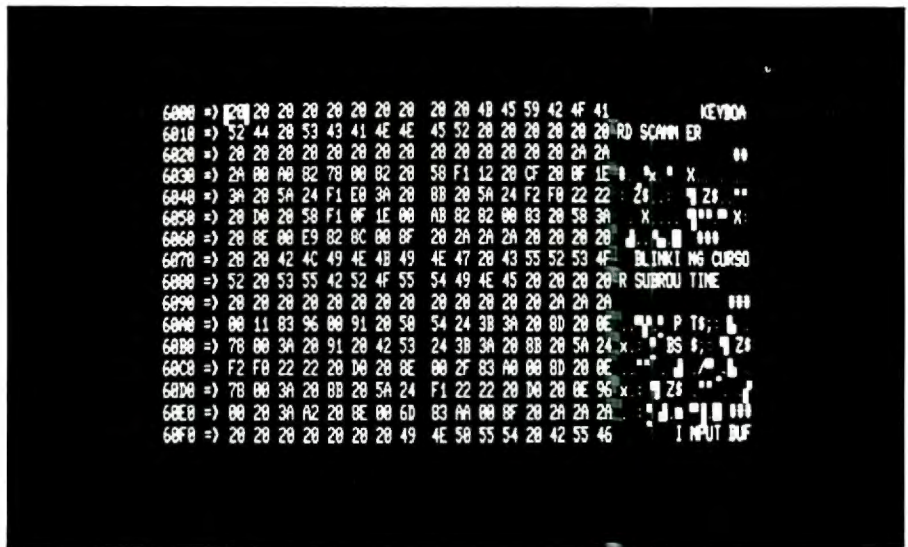


Photo 2. Display format for Model 4 Debug.

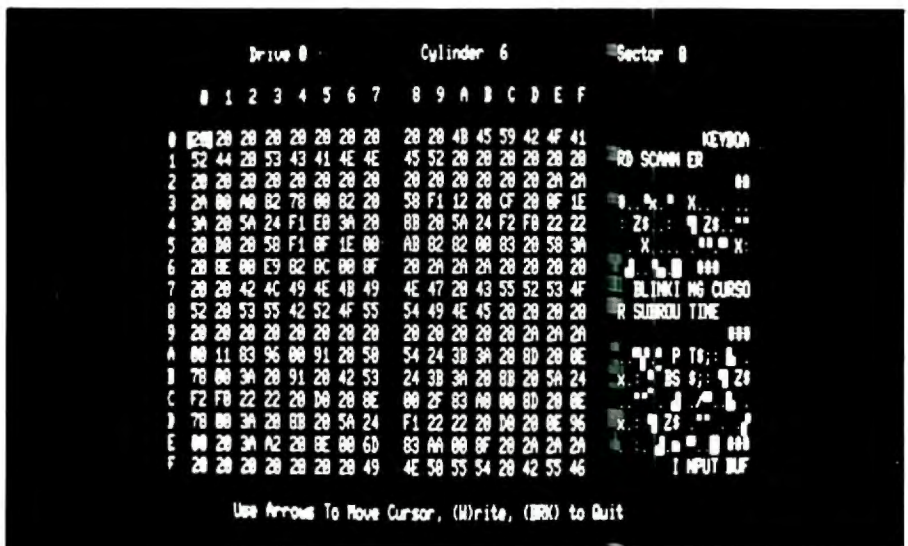


Photo 3. Disk Zapper's display format in the Modify mode.

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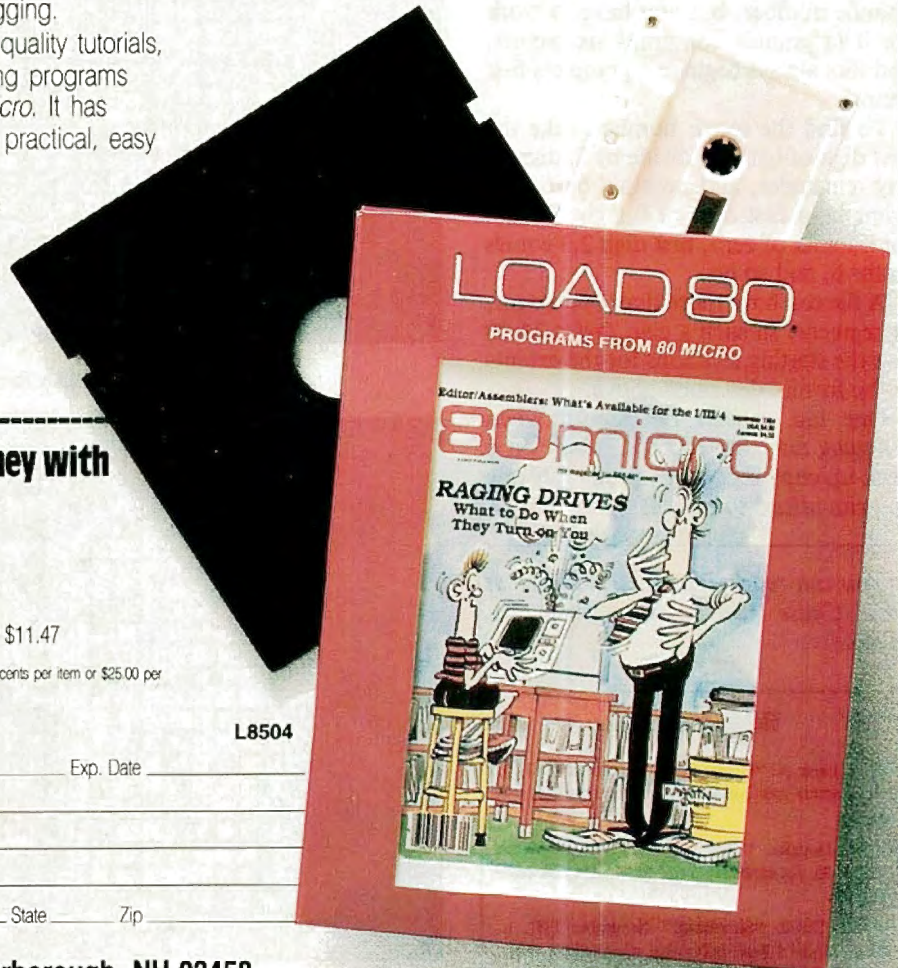
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	Drive 0							Cylinder 20							Sector 4					
	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F				
0	5F	09	7B	79	00	53	59	53	30	20	20	20	20	53	59	53	..{y.SYS 0	SYS		
1	F6	37	96	42	12	00	11	02	FF	FF	FF	FF	FF	FF	FF	FF	.7.B....	.....	
2	5F	09	7B	6A	00	53	59	53	30	20	20	20	20	53	59	53	..{j.SYS 8	SYS		
3	F6	37	96	42	23	00	1A	25	FF	FF	FF	FF	FF	FF	FF	FF	.7.B#..%	.....	
4	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	.....	.....
5	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	.....	.....
6	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	.....	.....
7	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	.....	.....
8	10	48	B4	1C	00	5A	41	50	34	20	20	20	20	43	4D	44	..H...ZAP 4	CMD		
9	96	42	96	42	08	00	06	01	FF	FF	FF	FF	FF	FF	FF	FF	.B.B....	.....	
A	0D	03	53	2C	00	42	41	53	49	43	20	20	20	4F	56	31	..S,.BAS IC	OVL		
B	78	2F	96	42	0B	00	1C	21	FF	FF	FF	FF	FF	FF	FF	FF	x/.B...!	.....	
C	1E	09	7B	8D	00	46	4F	52	4D	41	54	20	20	43	4D	44	..{.,FOR MAT	CMD		
D	BF	AE	96	42	12	00	0E	42	FF	FF	FF	FF	FF	FF	FF	FF	...B...B	.....	
E	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	.....	.....
F	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	.....	.....

(+)next sector, (-)previous sector, (N)odify, (I)input new sector number, (Q)uit

Figure 1. Compare SYS8 with Disk Zapper. Notice the lines labeled 2 and 8.

Program Listing. Disk Zapper source code.

```

00100 ;Model 4 Disk Zapping Program
00120 PSECT 3100H
00140 ;Initialization
00150 @VDCTL EQU 15
00160 @DSP EQU 02
00170 @EXIT EQU 16H
00180 @FLAGS EQU 65H
00190 @HEX8 EQU 62H
00200 @HEXDEC EQU 61H
00210 @KEY EQU 01
00220 @KEYIN EQU 09
00230 @DCHEX EQU 60H
00240 @RDSEC EQU 31H
00250 @RDSSC EQU 55H
00260 @WRSEC EQU 35H
00270 @WRSSC EQU 36H
00280 STKPNT DEFB 00
00290 START LD SP,STKPNT ;Set stack pointer
00300 LD IX,0000 ;Reset cursor position
00310 SVC @FLAGS
00320 SET 5,(Y+10) ;Set caps lock
00340 ;Main program
00350 BEGIN CALL INPUT ;Input sector number
00360 BEGA MOVI CMD,CMD1,80 ;Move prompt msg to video buffer
00370 BEGB CALL READ ;Read sector data
00380 CALL DISPLY
00390 LOOP1 SVC @KEY ;Wait for input
00400 CP 2BH
00410 JR Z,PLUS ;Next sector
00420 CP 3BH
00430 JR Z,PLUS
00440 CP 2DH
00450 JR Z,MINUS ;Previous sector
00460 CP 4DH
00470 JR Z,MOD ;Modify sector data
00480 CP 49H
00490 JP Z,BEGIN ;Input new numbers
00500 CP 51H

```

```

00510 JP Z,QUIT
00520 JR LOOP1
00540 PLUS LD A,(HSECT)
00550 INC A ;Inc sector count
00560 LD (HSECT),A
00570 CP 12H ;Is it the last sector?
00580 JR NZ,BEGB
00590 LD A,00
00600 LD (HSECT),A ;Reset sector count
00610 LD A,(HCYL)
00620 INC A ;Inc cylinder count
00630 LD (HCYL),A
00640 CP 28H ;Is it the last cylinder?
00650 JR NZ,BEGB
00660 LD A,00
00670 LD (HCYL),A ;Reset cylinder count
00680 JR BEGB
00700 MINUS LD A,(HSECT)
00710 DEC A ;Decrement sector count
00720 LD (HSECT),A
00730 CP 0FFH ;Underflow?
00740 JR NZ,BEGB
00750 LD A,17H
00760 LD (HSECT),A ;Set sector count to 17
00770 LD A,(HCYL)
00780 DEC A
00790 LD (HCYL),A ;Underflow?
00800 CP 0FFH
00810 JR NZ,BEGB
00820 LD A,27H
00830 LD (HCYL),A ;Set cyl count to 39
00840 JR BEGB
00860 ;Modify sector
00870 MOD LD IX,DSKBUF ;Start of buffer
00880 MOVI CMD,CMD2,80 ;Move prmpt msg to video buffer
00890 MODA CALL DISPLY
00900 SVC @KEY ;Input command
00910 CP 09
00920 JR Z,INCCHR ;Inc cursor position
00930 CP 0B
00940 JR Z,DECCHR ;Decrement cursor position
00950 CP 0BH
00960 JR Z,DECLIN ;Dec cursor line
00970 CP 0AH
00980 JR Z,INCLIN ;Inc cursor line
00990 CP 57H
01000 JR Z,WRT ;Write data to disk
01010 CP 80H
01020 JP Z,BRK
01030 CALL CONKBD ;Look for number
01040 JR NZ,NODA
01050 LD A,(NUMB)
01060 ADD A,A ;Mult by 16
01070 ADD A,A
01080 ADD A,A
01090 ADD A,A
01100 LD (NUMB1),A ;Save high nibble
01110 SVC @KEY ;Get 2nd char
01120 CALL CONKBD ;Look for number
01130 JR NZ,NODA
01140 LD A,(NUMB) ;Get high nibble
01150 LD B,A
01160 LD A,(NUMB1) ;Get low nibble
01170 ADD A,B
01180 LD (IX),A ;Put sum in disk buffer
01190 INC IX
01200 JR MODA
01210 INCCHR LD BC,IX
01220 LD HL,DSKBUF+255
01230 CPR BC
01240 JR Z,MODA
01250 INC IX ;Inc cursor position

```

Listing continued

Listing continued

```

01260 JR MODA
01270 DECCHR LD BC,IX
01280 LD HL,DSKBUF
01290 CPR BC
01300 JR Z,MODA
01310 DEC IX ;Dec cursor position
01320 JR MODA
01330 INCLIN LD BC,IX
01340 LD HL,DSKBUF+239
01350 CPR BC
01360 JP M,MODA
01370 LD BC,16
01380 ADD IX,BC
01390 JP MODA
01400 DECLIN LD BC,IX
01410 LD HL,DSKBUF+15
01420 CPR BC
01430 JP F,MODA
01440 LD BC,0FFF0H
01450 ADD IX,BC ;Sub 16
01460 JP MODA
01470 WRT CALL CLRDSP
01480 LD HL,WRTMSG
01490 CALL DSPMSG ;Display warning
01500 SVC @KEY
01510 CP 59H
01520 JP NZ,MODA
01530 CALL WRITE ;Write sector data
01540 LD IX,0000
01550 JP BEGA
01560 BRK LD IX,0000
01570 JP BEGA
01580 NUMB1 DEFB 00
01590 WRTMSG DEFB 0DH
01600 DEFB '
01610 DEFM ' You are about to modify disk data. '
01620 DEFM 'Continue, Y or N? '
01630 DEFB 60H
01650 ;Convert keyboard input to binary
01660 CONKBD LD B,A ;Save A
01670 CP 3AH ;> 39
01680 JP NC,NOT
01690 AND 0F0H ;Clear lower nibble
01700 CP 30H
01710 LD A,B ;Restore A
01720 JR NZ,NOT
01730 AND 0FH ;Clear upper nibble
01740 LD (NUMB),A ;Save number 0 - 9
01750 XOR A ;Set Z flag
01760 RET
01770 NOT CP 47H
01780 JP NC,NOTA ;> F
01790 CP 41H
01800 JP M,NOTA ;< A
01810 AND 0FH
01820 ADD A,9
01830 LD (NUMB),A ;Save number AH - FH
01840 XOR A ;Set Z flag
01850 RET
01860 NOTA OR A ;Reset Z flag
01870 RET
01880 NUMB DEFB 00
01900 ;Exit to TRSDOS
01910 QUIT CALL CLRDSP
01920 SVC @EXIT
01940 CMD1 DEFM '(+)next sector, (-)previous sector, (M)odify, '
01950 DEFM '(I)ntput new sector number, (Q)uit '
01960 CMD2 DEFM ' Use Arrows To Move Cursor, (W)rite, '
01970 DEFM '(BRK) to Quit '
01990 ;Read Disk Sector
02000 READ LD A,(HCYL) ;Cyl number
02010 LD D,A

```

```

02020 LD A,(HSECT) ;Sector number
02030 LD E,A
02040 LD A,(HDRIVE) ;Drive number
02050 LD C,A
02060 LD HL,DSKBUF
02070 LD A,D
02080 CP 14H ;Is it dir cylinder?
02090 JR Z,SYS
02100 SVC @RDSEC
02110 RET
02120 SYS SVC @RDSSEC
02130 RET
02150 ;Write Disk Sector
02160 WRITE LD A,(HCYL) ;Cyl number
02170 LD D,A
02180 LD A,(HSECT) ;Sector number
02190 LD E,A
02200 LD A,(HDRIVE) ;Drive number
02210 LD C,A
02220 LD HL,DSKBUF
02230 LD A,D
02240 CP 14H ;Is it dir cylinder?
02250 JR Z,WSYS
02260 SVC @WRSEC
02270 RET
02280 WSYS SVC @WRSSC
02290 RET
02310 ;Input Drive, Cylinder, Sector Number
02320 INPUT CALL CLRDSP
02330 LD HL,INPRMT
02340 CALL DSPMSG ;Display prompt message
02350 LD C,0EH ;Cursor on
02360 SVC @DSP
02370 LD HL,INDATA ;Data buffer
02380 LD C,00
02390 LD B,07 ;Number of characters
02400 SVC @KEYIN
02410 LD C,0FH ;Cursor off
02420 SVC @DSP
02430 LD A,B ;Check num char input
02440 CP 07
02450 JR NZ,INPUT ;Bad input
02460 SVC @DECEX
02470 LD A,C
02480 LD (HDRIVE),A
02490 LD HL,INDATA+2 ;Cylinder number
02500 SVC @DECEX
02510 LD A,C
02520 LD (HCYL),A
02530 LD HL,INDATA+5 ;Sector number
02540 SVC @DECEX
02550 LD A,C
02560 LD (HSECT),A
02570 RET
02580 INPRMT DEFB 0DH
02590 DEFB 0DH
02600 DEFM ' Input Drive Number, Cylinder Number, '
02610 DEFM 'Sector Number '
02620 DEFB 0DH
02630 DEFM ' Use Decimal Values. (d,cc,ss,) '
02640 DEFB 60H
02650 INDATA DEFB 00
02660 HDRIVE DEFB 00
02670 HCYL DEFB 00
02680 HSECT DEFB 00
02700 ;Display a message
02710 DSPMSG LD A,(HL) ;Get char
02720 INC HL
02730 CP 60H ;End of msg?
02740 RET Z
02750 LD C,A
02760 SVC @DSP

```

Listing continued

Listing continued

```
02770 JR DSPMSG
02790 ;Move data to video buffer and display
02800 DISPLY LD HL,PRSTLN
02810 LD C,0PH ;Turn cursor off
02820 SVC @DSP
02830 LD DE,DSKBUF
02840 LD B,16 ;Set up to move 16 lines
02850 LOOP2 PUSH BC
02860 LD (HL),20H ;Blank first space
02870 INC HL
02880 LD B,08
02890 CALL CONV1 ;Get first 8 characters
02900 LD B,08
02910 CALL CONV1 ;Get second 8 characters
02920 LD (HL),20H
02930 INC HL
02940 LD B,16 ;Display in alphanumeric
02950 LOOP3 DEC DE ;Reset DE
02960 DJNZ LOOP3
02970 LD B,08
02980 CALL DSPBUF ;Get first 8 characters
02990 LD (HL),20H ;Blank between groups of 8
03000 INC HL
03010 LD B,08
03020 CALL DSPBUF ;Get second 8 characters
03030 LD B,07
03040 LOOP4 LD (HL),20H ;Clear to end of line
03050 INC HL
03060 DJNZ LOOP4
03070 INC HL
03080 INC HL
03090 POP BC
03100 DJNZ LOOP2
03110 LD A,(INDATA) ;Conv drive, sector, cyl to ASCII
03120 LD (DRIVE),A
03130 LD A,(HCYL)
03140 CALL CONV
03150 LD (CYL),HL
03160 LD A,(HSECT)
03170 CALL CONV
03180 LD (SECTOR),HL
03190 CALL CLRDSP
03200 LD B,05
03210 LD HL,VIDBUF
03220 SVC @VDCTL
03230 RET
03250 ;Convert buffer data to numerical ASCII and move to video buffer
03260 CONV1 PUSH HL
03270 LD HL,IX ;Cursor location
03280 CPR DE ;Is cursor here?
03290 POP HL
03300 JR NZ,SKP1
03310 DEC HL ;Yes, display it
03320 LD (HL),8AH
03330 INC HL
03340 INC HL
03350 INC HL
03360 LD (HL),85H
03370 INC HL
03380 INC DE
03390 JR SKP2
03400 SKP1 LD A,(DE) ;Get char from disk buffer
03410 LD C,A
03420 SVC @HEX8 ;Conv and put in video buf
03430 INC DE
03440 LD (HL),20H
03450 INC HL
03460 SKP2 DJNZ CONV1
03470 LD (HL),20H
03480 INC HL
03490 LD (HL),20H
03500 INC HL
03510 RET
03530 ;Move data to video buffer without conversion
```

Listing continued

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Listing continued

```

;Get char from .disk buffer
A,(DE)
20H
P,SKP3
;Display . if < ASCII 20
(HL),A
DE
HL
DSPBUF
RET
;Convert binary to ASCII
H,00
LD A,0
DE,TEMP
SHXDEC
HL,(TEMP+3)
5
C,1CH
8DSP
C,1FH
8DSP
256
; Drive
; Cylinder
; Sector
;Fill 14 bytes with spaces
;Fill 80 bytes with spaces
;Fill 80 bytes with spaces
;Fill 80 bytes with spaces
;Fill 80 bytes with spaces
;First line of data goes here

```

End

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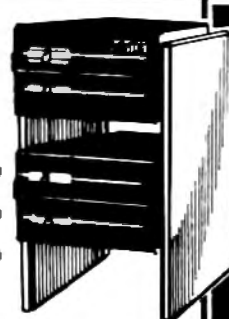
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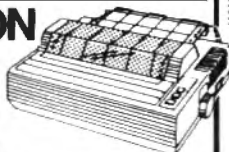


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DATE LINES

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As a lawyer, I use Profile III Plus to sort data in age discrimination cases, for docket control, and for mailing lists. Many of these functions involve the use of dates, often an awkward chore with Profile III Plus since it stores dates with the year first, then the month, then the day (YY/MM/DD). I've developed a way to sort information without concern for the way Profile III Plus handles them.

When I write a date, I write the month first, followed by the day, and finally the year (MM/DD/YY). Yet, when I want to sort a file, I prefer to sort first by year, then by the month and day. If Profile sorts by date according to the way I write dates, it would list all the files with a January date first, regardless of the year involved. For most purposes, this kind of sort is inappropriate.

Profile III Plus does let you input the date in a manner that executes a sort based first on year, then month and day. Unfortunately, entering each date in this manner is awkward and confusing. My technique is more sensible and takes advantage of the fact that Profile can sort by a string of characters longer than any specific field.

For example, if field 1 (last name) is 15 characters long while field 2 (first name) is 10 characters long, you can instruct Profile to sort by field 1. Profile asks you to specify the length for sorting; if you indicate, say, 25 characters, Profile treats the first 25 characters as if they were in the same field. The result is that Profile sorts the files first by last name, then by first name. Thus, all Smiths are grouped together and Arthur Smith is listed before Zeke Smith.

You can apply this same principle to dates. If you create and define separate fields for the year, month, and day, Pro-

file will store the information in a way that lets you sort the way you want. The versatility of Profile's screen and report formats lets you disguise the actual order of the material. In other words, the order in which Profile presents information on-screen or in a report doesn't depend on the order in which you store that information in a file. So, you can list information in month/day/year format even though Profile stores it in a different order.

To create a file that includes names and dates of birth, define the fields as indicated in Table 1. This order ensures that Profile always stores the birth date with the year first, month second, and day third. When defining the screen, arrange your information like this:

```
First Name: *2
Last Name: *1
Date of Birth: #4 #5 #3
```

The asterisk indicates to Profile that alphanumeric information appears in the following field, while the numbers 1 and 2 refer to the field into which information is put at this point on the screen. The number symbol indicates that you've entered numeric information in fields 3, 4, and 5. This way, Profile right-justifies single-digit numbers. For example, if you type in a 2, Profile records it as 02 so that Profile positions 2 before 20 in the data base.

The way to format reports is similar (see Table 2). Here, it doesn't matter whether you use numbers or letters. Please note that the asterisk indicates each of the fields. When you want to sort these records according to date of birth, instruct Profile to sort by field 3 and indicate that the length of the sort is six characters. The following dates have been sorted in this manner:

```
2 2 82
1 7 83
1 8 83
2 1 83
1 8 84
2 2 84
```

The sorted list in Table 3 represents a more detailed example of the sort you get with my technique. ■

Contact Edward M. Welch, an attorney, at People's Savings Building, Suite 301, 2 W. Michigan Mall, Battle Creek, MI 49017.

Field	Field Name	Field Length
1	Last name	15
2	First name	10
3	Birth YY	2
4	Birth MM	2
5	Birth DD	2

Table 1. Create fields using this format.

Last	First	Date of Birth
*1	*2	*4 *5 *3

Table 2. Use this method to format reports.

LAST	FIRST	DATE OF BIRTH
STONE	LARRY	05 30 34
WYMAN	BILL	07 22 41
MCDONALD	RONALD	10 03 41
ANDERSON	KAREN	10 12 43
CLARK	MIKE	09 21 46
JOHNSON	KEN	04 13 51
TYSON	ANDY	05 23 51
PETERSON	STEVE	01 23 56
KENT	SUSAN	09 01 56
BENNINGTON	TOM	03 30 59

Table 3. Sorted list generated with this technique.

A version of this article originally appeared in the July 15, 1984 edition of The Lawyer's Microcomputer.

Tidbit #19

Here's a short, simple Model I/III program that tests your typing speed. When you run the program, it displays instructions on the screen and prompts you to press the left-arrow key to start the time clock.

You can type up to 255 characters, or about four lines of text. As soon as your keyboard hangs up, press the enter key to stop the clock.

The program calculates and displays your typing speed in words per minute, using the standard 5-character-per-word equivalent. The listing's comments explain most program lines and define some key variables. To get the routine to work properly, I had to overcome two minor problems.

First, for the program to accept text containing punctuation marks such as commas or colons, I had to get around Basic's Input function, which would ignore anything typed in after these delimiters. Using the Line Input command instead of Input in line 120 solved this problem.

Second, I had to find a way to read the computer's internal clock. The TIME\$ commands in lines 110 and 130 set starting and ending times for the typing test. Line 100 checks for keyboard input. I used the left-arrow or backspace character, CHR\$(8), to start the clock, but you can substitute another key character, such as CHR\$(32), the space bar, if you wish.

Darrell T. Lee
Sandy, UT

```

10 CLS:PRINT"THIS PROGRAM WILL CALCULATE YOUR TYPING SPEED.":PRINT
20 PRINT
30 GOTO 50
40 CLS:REM
50 CLEAR 300
60 DIMA$(255)
70 PRINT"DON'T TYPE MORE THAN 255 CHARACTERS (ABOUT 50 WORDS).":PR
INT
80 PRINT"PRESS THE LEFT ARROW TO START THE CLOCK.":PRINT
90 PRINT"PRESS ENTER ON COMPLETION.":PRINT
100 BS=INKEY$:IFBS=""THEN 100
110 IFBS=CHR$(8)THENST$=TIME$ELSE100 :REM NOTES START TIME WHEN L
EFT ARROW IS PRESSED
120 LINEINPUT"HURRY UP, THE CLOCK IS RUNNING! ";A$:REM TEXT ENTRY
130 ET$=TIME$:REM NOTES ENDING TIME
140 Z=(LEN(A$))/5:REM NUMBER OF WORDS
150 SS$=RIGHT$(ET$,2):SM$=MID$(ET$,13,2):REM READS STARTING SECOND
S AND STARTING MINUTES
160 ES$=RIGHT$(ET$,2):EM$=MID$(ET$,13,2):REM READS ENDING SECONDS
AND ENDING MINUTES
170 ES=VAL(ES$):SS=VAL(SS$):TS=ES-SS:EM=VAL(EM$):SM=VAL(SM$):TM=(E
M-SM):REM CALCULATE TOTAL SECONDS, TOTAL MINUTES
180 IFTS<0THEN240 :REM CORRECTION IF SECONDS IS MINUS VALUE
190 IFTM<0THEN260 :REM CORRECTION IF MINUTES IS MINUS VALUE
200 T=TM*60+TS:WP=60*Z/T:REM T=TIME IN SECONDS WP=WORD SPEED
210 PRINT"YOU TYPED ";Z;" WORDS (5 LETTERS/WORD EQUIVALENT).":PRIN
T"IT TOOK YOU ";T;" SECONDS.":PRINT"YOUR TYPING SPEED IS ";WP;" WO
RDS/MINUTE. DO YOU WANT TO TRY AGAIN <Y> OR <N>"
220 INPUT QS:PS=LEFT$(QS,1):IFPS="Y"ORPS="y"THEN 40 ELSE END
230 END
240 TS=TS+60:TM=TM-1:REM TIME CORRECTION FACTOR
250 GOTO190
260 TM=TM+60:REM TIME CORRECTION FACTOR
270 GOTO200

```

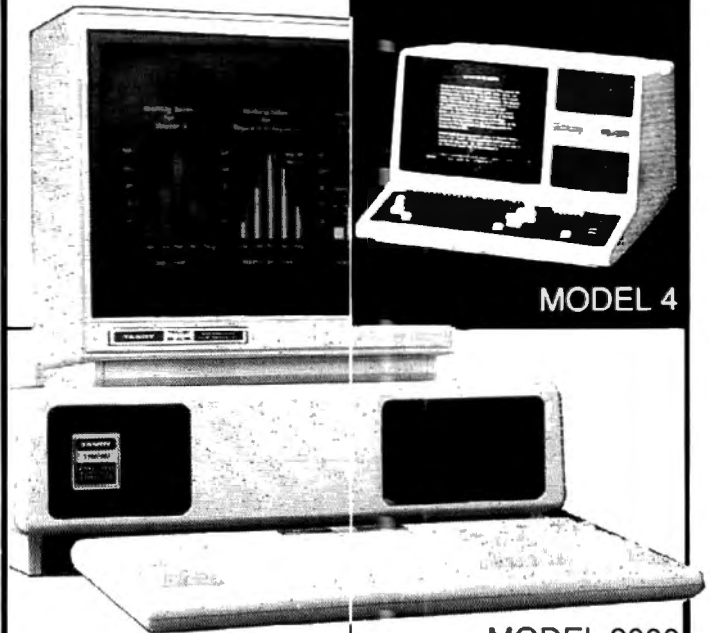
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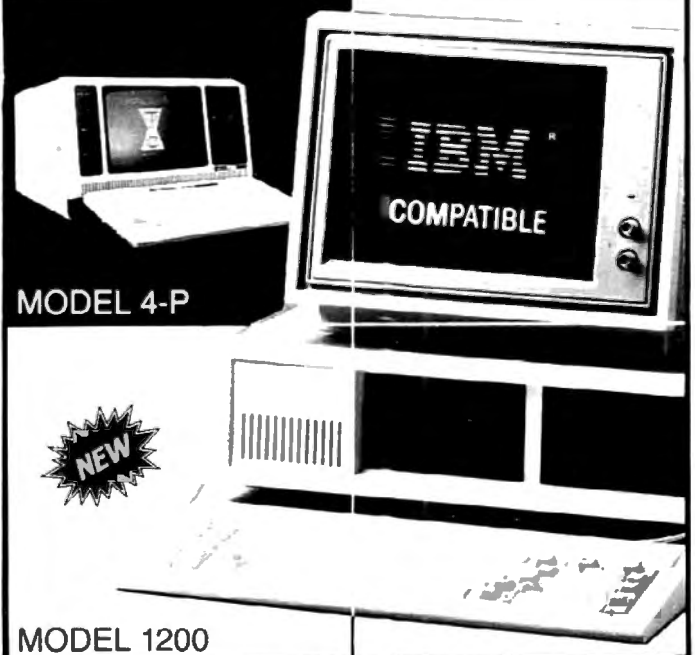
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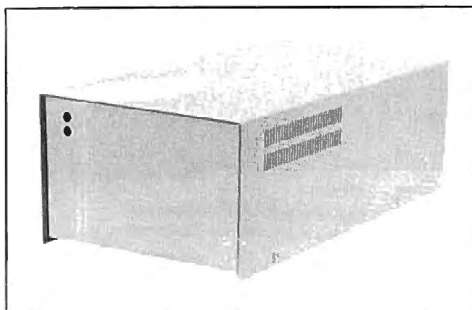


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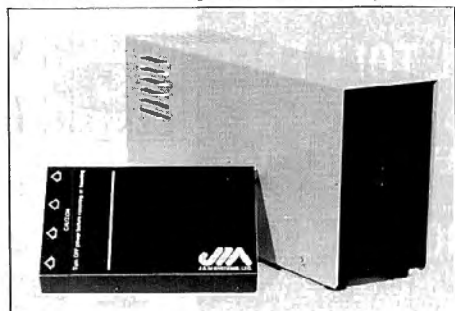
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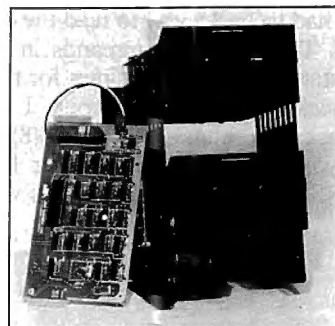


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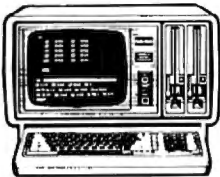
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Listing 1 continued from p. 47

```

1570 PRINT @ 1077 , "" ; : INPUT YR
1580 YE = (YR - Y1) + 1
1590 IF YE < 1 OR YE > 10 THEN CLS : PRINT @ 912 , "Out of Range!" : FOR I = 1 TO
500 : NEXT I : GOTO 1550
1600 CLS : PRINT : PRINT @ 892 , "Enter month (1 - 12) to be edited" ; : INPUT ME
1610 IF ME < 1 OR ME > 12 THEN CLS : PRINT @ 892 , "Must be in range of 1 to 12" :
FOR I = 1 TO 500 : NEXT I : GOTO 1600
1620 CLS : PRINT : PRINT : PRINT : PRINT
1630 PRINT "The data for the month of " M$(ME) ;
1640 PRINT " of the year " Y1 + YE - 1 " = " DA(YE,ME)
1650 PRINT : PRINT : PRINT "Do You want to edit this data?"
1660 IN$ = INKEY$ : IF IN$ = "" THEN GOTO 1660
1670 IF IN$ = "Y" OR IN$ = "y" THEN GOTO 1700
1680 IF IN$ < > "N" AND IN$ < > "n" THEN GOTO 1660
1690 GOTO 1760
1700 INPUT "Enter your new Data" ; DA(YE,ME)
1710 IF (DP$ = "N" OR DP$ = "n") AND DA(YE,ME) > 99999.99000000011 THEN PRINT "To
o High! - Graph will not handle values over 99,999.99." : GOTO 1700
1720 IF DA(YE,ME) > 99999999999.99006 THEN PRINT "Too High! Graph will not handle
values over 999,999,999,999.99." : GOTO 1700
1730 IF DA(YE,ME) = -99 THEN GOTO 1760
1740 IF DA(YE,ME) < 0 THEN PRINT "Too Low! - Graph not equipped to handle negative
numbers." : GOTO 1700
1750 IF DA(YE,ME) > DM THEN DM = DA(YE,ME)
1760 CLS : PRINT @ 892 , "Do you want to edit another item?"
1770 IN$ = INKEY$ : IF IN$ = "" THEN GOTO 1770
1780 IF IN$ = "Y" OR IN$ = "y" THEN GOTO 1550
1790 IF IN$ < > "N" AND IN$ < > "n" THEN GOTO 1770
1800 GOTO 370
2730 ' Draw Graph on Screen
2740 SCREEN 0 : CLR
2750 ' Border of Screen
2760 LINE (0,0)-(639,239),1,B
2770 ' Print Title
2780 GLOCATE ((639-(LEN(GT$)*8))/2),10),0
2790 PRINT #3 , GT$
2800 ' Draw Graph Sides and Bottom
2810 LINE (106,30)-(106,230),1
2820 LINE (106,230)-(606,230),1
2830 LINE (606,30)-(606,230),1
2840 ' Determine if scale numbers should be divided to assure
2850 ' that no more than 4 digits plus one decimal will
2860 ' appear on graph
2870 NTS = ""
2880 IF NT = > 1000000 THEN NT = NT / 1000000 : NTS = "Scale Value X 1,000,000"
: NR = NR / 1000000 : GOTO 2910
2890 IF NT = > 1000 THEN NT = NT / 1000 : NTS = "Scale Value X 1,000" : NR = NR /
1000 : GOTO 2910
2900 ' Print Scale Values along left side of Graph
2910 FOR Y = 30 TO 230 STEP 20
2920 GLOCATE (46,Y),0
2930 ' Round off to tenths and print Scale Value
2940 ' Print Top Number first
2950 PRINT #3 , INT((NT+.05)*10)/10
2960 ' Calculate next Scale Number to print
2970 ' Last Number - Range / 10 Segments
2980 NT = NT - (NR / 10)
2990 ' Print Horizontal grid if requested
3000 IF HG$ = "Y" OR HG$ = "y" THEN LINE (96,Y)-(595,Y),1,,LI(6)
3010 ' Print Scale Markers <-> on Graph
3020 GLOCATE (102,Y-3),0
3030 PRINT #3 , "-"
3040 GLOCATE (601,Y-3),0
3050 PRINT #3 , "-"
3060 NEXT Y
3070 ' Print Vertical grid if requested
3080 FOR X = 164 TO 548 STEP 48
3090 IF VG$ = "Y" OR VG$ = "y" THEN LINE (X,30)-(X,230),1,,LI(6)
3100 NEXT X
3110 ' Print Scale Multiplier on Graph if used
3120 GLOCATE (624,45),1
3130 PRINT #3 , NT$
3140 ' Print Scale Title above Scale Values
3150 GLOCATE (55,20),0
3160 PRINT #3 , ST$
3170 ' Test for Graph Type - Summary Line Graph
3180 IF AA = 9 THEN GOTO 3690
3190 ' Test for Graph Type - Annual Bar Graph
3200 IF AA = 10 THEN GOTO 3930
3210 ' Test for Graph Type - Summary Bar Graph
3220 IF AA = 11 THEN GOTO 4270
3230 ' Draw Months across Bottom for Annual Line Graph
3240 I = 1
3250 FOR X = 98 TO 593 STEP 45
3260 GLOCATE (X,231),0
3270 PRINT #3 , M$(I)
3280 I = I + 1
3290 NEXT X
3300 ' Print <Key> Box for Annual Line Graph
3310 GLOCATE (12,20),0
3320 PRINT #3 , "Key"
3330 LINE (9,17)-(40,29),1,B
3340 LINE (0,12)-(50,239),1,B
3350 ' Routine for Plotting Annual Line Graph
3360 YR = 1 : AL = 1 : YK = 40 : KY$ = STR$(Y1) : YY = Y1
3370 IF DA(YR,1) = -99 THEN GOTO 3660
3380 ' Print Year of DATA in KEY BOX
3390 GLOCATE (2,YK),0
3400 PRINT #3 , KY$
3410 ' Print sample line under Year in KEY BOX
3420 LINE (0,YK+12)-(40,YK+12),AL,,LI(YR)
3430 ' Touch up Key Box if last item erased
3440 IF AL = 0 THEN LINE (0,12)-(50,239),1,B
3450 XP = 108 : X = 153 : YP = 230 - ((DA(YR,1) - NB) * SC)

```

Listing 1 continued


```

3460 MO = 2
3470 IF DA(YR,MO) = -99 THEN GOTO 3660
3480 Y = 230 - ((DA(YR,MO) - NB) * SC)
3490 LINE (XP,YP)-(X,Y),AL,,LI(YR)
3500 XP = X : YP = Y
3510 X = X + 45
3520 MO = MO + 1 : IF MO < 13 THEN GOTO 3470
3530 IF AL = 0 THEN GOTO 3630
3540 ' Routine to Control Graphing
3550 ' An <E> will ERASE the last graph and draw the next one
3560 ' An <M> will send you back to the MENU
3570 ' Any other key draws the next graph
3580 IN$ = INKEY$: IF IN$ = "" THEN GOTO 3580
3590 IF IN$ = "M" OR IN$ = "m" THEN GOTO 370
3600 IF IN$ = "E" OR IN$ = "e" THEN AL = 0 : KY$ = " " : GOTO 3370
3610 IF DA(YR,1) = -99 THEN GOTO 3660
3620 YK = YK + 20
3630 AL = 1 : YR = YR + 1 : YY = YY + 1 : KY$ = STR$(YY)
3640 IF YR = 11 THEN GOTO 3660
3650 GOTO 3370
3660 IF INKEY$ = "" THEN 3660
3670 GOTO 370
3680 ' Routine for Plotting Summary Line Graph
3690 YA = Y1
3700 YR = 0 : MO = 0
3710 ' Print Years across bottom of Graph
3720 FOR X = 114 TO 546 STEP 48
3730 GLOCATE (X,231),0
3740 PRINT #3, YA
3750 YA = YA + 1
3760 NEXT X
3770 ' Determine starting point for plotting graph
3780 XP = 116 : X = 120 : YP = 230 - ((DA(1,1) - NB) * SC)
3790 ' Plot the Line Graph
3800 FOR YR = 1 TO 10
3810 ' Skip the first month of the first year
3820 IF YR = 1 THEN S = 2 ELSE S = 1
3830 FOR MO = S TO 12
3840 IF DA(YR,MO) = -99 THEN YR = 11 : MO = 13 : GOTO 3880
3850 Y = 230 - ((DA(YR,MO) - NB) * SC)
3860 LINE (XP,YP)-(X,Y),1,-1
3870 XP = X : YP = Y : X = X + 4
3880 NEXT MO
3890 NEXT YR
3900 IF INKEY$ = "" THEN GOTO 3900
3910 GOTO 370
3920 ' Routine to plot annual bar graph
3930 I = 1
3940 ' Print months across bottom of Graph
3950 FOR X = 121 TO 593 STEP 40
3960 GLOCATE (X,231),0
3970 PRINT #3, M$(I)
3980 I = I + 1
3990 NEXT X
4000 ' Establish Year to Graph
4010 SCREEN 1
4020 CLS : PRINT @ 728, "" ;
4030 XX$ = "What is the number for the year of this graph"
4040 PRINT TAB((80-LEN(XX$))/2); XX$ ;
4050 PRINT @ 912, Y1 ; " - " ; Y1 + 9
4060 PRINT @ 1077, "" ; : INPUT YN
4070 YR = (YN - Y1) + 1
4080 IF YR < 1 OR YR > 10 THEN CLS : PRINT @ 816, "No. of Year not in range." : F
OR I = 1 TO 500 : NEXT I : GOTO 4020
4090 IF DA(YR,1) = -99 OR DA(YR,1) = 0 THEN CLS : PRINT @ 912, "No DATA" : FOR I
= 1 TO 500 : NEXT I : GOTO 4020
4100 ' Draw Bars for each Month
4110 SCREEN 0
4120 LINE (5,12)-(55,24),1,B
4130 GLOCATE (6,15),0 : PRINT #3, Y1 + YR - 1
4140 XP = 116 : YP = 230 : X2 = 154
4150 FOR MO = 1 TO 12
4160 IF DA(YR,MO) = -99 THEN MO = 11 : GOTO 4210
4170 Y2 = 230 - ((DA(YR,MO) - NB) * SC)
4180 LINE (XP,YP)-(X2,Y2),1,B
4190 IF DA(YR,MO) > NB THEN PAINT (XP+1,YP-1),PTS,1
4200 XP = XP + 40 : X2 = X2 + 40
4210 NEXT MO
4220 IF INKEY$ = "" THEN GOTO 4220
4230 GOTO 370
4240 ' Routine to plot Summary Bar Graph
4250 ' Print Subtitle on Graph to indicate that DATA
4260 ' represents average for each year
4270 TAS = "(Annual Averages)"
4280 GLOCATE (((639-LEN(TAS)*0))/2),20),0
4290 PRINT #3, TAS
4300 ' Print Years across bottom of Graph
4310 YA = Y1 : FOR I = 106 TO 581 STEP 50
4320 GLOCATE (I,231),0
4330 PRINT #3, YA
4340 YA = YA + 1
4350 NEXT I
4360 ' Draw BAR for each Year
4370 XP = 108 : YP = 230 : X2 = 154 : AN = 0
4380 FOR YR = 1 TO 10
4390 AV = 0
4400 FOR MO = 1 TO 12
4410 IF DA(YR,MO) = -99 THEN AN = MO - 1 : YR = 11 : MO = 13 : GOTO 4450
4420 AV = AV + DA(YR,MO)
4430 ' Calculate Annual Average for each Year
4440 AN = MO
4450 NEXT MO
4460 IF AN < 1 THEN GOTO 4520
4470 AV = AV / AN

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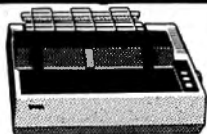
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Listing 1 continued

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4480 Y2 = 230 - ((AV - NB) * SC)
4490 LINE (XP,YP)-(X2,Y2),1,B
4500 IF AV > NB THEN PAINT (XP+1,YP-1),PTS,1
4510 XP = XP + 50 : X2 = X2 + 50
4520 NEXT YR
4530 IF INKEY$ = "" THEN GOTO 4530
4540 GOTO 370
4550 ' Re-display Last Graph
4560 SCREEN 0
4570 IF INKEY$ = "" THEN GOTO 4570
4580 GOTO 370
4590 ' Routine for loading data from DISK
4600 CLS : PRINT "Routine for loading data from disk."
4610 DM = 0
4620 PRINT : PRINT "Enter file name (Do NOT use extension)"
4630 PRINT : PRINT "Enter a ? for DIRECTORY"
4640 INPUT FFS$
4650 IF FFS$ <> "?" THEN GOTO 4700
4660 CLS : PRINT : PRINT "Drive No?"
4670 DNS$ = INKEY$: IF DNS$ < "0" OR DNS$ > "3" THEN GOTO 4670
4680 SYSTEM "DIR : " + DNS$
4690 PRINT @ 1373, "" : INPUT "Press <ENTER> to continue!" : IN$: GOTO 4620
4700 IF LEN(FFS$) > 8 OR LEN(FFS$) < 1 THEN PRINT "FILE NAME must be 1 to 8 letters long." : GOTO 4640
4710 PRINT : PRINT "Enter Disk Drive to be used {0 - 3}."
4720 PRINT " Default = <1>"
4730 DDS$ = "1"
4740 INPUT DDS$
4750 IF DDS$ < "0" OR DDS$ > "3" THEN PRINT "Invalid Drive!" : GOTO 4710
4760 FLS$ = FFS$ + "/GDT" + ":" + DDS$
4770 OPEN "r" , 1 , FLS$
4780 INPUT #1 , DP$
4790 ' Determine Precision of DATA based on stored Flag DP$
4800 GOSUB 5770
4810 INPUT #1 , GTS$
4820 INPUT #1 , STS$
4830 INPUT #1 , Y1$
4840 FOR YR = 1 TO 10 : FOR MO = 1 TO 12
4850 INPUT #1 , DA(YR,MO)
4860 IF DA(YR,MO) > DM THEN DM = DA(YR,MO)
4870 NEXT MO : NEXT YR
4880 CLOSE
4890 GOTO 370
4900 ' Routine for saving data on DISK
4910 CLS : PRINT : PRINT "Routine for saving Data to DISK."
4920 PRINT : PRINT "Enter File name for File (Do not use Extension)."
4930 IF FFS$ = "" THEN GOTO 4960
4940 PRINT : PRINT "The Default name = FFS$
4950 PRINT : PRINT " Do you want to use the Default value? Y/N"
4952 AS=INKEY$:IF AS="" THEN 4952
4954 IF AS="Y" THEN 4980
4956 IF AS="N" THEN PRINT:PRINT "Enter File name = ":GOTO 4960
4958 GOTO 4952
4960 INPUT FFS$
4970 IF LEN(FFS$) > 8 OR LEN(FFS$) < 1 THEN PRINT "FILE NAME must be 1 to 8 letters long." : GOTO 4920
4980 PRINT : PRINT "Enter Disk Drive to be used {0 - 3}."
4990 PRINT " Default = <1>"
5000 DDS$ = "1"
5010 INPUT DDS$
5020 IF DDS$ < "0" OR DDS$ > "3" THEN PRINT "Invalid Drive!" : GOTO 4980
5030 FLS$ = FFS$ + "/GDT" + ":" + DDS$
5040 OPEN "o" , 1 , FLS$
5050 PRINT #1 , DP$
5060 PRINT #1 , GTS$
5070 PRINT #1 , STS$
5080 PRINT #1 , Y1$
5090 FOR YR = 1 TO 10 : FOR MO = 1 TO 12
5100 PRINT #1 , DA(YR,MO)
5110 NEXT MO : NEXT YR
5120 CLOSE
5130 ' If this is called from Print Routine go back and print
5140 IF AA = 13 THEN RETURN ELSE GOTO 370
5150 ' Routine to Calculate First Year Drop Off if Desired
5160 CLS : PRINT "Data for year Y1 will be dropped if"
5170 PRINT "additional data is entered."
5180 PRINT : PRINT "Do you wish to add more data (Y or N)?"
5190 IN$ = INKEY$: IF IN$ = "" THEN 5190
5200 IF IN$ = "N" OR IN$ = "n" THEN 370
5210 IF IN$ <> "Y" AND IN$ <> "y" THEN GOTO 5190
5220 CLS : PRINT "Okay! Data for Year Y1 is being erased!"
5230 Y1 = Y1 + 1
5240 FOR YR = 1 TO 9 : FOR MO = 1 TO 12
5250 DA(YR,MO) = DA(YR+1,MO)
5260 NEXT MO : NEXT YR
5270 FOR MO = 1 TO 12
5280 DA(10,MO) = 0
5290 NEXT MO
5300 YR = 10 : MO = 1
5310 GOTO 1020
5320 ' Routine to find place to add data
5330 CLS : PRINT @ 892 , "Calculating place to Add DATA to file!"
5340 FL = 0
5350 FOR YR = 1 TO 10
5360 FOR MO = 1 TO 12
5370 IF DA(YR,MO) = -99 THEN RY = YR : OM = MO : YR = 11 : MO = 13 : FL = 1
5380 NEXT MO : NEXT YR
5390 IF FL <> 1 THEN GOTO 5160
5400 YR = RY : MO = OM
5410 DA(YR,MO) = 0
5420 GOTO 1020
5430 ' Error handling routine
5440 SCREEN 1:CLS:PRINT:PRINT:PRINT"ERROR #";ERR
5450 PRINT "In line " ; ERL
5460 FOR I = 1 TO 2000 : NEXT I
    
```

Listing 1 continued

Listing 1 continued

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5750 RESUME 370
5760 ' Set to Single or Double Precision
5770 IF DP$ = "Y" OR DP$ = "y" THEN GOTO 5790
5780 DEFSNG D , N : NL = 1000001 : DP = 0 : RETURN
5790 DEFDBL D , N : NL = 100000000000#
5800 ' Check to see if Array has been dimensioned
5810 ' Double Precision (DP = 1) --- If so go back ---
5820 ' If not Dimension Array and Set Flag DP to 1
5830 IF DP = 1 THEN RETURN ELSE DIM DA(10,12) : DP = 1 : RETURN
5840 ' Enable Break Key and End
5850 'SYSTEM "SYSTEM (BREAK=YES)"
5860 CLS : END
5870 IF SWFLG=0 AND AA=7 THEN 2050 ELSE SWFLG=0:CHAIN MERGE "PRINTR",2050,ALL,DELE
TE 1810-2720
5880 IF SWFLG=0 AND AA=13 THEN 1820 ELSE SWFLG=0:CHAIN MERGE "PRINTR",1820,ALL,DEL
ETE 1810-2720
5890 IF SWFLG=1 AND AA<7 OR SWFLG=1 AND AA<13 THEN 1900 ELSE SWFLG=1:CHAIN MERGE
"GCALC",1900,ALL,DELETE 1810-2510

```

End

Program Listing 2. Print routines for Grapher.

```

1810 ' Print Graph on Graphics Printer
1820 CLS : PRINT
1830 ' Give chance to save DATA for protection against loss
1840 PRINT : PRINT : PRINT "You may lose Your Data"
1850 PRINT "if you Proceed to PRINT!"
1860 PRINT : PRINT "Do You want to SAVE it First?"
1870 PRINT "<Y or N>"
1880 IN$ = INKEY$: IF IN$ = "" THEN GOTO 1880
1890 IF IN$ = "Y" OR IN$ = "y" THEN GOTO 1920
1900 IF IN$ < > "N" AND IN$ < > "n" THEN GOTO 1880
1910 GOTO 1930
1920 GOSUB 4910
1930 CLS : PRINT : PRINT "If Printer is ready press <P>."
1940 PRINT : PRINT "To return to MENU press any other key."
1950 IN$ = INKEY$: IF IN$ = "" THEN GOTO 1950
1960 IF IN$ = "P" OR IN$ = "p" THEN GOTO 1990
1970 GOTO 370
1980 ' Check to see if printer is ready
1990 GOSUB 2460
2000 ' Print Graph and Return to Menu
2010 ' Change FILESPEC as required
2020 ' GPRINT/CMD - GPRT2/CMD - GPRT3/CMD
2030 SYSTEM "GPRINT/CMD"
2040 GOTO 370
2050 ' Routine to print report of Data
2060 ' First see if there is Data available to print
2070 IF DA(1,1) = 0 THEN CLS : PRINT @ 912 , "No Data!" : FOR I = 1 TO 500 : NEXT
I : GOTO 370
2080 ' Check to see if data exceeds capacity of report
2090 IF DM > 999999999.99# THEN CLS : PRINT @ 892 , "Data value exceeds capacity o
f report format." : FOR I = 1 TO 500 : NEXT I : GOTO 370
2100 ' Check to make sure printer is ready
2110 GOSUB 2460
2120 ' Check to determine Type Style to use
2130 CLS : PRINT : PRINT : PRINT "Which type style do you want?"
2140 PRINT : PRINT "1 = 16.7 Characters per inch"
2150 PRINT : PRINT "2 = 12 Characters per inch"
2160 PRINT : PRINT : PRINT "Selection <1 or 2>:"
2170 IN$ = INKEY$: IF IN$ = "" THEN GOTO 2170
2180 IF IN$ < "1" OR IN$ > "2" THEN GOTO 2170
2190 IF IN$ = "1" THEN WD = 141 : TB = 40 : TS = 20
2200 IF IN$ = "2" THEN WD = 102 : TB = 20 : TS = 29
2210 CLS : PRINT @ 892 , "Printing data on printer."
2220 ' Set print style
2230 LPRINT CHR$(27) ; CHR$(TS) ;
2240 LPRINT "" : LPRINT "" : LPRINT ""
2250 TA = (WD-LEN(GT$))/2
2260 LPRINT TAB(TA) 'GT$
2270 LPRINT ""
2280 TT$ = "Data represents " + ST$
2290 TA = (WD-LEN(TT$))/2
2300 LPRINT TAB(TA) TT$
2310 LPRINT "" : LPRINT ""
2320 SS = 1 : YY = Y1 : Z = 1 : ZZ = 1
2330 TA = TB + 2 : LPRINT TAB(TB-12) "Month" ; : FOR I = Z TO Z + 4 : LPRINT TAB(T
A) YY ; : YY = YY + 1 : TA = TA + 16 : NEXT I
2340 LPRINT "" : LPRINT ""
2350 FOR MO = 1 TO 12 : LPRINT TAB(TB-12) M$(MO) ;
2360 TA=TB-20:FOR YR=ZZ TO ZZ+4:TA=TA+16:IF DA(YR,MO)--99 THEN LPRINT TAB(TA) USIN
G UP$;0;ELSE LPRINT TAB(TA) USING UP$;DA(YR,MO);
2370 NEXT YR
2380 LPRINT "" : LPRINT ""
2390 NEXT MO
2400 LPRINT "" : LPRINT ""
2410 IF SS = 2 THEN GOTO 370
2420 IF DA(YR,MO-1) = 0 THEN GOTO 370
2430 SS = SS + 1 : Z = 6 : ZZ = 6 : YY = Y1 + 5
2440 GOTO 2330
2450 ' Routine to prepare printer
2460 CLS : PRINT : PRINT : PRINT : PRINT
2470 PRINT "Turn on Line Printer"
2480 PRINT : PRINT : PRINT "Press any key." : PRINT : PRINT : PRINT "
To return to the MENU press <X>."
2490 I$ = INKEY$: IF I$ = "" THEN GOTO 2490
2500 IF I$ = "X" OR I$ = "x" THEN GOTO 370
2510 RETURN

```

End

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Program Listing 3. GraphCalc module.

```

1810 ' Calculate Scale of Graph
1820 SC = Scale
1830 NT = Top Number
1840 NB = Bottom Number
1850 NR = Range of Numbers
1860 NH = Highest Value of Data
1870 NL = Lowest Value of Data
1880 ' Establish desire for grid lines on Graph
1890 ' Check to determine if there is Data to graph
1900 IF DA(1,1) = 0 THEN CLS : PRINT @ 912 , "No Data" :
FOR I = 1 TO 500 : NEXT I : GOTO 370
1910 CLS :PRINT :PRINT :PRINT " Do you want grids on your
graph?"
1920 IN$ = INKEY$ : IF IN$ = "" THEN GOTO 1920
1930 IF IN$ = "y" OR IN$ = "Y" THEN GOTO 2000
1940 ' If grid lines not desired skip to next routine
1950 IF IN$ = "n" OR IN$ = "N" THEN GOTO 2110
1960 GOTO 1920
1970 ' If BAR or ANNUAL LINE graph
1980 ' Skip request for Vertical grids
1990 ' and set Horizontal Flag to yes
2000 IF AA = 8 OR AA = 10 OR AA = 11 THEN HG$ = "Y" : VG$
= "N" : GOTO 2130
2010 PRINT:PRINT"Do you want HORIZONTAL grids? <Y or N>?"
2020 HG$ = INKEY$ : IF HG$ = "" THEN GOTO 2020
2030 IF HG$ = "y" OR HG$ = "Y" THEN GOTO 2050
2040 IF HG$ <> "n" AND HG$ <> "N" THEN GOTO 2020
2050 PRINT : PRINT "Do you want VERTICAL grids? <Y or N>?"
2060 VG$ = INKEY$ : IF VG$ = "" THEN GOTO 2060
2070 IF VG$ = "y" OR VG$ = "Y" THEN GOTO 2130
2080 IF VG$ = "n" OR VG$ = "N" THEN GOTO 2130
2090 GOTO 2060
2100 ' If grids not desired set flags to NO
2110 HG$ = "N" : VG$ = "N"
2120 ' Zero scaling variables
2130 CLS : NH = 0 : NB = 0 : NT = 0
2140 ' Calculate highest and lowest values of DATA
2150 PRINT : PRINT @ 892 , "Calculating Highest and Lowest
Values"
2160 FOR YR = 1 TO 10
2170 FOR MO = 1 TO 12
2180 IF DA(YR,MO) = -99 THEN YR = 11 :MO = 13 :GOTO 2210
2190 IF NH < DA(YR,MO) THEN NH = DA(YR,MO)
2200 IF NL > DA(YR,MO) THEN NL = DA(YR,MO)
2210 NEXT MO : NEXT YR
2220 ' Check to determine method of Scaling Graph
2230 ' Manual Scaling - Computer Determines Scale
2240 IF NH > 500 THEN GOTO 2330
2250 CLS : PRINT @ 892 , "How do you want to set the Graph
Scale?"
2260 PRINT : PRINT "Do it <M>anually."
2270 PRINT "Have the <C>omputer do the work."
2280 PRINT : PRINT "What is your choice? <M or C>"
2290 IN$ = INKEY$ : IF IN$ = "" THEN GOTO 2290
2300 IF IN$ = "C" OR IN$ = "c" THEN GOTO 2460
2310 IF IN$ <> "M" AND IN$ <> "m" THEN GOTO 2290
2320 ' Routine to Manually Determine Scale Values
2330 CLS : PRINT : PRINT "Routine to set Scale Values."
2340 PRINT : PRINT
2350 PRINT "The lowest value of your data = " ;
2360 PRINT USING UP$ ; NL
2370 INPUT"what do you want for the bottom SCALE Value";NB
2380 IF NB > NL THEN PRINT "Value too high!" :GOTO 2370
2390 PRINT : PRINT "The highest value of your data = " ;
2400 PRINT USING UP$ ; NH
2410 INPUT "what do you want for the top SCALE Value" ; NT
2420 IF NT < NH THEN PRINT "Value too low!" : GOTO 2410
2430 GOTO 2680
2440 ' Routine for the Computer to Determine Scale
2450 ' Establish value of Top Scale Number
2460 IF NH = < 5 THEN NT = 5 : GOTO 2580
2470 IF NH = < 10 THEN NT = 10 : GOTO 2580
2480 IF NH = < 15 THEN NT = 15 : GOTO 2580
2490 IF NH = < 25 THEN NT = 25 : GOTO 2580
2500 IF NH = < 50 THEN NT = 50 : GOTO 2580
2510 IF NH = < 75 THEN NT = 75 : GOTO 2580
2520 IF NH = < 100 THEN NT = 100 : GOTO 2580
2530 IF NH = < 200 THEN NT = 200 : GOTO 2580
2540 IF NH = < 300 THEN NT = 300 : GOTO 2580
2550 IF NH = < 400 THEN NT = 400 : GOTO 2580
2560 NT = 500
2570 ' Establish value of Bottom Scale Number
2580 IF NL = < 25 THEN NB = 0 : GOTO 2680
2590 IF NL = < 50 THEN NB = 25 : GOTO 2680
2600 IF NL = < 75 THEN NB = 50 : GOTO 2680
2610 IF NL = < 100 THEN NB = 75 : GOTO 2680
2620 IF NL = < 200 THEN NB = 100 : GOTO 2680
2630 IF NL = < 300 THEN NB = 200 : GOTO 2680
2640 IF NL = < 400 THEN NB = 300 : GOTO 2680
2650 NB = 400
2660 ' Establish Range of Numbers between Top and Bottom
2670 ' Scale Values
2680 NR = NT - NB
2690 ' Determine Scale Multiplier for use in calculating
2700 ' Y axis for graphs
2710 ' 200 Pixels High divided by Range of Numbers
2720 SC = 200 / NR

```

End

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Program Listing 4. Changes for the Models 1000 and 1200.

Listing 1

Insert line 1 KEY OFF to clear the screen labels.

For reading clarity, I use only three lines on the annual line graph with an option to choose which years to graph. I use &HFFFF, &HF0F0, and &H8FF8 only in the LI array.

Add the following lines:

```
1 REM Model 1000/1200 Conversion by Beve Woodbury, 80 Micro Staff
622 IF AA=8 OR AA=10 THEN GOSUB 6000
Move lines 4000-4090 to end of program (6000-6090),
changing 4010 SCREEN 1 to 6010 KK=1
6062 IF AA=8 AND YN=0 THEN LG(KK)=0 : KK=1 : YN=Y1 : RETURN
6100 IF AA<8 THEN YQ=YR : RETURN
6110 PRINT: PRINT "You may choose up to 3 years to graph or
enter 0 to end"
6120 LG(KK)=YR : KK=KK+1
6130 IF KK<4 THEN PRINT : PRINT : GOTO 6030
6140 KK=1 : RETURN
```

Add line 375 SCREEN 2: LINE (0,190)-(639,199),0,BP to erase the bottom line of the graph.

Change disk drive specifications to A and B in lines 4710, 4750, 4900, and 5020.

Delete lines 150, 160, 310, 320, 2020, 2030, 3440, 3530-3570, 3590-3600, 4110, 4190, 4500, 4550-4580, 4720, 4730, 4990, 5000, 5040, and 5050.

Change all PRINT@ nnn and PRINT 0-3 statements to PRINT.

Eliminate the Redisplay Graph and Print Graph options.

Edit 630 to remove the 12th and 13th line numbers, and change the option number for Exit to 12.

Make the following changes:

```
550 PRINT
580 PRINT
2760 LINE (0,0)-(639,199),1,B
2780 PT=INT(79-(LEN(GTS)))/2: LOCATE 2,PT
2810 LINE (99,19)-(580-179),1,B
```

```
2910 FOR Y=3 TO 23 STEP 2
2920 LOCATE Y,7
3000 IF HGS="Y" OR HGS="y" THEN QX=Y*8-6:LINE(99,QX)-(
500,QX)
3020 LOCATE Y,13
3040 LOCATE Y,74
3080 FOR X=151 TO 535 STEP 48
3090 IF VG$="Y" OR VG$="y" THEN LINE
(X,20)-(X,100),1,,LI(6)
3120 FOR Y=1 TO LEN(NTS)
3130 LOCATE Y+3,77:PRINT MIDS(NTS,Y,1) :NEXT Y
3150 LOCATE 2,10
3250 FOR X=15 TO 70 STEP 5
3260 LOCATE 24,X
3270 PRINT MS(I);
3310 LOCATE 3,3
3330 LINE (9,14)-(40,25),1,B
3360 YR=LG(KK) : YK=5 : YQ=Y1+YR-1 : KY$=STR$(YQ) : QQ=1
3390 LOCATE YK,1
3420 QX=YK*8
3430 LINE (1,QX)-(48,QX),,,LI(QQ)
3450 XP=112 : X=153 : YP=179-((DA(YR,1)-NB)*SC)
3480 Y=179-((DA(YR,MO)-NB)*SC)
3490 LINE (XP,YP)-(X,Y),,,LI(QQ)
3510 X=X+41
3620 YK=YK+2
3630 KK=KK+1 : YR=LG(KK) : YQ=Y1+YR-1 : KY$=STR$(YQ) :
QQ=QQ+1
3640 IF KK=4 OR LG(KK)=0 THEN 3660
3720 FOR X=14 TO 60 STEP 6
3730 LOCATE 24,X
3740 PRINT YA;
3780 XP=100 : X=114 : YP=179-((DA(1,1)-NB)*SC)
3850 Y=179-((DA(1,1)-NB)*SC)
3880 LINE (XP,YP)-(X,Y)
3950 FOR X=15 TO 70 STEP 5
3960 LOCATE 24,X
3970 PRINT M
```

Listing 2

Delete lines 2000-2040.

Listing 3

Change 200 to 160 in lines 2710 and 2720.

End

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	DEFB	ODH "
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In the Chips: A CMOS Single-Board Computer

CMOS (complimentary metal oxide semiconductor) chips represent the state of the art in microprocessors. With their many advantages over standard MOS and bipolar technology, including low power consumption, CMOS systems are becoming increasingly popular. The popularity of lap-size portable microcomputers (the Radio Shack Models 100 and 200, for example) has been made possible by recent advances in CMOS technology. In this two-part project, I'll describe building a CMOS single-board computer that features low power consumption but offers many capabilities. You'll find it ideal for prototyping CMOS circuits and in real-world control applications.

This month, I'll describe the computer's component parts; next month, I'll cover building and operating the board.

The single-board computer (see the Photo), the DR800, is based on the NSC800 microprocessor from National Semiconductor Corp. (now second-sourced by Standard Microsystems). This advanced 8-bit CMOS processor combines features of both the Z80 and the 8085, with some useful capabilities of its own. Besides the obvious things like RAM and ROM, the DR800 board also contains two UARTs (for asynchronous serial communication) with RS-232C interfaces and jumper-selectable baud rates, as well as an NSC810 peripheral chip, which contains RAM, timers, and input/output (I/O) lines. For more information about the NSC800 microprocessor family, I highly recommend *The NSC800 Microprocessor Cookbook* (TAB Books, Blue Ridge Summit, PA 17214, \$12.95).

The NSC800 Microprocessor

Figure 1 shows the pinout of the NSC800. From a software (and consequently, register structure) point of view, the NSC800 appears much like a

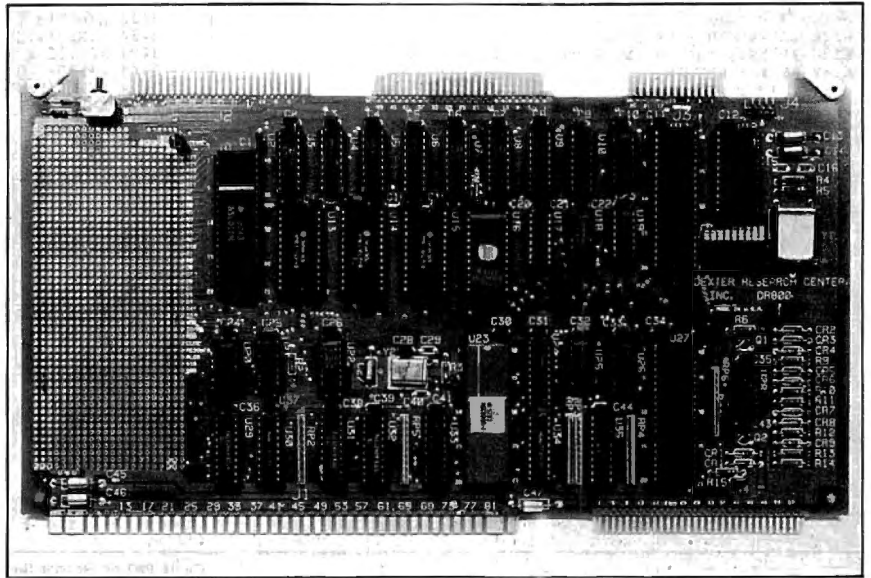


Photo. The DR800 single-board computer.

Z80 microprocessor. It executes the entire Z80 instruction set (at both the source and object code levels) and implements all three of the Z80's inter-

rupt modes. Like the Z80, it has dynamic RAM refresh capability. The NSC800, however, has an 8-bit refresh register, instead of 7 bits like the Z80, permitting easy refresh of dynamic RAMs that require 8-bit refreshing.

From a hardware standpoint, the NSC800 microprocessor is similar to the Intel 8085 microprocessor. Like the 8085, it has a multiplexed address/data bus, five interrupt inputs, and an on-chip crystal oscillator (requiring only an external crystal for operation). It also has similar bus timing, allowing it to work with any of the many 8085 family of peripheral devices. This is particularly advantageous now that you can get many of these peripheral devices in CMOS versions.

The Multiplexed Address/Data Bus

The NSC800 (like the 8085) has multiplexed address/data lines. The eight data lines (D0-D7) share the same physical pins as the low-order eight address lines (A0-A7). During the first part of a memory cycle, the processor puts the 16-bit address on the address lines (or address/data lines). Then, the

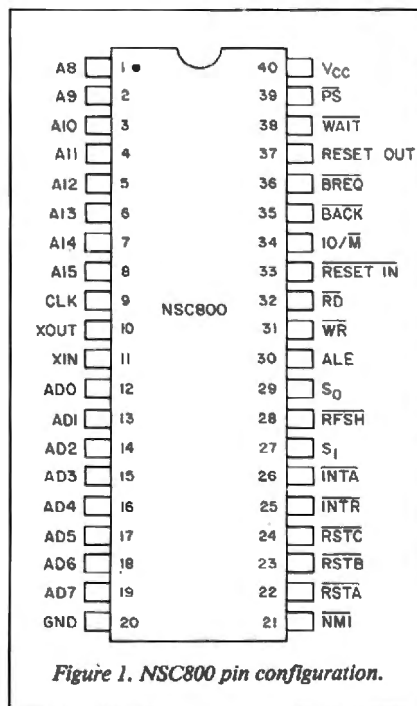


Figure 1. NSC800 pin configuration.

address latch enable signal (ALE/) goes low, latching the low-order eight address lines to an external 8-bit latch (this is called demultiplexing). The high-order address lines (A8-A15) remain active throughout the cycle. During the second portion of the memory cycle, the processor (for a write cycle), a peripheral, or a memory device (for a read cycle) puts data on the address/data lines, which act strictly as data lines at this time.

The I/O cycles work similarly, although you don't need an external latch for addressing I/O devices. Since I/O devices require only an 8-bit address, the address appears on both the low-order and high-order address lines. You can use the high-order address lines for I/O device address decoding, eliminating the need for bus demultiplexing during I/O cycles. Like the Z80 (but unlike the 8085), the processor automatically inserts a single wait state during every I/O cycle.

Bus multiplexing frees up other pins and so increases the chip's capabilities. For an 8-bit processor, the only pin cost for multiplexing is the addition of a demultiplexing signal, the ALE/ signal in the case of the NSC800. The processor has seven more pins free for other uses. The NSC800 puts these free pins to good use, providing several features not available on the Z80. These include advanced cycle status signals, crystal oscillator pins, three more interrupt inputs than on the Z80, a reset out line, and a power save line.

Intel has adopted bus multiplexing as a standard feature in all its microprocessors since the 8080. The 8085, as well as all current members of the 8086 family (including the 80186 and 80286 processors), have multiplexed buses. The Zilog Z8000 processors have multiplexed buses, too.

In contrast, all Motorola processors have non-multiplexed buses. Motorola claims that it can achieve higher performance by not multiplexing the buses (though Intel denies this). Motorola is probably right, but the difference is only significant in certain high-performance systems. I don't think many 8-bit systems are significantly affected by processors with multiplexed buses.

The NSC800 Advanced Cycle Status Lines

The NSC800, like the 8085, has two

Motorola claims it achieves higher performance by not multiplexing its buses.

advanced cycle status lines, S0 and S1. These signals provide advance information as to the type of bus cycle about to start. The pins are decoded as follows:

S1	S0	Cycle Starting
0	0	Halt
0	1	Write
1	0	Read
1	1	Opcode fetch

These signals, along with the I/O or memory signals indicate the exact cycle coming up (I/O write, memory read, and so on).

The NSC800 Interrupt Structure

The interrupt structure is a combination of the Z80 and the 8085. Like the Z80, you can choose from three interrupt modes. Like the 8085, this chip includes five interrupt inputs (compared with two on the Z80), three of which are prevectorored (called restart interrupts). These have preassigned locations to which they vector when an interrupt occurs.

The remaining two interrupt inputs are like those of the Z80: nonmaskable (NMI/) and maskable (INTR/). You can't disable the nonmaskable interrupt under software control (i.e., you can't mask it), and it's generally reserved for system emergencies such as power failure processing. All remaining NSC800 interrupts are maskable, meaning you can individually enable or disable them under software control.

The three restart interrupt inputs are RSTA/, RSTB/, and RSTC/. These interrupt inputs have specific vector locations, corresponding to those of the 8085 interrupt inputs (RST 7.5, RST 6.5, and RST 5.5). While the vector locations for the corresponding NSC800 and 8085 interrupt inputs are the same, interrupt triggering is slightly different between the processors.

When an interrupt occurs on one of these restart interrupt lines (assuming you've enabled the interrupt), the processor makes a call (or restart) to the respective vector address, where it expects the start of the interrupt service

routine. Also, all further maskable interrupts are disabled at this time.

On completion of interrupt servicing, the interrupt service routine (ISR) must explicitly reenable interrupts before returning, if further interrupts are to be allowed. The vector locations corresponding to the three Restart interrupt inputs are:

RSTA/	003CH
RSTB/	0034H
RSTC/	002CH

Typically, a jump instruction is at the specified vector location, causing execution to branch to a service routine elsewhere in memory.

The nonmaskable interrupt also vectors to a predetermined address when activated: address 0066 hexadecimal (hex). When a nonmaskable interrupt occurs, it disables the maskable interrupts. This is true for the Z80 as well as the NSC800.

The INTR/ input (which operates the same as the Z80's INT/ input) is the most versatile of the interrupt inputs. There are three software-selectable modes of operation. Mode zero, or 8080A-compatible mode, handles interrupts like the 8080A (and 8085) microprocessor. Mode 1, or Restart Input mode, handles interrupts as a restart interrupt (like the other restart interrupts) with a vector to location 0038 hex. Mode 2, or Indirect Call mode, is the most versatile of the interrupt modes, letting you put an interrupt vector table anywhere in memory.

Mode zero is the default mode when you reset the NSC800, and it makes the processor respond in the same manner as the 8080A (or 8085) does to an external interrupt. When an interrupt occurs, the processor acknowledges the interrupt by bringing its interrupt-acknowledge (INTA/) line low. This line acts as a read strobe to the interrupt control circuitry, which responds by putting an instruction (or the first byte of a multiple-byte instruction) on the data bus. The processor then reads in the opcode value on the data bus lines at the rising edge of INTA/ time, and invokes additional INTA/ cycles if the opcode indicates a multiple-byte instruction.

The instruction given to the processor is generally some form of a call to the ISR. Most systems use the restart instructions, since these are 1-byte call instructions to predetermined memory locations (in memory

page zero). Using the restart instructions simplifies interrupt hardware requirements. Other systems use devices like the Intel 8259A interrupt controller, which provides a full 3-byte call instruction, allowing a call to virtually any memory address.

Interrupt mode 2 offers the greatest amount of flexibility. This mode uses the NSC800's special interrupt register. When a device interrupts the processor, the INTA/ line goes low to acknowledge the interrupt. The device (or other external interrupt control circuitry) must then put an interrupt vector on the data bus (this vector must be even, by convention).

The vector is the low-order byte of an address, whose high-order byte is in the processor's interrupt register. The processor then looks at the memory location to which the formed address points, and here it finds another address stored—the actual address of the interrupt service routine.

The processor then calls the ISR to service the interrupt. This gives you great flexibility, since you can put the interrupt vector table and the interrupt service routine almost anywhere in memory. The Zilog Z80 support chips (the SIO and PIO devices) are designed to work under this interrupt mode.

The NSC800 Power Save Feature

Being a CMOS device (manufactured using National's proprietary P2 CMOS technology), the NSC800 is inherently low in power consumption. One of the properties of CMOS devices, however, is that they consume more power when the transistors switch than when they remain in a static state (either high or low). Since the NSC800 is a timed device using a fast clock signal for internal synchronization, it uses more power during processor operation than if the clock were stopped and the internal transistors stopped switching. The NSC800 provides such a feature with its power save (PS/) input.

When the NSC800's PS/ line is pulled low, the current instruction is completed. Then the internal clock is disabled so that almost no internal switching takes place (the oscillator still operates and provides the CLK output to the rest of the system). This reduces power consumption roughly by half, saving a considerable amount of power. During this, the processor

The NSC810 offers several features not often found on I/O devices such as the 8255A.

preserves all registers and internal processor status values, letting the NSC800 continue execution where it left off when the PS/ line returns to its inactive (high) state. Many systems use a timer (such as on the NSC810, described below) to deactivate the NSC800 for a period of time, then reactivate it to handle anything that needs service. This periodic deactivate/reactivate cycling can save a lot of power.

The NSC810 RAM-I/O Timer

The NSC810 pinout appears in Fig. 2. The NSC810 peripheral device is a versatile member of the NSC800 family, containing 128 bytes of RAM, 22 I/O lines and two 16-bit timers. It also has on-chip demultiplexing circuitry, making it particularly simple to interface to the NSC800 microprocessor.

There are three I/O ports on the NSC810: two 8-bit ports (ports A and B) and a single 6-bit port (port C). Unlike the Intel 8255A programmable peripheral interface described in previous Project 80 projects, you can select the direction of the NSC810 I/O lines on a line-by-line basis, instead of

on a port-by-port basis, as on the 8255A. While ports A and B are free for use as general-purpose I/O lines, each of the port C lines has a dual function. The function assigned to each line is determined by the desired features of the NSC810 selected by software.

PC0 (port C, bit zero) doubles as an INTR/ (interrupt request) line, allowing the NSC810 to interrupt the NSC800 under certain, programmable conditions. PC1 doubles as a buffer full (BF) handshaking line when communicating with other devices requiring handshaking. PC2 doubles as a strobe (STB/) input handshaking signal from an external device. PC3 doubles as a gate signal for the internal timers, letting you enable or disable timer operation through external circuitry. PC4 and PC5 double as the timer 1 input line and timer 1 output line, respectively. Timer zero has separate input and output pins.

The NSC810 also offers several other features not often found on typical I/O devices, such as the 8255A. One useful feature is the ability to selectively set and clear individual bits in each port. By writing a byte to the bit set register of a particular port, for example, the bits in the port corresponding to set bits in the written byte are turned on, without affecting other bits in the same port.

Ports B and C are always in the Basic I/O mode, so you can use the port bits only as general-purpose I/O bits. Port A, however, has four possible modes of operation: mode zero, the Basic I/O mode; mode 1, the strobed mode input; mode 2, the strobed mode output, active bus; and mode 3, the strobed mode output, tristate bus. Mode zero is the same as the other NSC810 ports, permitting general-purpose use of the bits. The processor can selectively turn on or off bits and check the status of port bits.

Mode 1 allows external devices to write data to the NSC810 and strobe (latch) the data into port A via the PC2 strobe (STB/) input line. Mode 2 allows the NSC810 to write to other devices and indicate data validity via the PC1 buffer full (BF) signal. In mode 2, the port A output lines are always active. Each bit always has either a 1 or zero value on it, and it's never in the high-impedance state. Mode 3 is similar to mode 2, but the port A lines

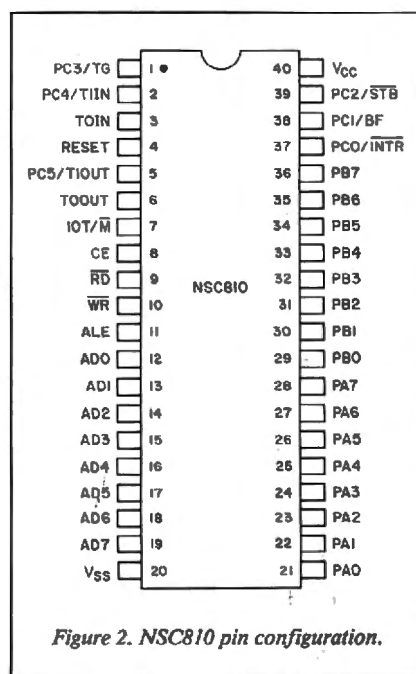


Figure 2. NSC810 pin configuration.

PROJECT 80

Circle 136 on Reader Service card.

Quantity	Description	Distributor	Part Number	Price (each)
1	NSC800 microprocessor (2.5 MHz)	DK	NSC800N	\$20.81
1	NSC810 RAM I/O timer (2.5 MHz)*	AE	NSC810N	20.81
2	6402 CMOS UARTS	JDR	IM6402	7.95
1	MC14411 baud-rate generator	JDR	MC14411	11.95
1-3	6116 2K by 8 CMOS static RAMs (200 ns)	JE	HM6116-4	4.75
2	74HC244 octal tristate buffers (HS CMOS)	JE	74HC244	2.59
1	74HC245 octal tristate transceiver (HS CMOS)	JE	74HC245	2.59
1	74HC373 tristate octal d-type latch (HS CMOS)	JE	74HC373	2.69
1	74HC00 quad two-input NAND gate (HS CMOS)	JE	74HC00	.59
1	74 HC02 quad two-input NOR gate	JE	74HC02	.59
1	74HC04 hex inverter (HS CMOS)	JE	74HC04	.59
1	74HC08 quad two-input AND gate (HS CMOS)	JE	74HC08	.59
4	74HC138 3-to-8 line decoders (HS CMOS)	JE	74HC138	1.19
1	74HC157 quad 2-to-1 multiplexer (HS CMOS)	JE	74HC157	.99
2	74LS240 inverting tristate bus buffers (LS TTL) IC	JDR	74LS240	.95
1	74LS244 octal tristate buffer (LS TTL) IC	JDR	74LS244	1.29
1	74LS640 octal bus transceiver (inverting LS TTL)	JDR	74LS640	2.20
1	TIL064 quad op-amp (high-speed; Texas Instruments)*	AE	TIL064	.99
11	1N914 small signal diodes†	RS	276-1122	.10
1	1.8432 MHz crystal	JDR		3.95
1	4.0 MHz crystal	DK	X006	2.95
5	10k ohm nine-element resistor network (SIP)	DK	Q9103	.42
1	3.3k ohm nine-element resistor network (SIP)	DK	Q9332	.42
2	1k ohm resistors (.25 watt)	RS	271-1321	.08
2	6.8k ohm resistors (.25 watt)	DK		.05
4	10k ohm resistors (.25 watt)	RS	271-1335	.08
1	15k ohm resistor (.25 watt)	DK		.05
1	27k ohm resistor (.25 watt)	DK		.05
1	1m ohm resistor (.25 watt)	DK		.05
1	15m ohm resistor (.25 watt)	DK		.05
3	22 pF/500 V disc capacitors	DK	P4004	.08
1	68 pF/50 V disc capacitor	JDR		.05
36	.1 μF/50 V disc capacitors	RS	272-135	.25
1	10 μF/35 V electrolytic capacitor (PC mount)	RS	272-1025	.59
1	Momentary contact SPST switch (mini)	RS	275-1571	.80
1	DR800 PC board ‡	WDS	DR800PC	89.95
1	DR800 monitor in 27C32 EPROM‡	WDS	DR800MON	27.95

* Arrow Electronics orders are generally shipped COD. Call or write in advance to determine current pricing and availability.

† A 1N4148 diode is a direct replacement in this application.

‡ Add \$2 shipping and handling for board orders and \$1 shipping and handling for EPROM orders. A board purchase includes the DR800 manual. The manual is also available separately for \$5 plus 50 cents shipping and handling. A document source listing of the DR800 Monitor program is also available for \$5 plus 50 cents shipping and handling.

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

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

JDR Microdevices, 1224 S. Bascom Ave., San Jose, CA 95128, 800-538-5000 or 408-995-5430 outside CA; 800-662-6279 inside CA.

Jameco Electronics (JE), 1355 Shoreway Road, Belmont, CA 94002, 415-592-8097.

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

Washtenaw Digital Systems, P.O. Box 2014, Ann Arbor, MI 48106.

Table. Parts list and ordering information.

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PROJECT 80

remain in their high-impedance state until the STB/ signal goes low, indicating that the external device is ready for more data.

The NSC810 also has two versatile 16-bit timers. These timers, timer zero and timer 1, have six operating modes, providing a great deal of timing and counting flexibility. They are event counter, accumulative timer, restart-

minimal emulation software) through one serial port, while the second serial port connects to an external host system. Through various commands, you can download program object code from the host system into the DR800's RAM to permit program checking and debugging. In addition, the two serial ports have independent baud-rate selection.

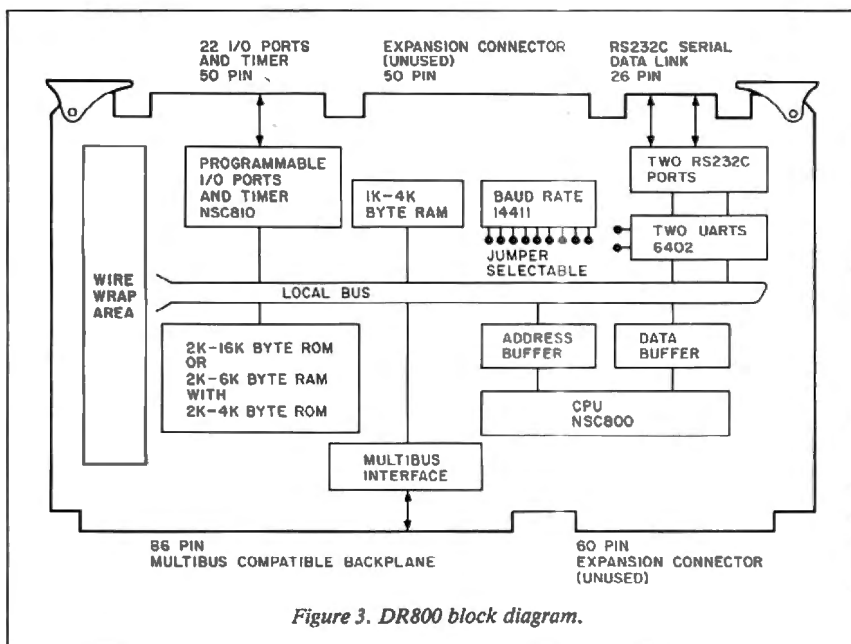


Figure 3. DR800 block diagram.

able timer, one-shot, square wave, and pulse generator. These modes cover most applications.

The DR800 CMOS Single-Board Computer

The DR800 CMOS single-board computer is designed as a development tool for circuit prototyping, an aid in developing NSC800-based systems, or merely as a computer training tool. You'll also find it useful as a system controller for any number of applications. Because of its qualities, it works well in industrial control. A monitor ROM (described later) is also available to permit easy program downloading from a host system, as well as many debugging features such as memory viewing, alteration, and program breakpointing. The DR800 block diagram is shown in Fig. 3.

I purposely put two serial ports on the board for easy program development. With the development ROM installed, the user normally communicates to the system monitor with a terminal (or microcomputer with ter-

Another feature important for a board such as this is the ability to communicate and work with other special-function boards already available. This means implementing a standard bus interface on the board. To keep the board to a reasonable complexity level, I chose to implement a subset of the Multibus standard. The primary shortcoming is in the lack of the XACT/ (transfer acknowledge) handshaking line (waiting for a device to be ready) and in interrupt handshaking. The NSC800 interrupt and WAIT/ lines are brought out to reserved Multibus pins for those who want to use them, however.

It is my feeling that the board should be able to communicate with most Multibus peripheral boards without using the XACK/ handshaking line, since the DR800 board runs relatively slowly (at 2 MHz). I haven't had any problems working with the few Multibus memory and peripheral boards I've tried.

Multibus, incidentally, was developed by Intel and is an Intel trademark.

PROJECT 80

Coming Up

Next month's installment of Project 80 will include instructions for building and operating the computer as well as schematics for the board. ■

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

CMOS Single-Board Computer References

NSC800 and NSC810 data sheets at no charge:

National Semiconductor Corp.
2900 Semiconductor Drive
Santa Clara, CA 95051

6402 data sheet at no charge:

Intersil Inc.
1272 Forgewood Ave.
Sunnyvale, CA 94086

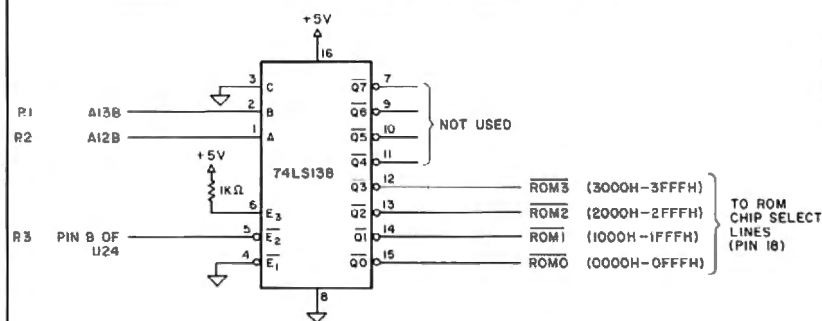


Figure a. Changes to printer buffer circuit for additional ROM space. All four ROM sockets are wired the same as the ROM socket shown in Fig. 5c of the original schematics, except that they each get different chip select signals, and the pin 21s can all be tied to A11B without a jumper.

Below are listed changes necessary to complete the printer buffer in the September 1984 Project 80 (p. 102).

- You need five 1k ohm resistors instead of the three indicated in the parts list. You need four if you don't use Ropt as described in the text.

- You don't need a 10k ohm resistor, though one is indicated in the parts list.

- R10 is the 4.7k ohm resistor used to pull up NMI/, BUSREQ/ and WAIT/ on the Z80 (U1), although it isn't marked R10.

- The parts list mentions two quad two-input AND gates with the part number 74LS04. This should be two quad two-input NAND gates with the part number 74LS00.

- Some readers had trouble finding the U29 on the schematic. U29 is not a true IC, but merely a delay line, shown near the lower 74LS157 (U13) in Fig. 5d.

- A note about the 74LS51 gates (U31) in Fig. 5e: Each gate consists of two AND gates and one NOR

gate. The combination of these, all on the same chip (actually two per chip), is called an AND-OR-INVERT gate.

- I have had some requests for copies of my original schematics if the ones redrawn in *80 Micro* were in error. As far as I can tell, the schematics are reproduced identically.

- Some readers have asked about the additional circuitry required for the extra ROM space I mentioned in the column. If you need more than the 4K offered by the 2723A, you can add the circuitry shown on the schematic diagram (Figure a). This circuitry gives you up to four 2732As in your system, with up to 16K of ROM space. Note that the circuitry is designed only for 2732As, not for 2716s. All of the ROM sockets should be wired the same as the ROM socket shown in Fig. 5c of the original schematics, except that you should connect all of the pin 21s to A11B. This way, each socket gets its own chip select signal (pin 18). ■

Circle 102 on Reader Service card.

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Uploading and Downloading The Express Way

Any data base is a constant source of stress on your software, especially when it's part of the software that keeps your bulletin board system (BBS) up and running. The most demanding part of any BBS, the data base, is where callers use bulk transfers to upload and download files. Now that your board is so close to completion, it's time that we discussed the data base in detail, with code included.

To achieve a better understanding of the data base's involvement, first consider data storage and transmission. Your BBS stores bytes received from callers in a Basic string before writing them to disk. As you saw in earlier issues of the BBS Express, your board responds to an XOFF character in time to stop data transmission so that characters in transit to or from the caller aren't lost.

This is important when you consider a 300-baud transmission. At 300 baud, there's a bit coming in approximately every .0033 seconds. Electricity travels about 621 miles in this time span; if the call is routed through a satellite whose round trip orbit is 45,000 miles, it takes an electrical signal about a quarter second to make the trip. This translates to the time it takes to transmit seven characters, meaning that the BBS has to reserve at least that amount of space to catch the pipeline material.

In terms of the data base, this is important because material transmits at computer speed, not typing speed. Before the BBS receives the material, however, it needs a file name to assure a place on the board's data base cata-



Program Listing. BBS module for the data base catalog.

```

1180 GOSUB260
1190 AC=0:LSET CKS=CM$:PRINT"Searching...":EN=DS:GOSUB940:IF ER
THEN CLOSE:PRINT"No such file.":RETURN
1200 IF (WZ) OR (PI$="PASSWORD ") THEN 1220
1210 PRINT"FILE PASSWORD PROTECTED":PRINT"Password: ";:GOSUB130:
PRINTCHR$(17):IF LEFT$(I$,16)<>PI$ THEN PRINT"Access denied":RET
URN
1220 AC=-1:RETURN
3710 IF CM$<>" THEN 3730
3720 CLOSE:PRINT"ACCESS Command (? for HELP): ";:GOSUB130:PRINTC
HRS(17):IF CT=0 THEN 3720 ELSE CM$=LEFT$(I$,CT)
3730 GOSUB300
3740 ONINSTR("$SUDEC",CS)GOTO4160,3760,3960,1720,4020
3750 PRINT"? - Prints this list":PRINT"U - Upload to Towne Crier":
PRINT"D - Download from Towne Crier":PRINT"E - Exit XA space":
PRINT"C - Catalog":GOTO3720
3760 CCI=0:GOSUB260
3770 IF CM$<>" THEN 3790
3780 PRINT"Filename: (20 max)";:GOSUB130:PRINTCHR$(17):IF CT=0 TH
EN 3720 ELSE CM$=LEFT$(I$,CT)
3790 LSET CKS=CM$:EN=DS:GOSUB940:IF ER THEN 3810
3800 PRINT"That name is in use.":PRINT"Please choose another.":G
OTO3780
3810 TL=0:PRINT"Description: (128 max)";:GOSUB130:PRINTCHR$(17):T
L=-1:IF CT=0 THEN 3810 ELSE DC$=LEFT$(I$,CT)
3820 CLS:PRINTCHR$(12):CKS=PRINTDC$:PRINT"Correct (y/n)? ";
3830 GOSUB130:PRINTCHR$(17)
3840 IF ASC(I$)-78 THEN 3780
3850 IF ASC(I$)<89 THEN 3830
3860 AS="XA000/BBS"+DS:ND=ND+1:MN=ND:GOSUB860:LSET F2$=A$:LSET
N1$=CK$:LSET D1$=DC$:LSET XA$=MKI$(0):LSET PI$="PASSWORD"
3870 IF SY THEN TL=-1:PRINT"Password (Default to none)";:GOSUB13
0:PRINT CHR$(17):IF CT>0 THEN LSET PI$=I$
3880 DS=DS+1:PUT 2,DS
3890 CLS:PRINTCHR$(12);"One moment please...":TL=0:NC=-1
3900 OPEN"O",3,AS
3910 PRINT"Ready to receive.":PRINT"Enter /EX to end."
3920 GOSUB130
3930 ILEFT$(I$,3)="/EX"ORLEFT$(I$,3)="/ex"THEN3950
3940 PRINT#3,LEFT$(I$,CT);:CCI=CCI+CT:GOTO3920
3950 GET 2,DS:LSET LP$=MKI$(0):LSET RP$=MKI$(0):LSET XL$=MKSS(CC
1):PUT 2,DS:TL=-1:NC=0:PRINTCHR$(17);:EN=DS:GOSUB870:CLOSE:GOTO3
720
3960 IF DS=0 THEN PRINT"No data files available.":GOTO3720
3970 IF CM$<>" THEN 4000
3980 PRINT"Filename to download ";:GOSUB130:PRINTCHR$(17):IF CT=
0 THEN 3720 ELSE CM$=LEFT$(I$,CT)

```

Listing continued

System Requirements

Model III

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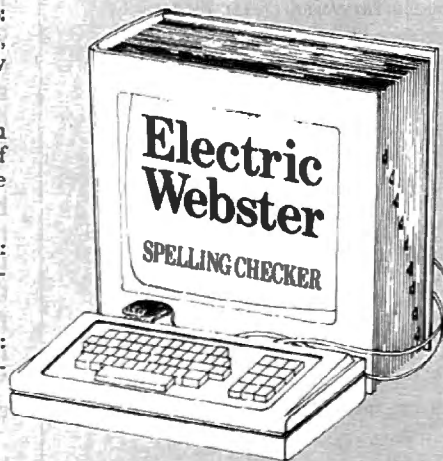
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Listing continued

```

4000 GOSUB1100:IF NOTAC THEN 3720
4010 LSET XA$=MKIS(CVI(XA$)+1):PUT 2,MR:OPEN"1",3,F2$+DDS:GOSUB4
860:GOTO3720
4020 GOSUB260:GOSUB4030:GOTO3720
4030 IF DS>0 THEN CLS:PRINTCHR$(12),"FILE CATALOG" ELSE PRINT"No
data files available":RETURN
4040 PRINT#1 - Catalog and description":PRINT#2 - No description
":PRINT#3 - Instring catalog"
4050 PRINT"Choose by number "
4060 CA=VAL(CM$):IF CA=1 OR CA=2 OR CA=3 THEN PRINT CA:GOTO4080
4070 GOSUB130:PRINT CHR$(17):IF CT=0 THEN RETURN ELSE CA=VAL(I$)
:IF CA<>1 AND CA<>2 AND CA<>3 THEN 4050
4080 PRINT"Enter a Control-P to quit":IF (CA=2) OR (CA=3) THEN P
RINT"Filename          Size      Accesses"
4085 IF CA=3 THEN PRINT"Search for: ";:GOSUB130:PRINTCHR$(17):;SF$
=LEFTS(I$,CT)
4090 GOSUB1020
4100 IF ER THEN RETURN
4110 IF (NOTSY) AND (LEFTS(P1$,8)<>"PASSWORD") THEN 4140
4120 IF (CA=2) OR ((CA=3) AND (INSTR(N1$,SF$)>0)) THEN PRINTUSING
U$;N1$;CVS(XL$);CVI(XA$);:IFWZ THEN PRINT" ";:F2$ ELSE PRINT
4130 IF CA=1 THEN PRINT N1$:POKE RE,SV:29=USR2(VARPTR(D1$)):PRIN
T D1$
4140 IF INKEY$=CHR$(16) THEN RETURN
4150 GOSUB1080:GOTO4100
4160 IF NOT SY THEN 3720
4170 CLOSE:PRINT"SYSOP Commands (?=HELP): ";:GOSUB130:PRINTCHR$(
17):IF CT=0 THEN 3720 ELSE CM$=LEFTS(I$,CT)
4180 GOSUB300
4190 ON INSTR("KHERCSPF",C$) GOTO4220,4310,3720,4370,4210,4430,4
60,4205
4200 PRINT"? - Prints this list":PRINT"K - KILL file":PRINT"H -
Edit header":PRINT"E - Exit SYSOP function":PRINT"R - Rename fil
e"
4202 PRINT"S - Submit file from disk":PRINT"P - Change Password"
:PRINT"C - Catalog":PRINT"F - Rewrite File Pointers":GOTO4170
4205 GOSUB260:E=DS:GOSUB5270:CLOSE:DS=NV:GOSUB190:GET3,1:LSETDSS
=MKIS(D$):PUT3,1:GOTO3710
4210 GOSUB260:GOSUB4030:GOTO4170
4220 GOSUB260:IFCM$<>" THEN4240
4230 PRINT"Filename to KILL (or ENTER to quit): ";:GOSUB130:PRIN
TCHR$(17):IF CT=0 THEN 4290 ELSE CM$=LEFTS(I$,CT)
4240 FL$=CM$:GOSUB1190:IF NOTAC THEN 4230
4250 PRINT"KILLING ";N1$:PRINT"PLEASE CONFIRM CONTINUATION (Y/N)
"
4260 GOSUB130:PRINTCHR$(17)
4270 IF ASC(I$)-89 THEN DF=-1:LSET P1$=CHR$(0):PUT 2,MR:CLOSE:KI
LL F2$:GOSUB260
4280 GOTO4230
4290 IF DF THEN F=DS:GOSUB5270:DS=NV:GOSUB190:GET3,1:LSET DSS=MK
I$(D$):LSETNDS=MKIS(ND):PUT3,1:DF=0
4300 GOTO4170
4310 IF CM$<>" THEN4330
4320 PRINT"Filename to Edit: ";:GOSUB130:PRINTCHR$(17):IF CT=0 T
HEN 4170 ELSE CM$=LEFTS(I$,CT)
4330 GOSUB1180:IF NOTAC THEN 4170
4340 PRINT"Current description: ";:PRINT D1$
4350 TL=0:PRINT"New description (128 max) ";:GOSUB130:PRINT CHR$(
17):TL=-1:IF CT>0 THEN LSET D1$=I$:PUT 2,MR
4360 GOTO4170
4370 IFCM$<>" THEN 4390
4380 PRINT"Filename to RENAME: ";:GOSUB130:PRINTCHR$(17):IF CT=0
THEN 4170 ELSE CM$=LEFTS(I$,CT)
4390 GOSUB1180:IF AC THEN X=MR ELSE 4170
4400 PRINT"New file name: ";:GOSUB130:PRINTCHR$(17):IF CT=0 THEN
4170
4410 LSET CK$=I$:EN=DS:GOSUB940:IF NOTER THEN PRINT"Name in use.
":GOTO4400
4420 GET2,X:F$=P1$:LSET P1$=CHR$(0):PUT 2,X:LSET N1$=I$:LSET P1$
=P$:LSET LP$=MKIS(0):LSET RP$=MKIS(0):DS=DS+1:PUT 2,DS:DF=-1:GOT
O4290
4430 PRINT"Name of existing file to be submitted: ";:GOSUB130:PR
INTCHR$(17):IF CT=0 THEN 4170 ELSE FL$=LEFTS(I$,CT)
4440 GOSUB260
4450 OPEN"1",1,FL$:CLOSE1
4460 PRINT"Name of XA file: ";:GOSUB130:PRINTCHR$(17):IF CT=0 TH
EN 4170
4470 LSET CK$=I$:EN=DS:GOSUB940:IF NOTER THEN CLOSE:PRINT"Name i
n use.":GOTO4460
4480 TL=0:PRINT"Description: (128 max) ";:GOSUB130:PRINTCHR$(17)
:IF CT=0 THEN 4170 ELSE DC$=LEFTS(I$,128)
4490 A$="XA000/BBS"+DDS:ND=ND+1:MN=ND:GOSUB860:LSET F2$=A$:LSETN
1$=CK$:LSET D1$=DC$:LSET XA$=MKIS(0):LSETP1$="PASSWORD":LSET LP$
=MKIS(0):LSET RP$=MKIS(0)
4500 TL=-1:PRINT"PASSWORD (DEFAULT TO NONE)";:GOSUB130:PRINTCHR$(
17):IF CT>0 THEN LSET P1$=I$
4510 DS=DS+1:PUT 2,DS:PRINT"One moment please...":CC1=0:TL=0:NC=
-1
4520 OPEN"R",1,FL$:CC1=0
4530 FIELD 1,255 AS A1$,1 AS B1$
4540 OPEN"O",-3,AS
4550 FOR X=1 TO LOF(1)
4560 GET 1,X
4570 PRINTA1$;:A2$=A1$:B$=B1$
4580 CR=INSTR(A2$,CHR$(13)):IFCR>0 THENMID$(A2$,CR,1)=CHR$(141):G
OTO4580
4590 IFASC(B$)=13 THENB$=CHR$(141)
4600 REM
4610 CR=INSTR(A2$,CHR$(0)):IF CR>0 THENCC1=CC1+CR:PRINT#3,LEFTS(
A2$,CR):;GOTO4640 ELSEPRINT#3,A2$:;CC1=CC1+255
4620 IFB$<>CHR$(0) THENPRINT#3,B$:;CC1=CC1+1
4630 REM
4640 NEXT:PRINT
4650 CLOSE1:GET 2,DS:LSET XL$=MKIS(CCI):PUT 2,DS:TL=-1:NC=0:PRIN
TCHR$(17):;EN=DS:GOSUB870:GOTO4170

```

Listing continued

log. Messages, as discussed in some detail earlier, take on secret file names. The idea is to never give a caller access to the real file names on the disk; otherwise, your system is much too vulnerable.

Each data base file, then, has a public file name and a secret file name. The BBS builds the secret file name from the data base file number, XAx-xx/BBS, in the same way that it builds the message file. The first file is XA001/BBS, the second XA002/BBS, and so on. One advantage of this method is that your public file names aren't limited to legal TRSDOS file names; you're allowed 20 characters, all of which are legal.

Binary Trees Revisited

In creating the data base catalog, you'll also use the binary tree method that was used to find files in the membership log (February 1985, p. 104). You must make each file name unique, though, because duplicate file names might confuse the tree. When a caller orders an upload, he's first prompted for a file name, which is then evaluated for originality.

Lines 3760-3850 of the Program Listing perform this operation. In addition, since you're maintaining your own directory, line 3810 makes it possible to include information such as descriptions, which aren't normally included in a DOS directory.

Line 3860 builds the secret file name by calling the same routine that creates the secret names for the message board. If SY = -1, line 3870 gives you the option of password protecting the file you're about to upload. If the file's password is anything but "Password," it's not visible on the catalog.

Line 3880 bumps the data slot (DS) by 1, and puts the information for this file in XASPACE/BBS. DS is the number of the last record used in XASPACE/BBS. Line 3920 opens the secret file, A\$, while line 3920 calls the telecommunicating input statement. Each call stores up to 255 characters in I\$, and then exits after sending an XOFF. If the line begins with /EX (or /ex), the BBS terminates the routine in line 3930. Otherwise, you'll use PRINT#3 to write the string to the secret file, and bump CC1 by the value of CT, the character count.

When the caller signals his exit with

Listing continued

```

4660 IFCH$<>"THEN4680
4670 PRINT"Filename: ";:GOSUB130:PRINT CHR$(17):IF CT=0 THEN 417
0 ELSE CNS=LETS(1S,CT)
4680 GOSUB1180:IF NOTAC THEN 4170
4690 LSETP1$="PASSWORD":PRINT"New Password:(Default to none) ";
:GOSUB130:PRINT CHR$(17):IF CT>0 THEN LSET P1S=1S
4700 PUT2,MR
4710 GOTO4170
5190 IF ERL=4450 THEN PRINT"File not found":CLOSE:RESUME 4430
5210 CLOSE:PRINT"%% System error in ";ERL:PRINT"Logging error.
One moment please..."
5260 CLOSE:RESUME 1720
5270 NV=0:PRINT"File Compression":PRINTE"Files"
5280 FOR X=1 TO E:GETR,X:PRINTX,N1S;
5290 IF ASC(P1S)=0 THEN PRINT"-->DELETED":GOTO5320
5300 NV=NV+1:LSET LP$=MKIS(0):LSET RP$=MKIS(0):PUT2,NV
5310 IF NV>1 THEN LSETCK$=N1S:EN=NV:GOSUB870
5320 PRINT:NEXT
5330 IF NV=LOP(2) THEN5350
5340 FOR X=NV+1 TO LOP(2):GET2,X:LSETLP$=MKIS(0):LSETRP$=MKIS(0)
:PUT2,X:NEXT
5350 PRINT"Compressed to"NV"Files":CLOSE:RETURN
6500 ONINSTR("SCLE",A$) GOTO 6520,6570,6580,6590
6510 GOTO 1350
6520 CLS:LINEINPUT"Enter TIMES desired (MM/DD/YY HH:MM:SS) ";TMS
6530 IFVAL(TMS)<1ORVAL(TMS)>12ORVAL(MIDS(TMS,4))<1 ORVAL(MIDS(TMS,4))>12ORVAL(MIDS(TMS,10))<0 ORVAL(MIDS(TMS,10))>23ORVAL(MIDS(TMS,13))<0ORVAL(MIDS(TMS,13))>59ORVAL(MIDS(TMS,16))<0 OR VAL(MIDS(TMS,16))>59 THEN 6520
6540 IF MIDS(TMS,3,1)<>"/" OR MIDS(TMS,6,1)<>"/" OR MIDS(TMS,9,1)<>":" OR MIDS(TMS,12,1)<>":" OR MIDS(TMS,15,1)<>":" THEN 6520
6550 Y=0:FORX=1TO16STEP3:POKE16924-Y,VAL(MIDS(TMS,X,2)):Y=Y+1:NEXT:CLS:GOTO1340
6570 CH=(CH=0):IFCHTHENPRINT@188,"ON ";:POKE-1,1ELSEPRINT@188,"O
FF":POKE-1,0
6575 GOTO1360
6580 POKETT,0:POKETT+1,0:POKETN,0:POKETN+1,0:WZ=-1:SY=-1:GOTO1380
6590 CLOSE:END

```

End

/EX, line 3950 gets the record from XASPACE/BBS, and LSETS LP\$ and RP\$, the binary tree pointers, to zero. It also LSETS XL\$, the length of the file, to CC! and puts the record back. The GOSUB 870 command adds the new file to the existing binary tree. The PRINT CHR\$(17) commands scattered about simply send XON characters to the caller.

Ready to Download

Downloading files from the data base is a much simpler proposition. When downloading, the caller's terminal program must handle the timing, while the board watches for XOFF characters. Now, lines 1180-1220 decide whether or not to grant the caller access to the file. He must know

the correct file name, and, if it's password-protected, he must know the password. If the caller is a wizard, that is, operating from the BBS's host console, he needn't know the password. This routine uses another Boolean variable, AC. If it's zero, the BBS doesn't grant access; if it's -1, the caller may see the file.

The downloading actually starts at line 3960 with a call to 1180. If the caller has access to the file, line 4010 bumps XA\$, the number of accesses, to that file; it then opens the secret file name, F2\$, and goes to line 4860, the same read routine used by the message base.

Now that you have all that information in XASPACE/BBS, you ought to be able to recover it. The catalog starts

at line 4020 and calls a subroutine at line 4030. Because the catalog is a subroutine, the sysop can call it from the sysop menu without having to duplicate code. The BBS displays the catalog either with or without descriptions.

You also have the option to search through the catalog. If you do so, line 4085 initiates a search string. The BBS displays only those file names containing that specific string. Line 4110 makes the password-protected files invisible to non-syops, and line 4120 prints the secret file name for wizards. By knowing the file name, a wizard can call the file into a word processor and edit it before saving it back to the same file name.

Calls to lines 1020 and 1080 initiate the routine that produces a sorted list, which results in an alphabetized list of the files. The call to USR2 in line 4130 video formats the description to the caller's video width, while line 4140 checks for a control-P from the caller.

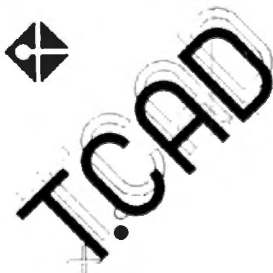
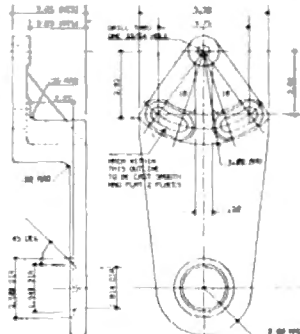
Lines 4160 to 4710 handle these sysop options: kill, rename, and password-protect. Killing or renaming a file calls the file compression routine in lines 5270 to 5350, which works to maintain the integrity of the binary tree. Any file with a password of CHR\$(0) is removed and the file is compressed to fill the hole left behind. ■

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The Ins and Outs Of Computer I/O

Computer input/output, or I/O, is any activity that moves information into or out of a computer. In the mid-1960s the words input and output became part of our vernacular and soon became clichés meaning to give and get information.

In computer jargon, input means putting information into a device and output means taking it out. You enter information *into* and get information *from* computers. This month I'll look at some common I/O statements.

I/O Statements Defined

Reference books vary in what they define as I/O statements for the TRS-80. To avoid confusion, I take this radical stance: Information that's moving comes from somewhere and goes somewhere. Where it happens to be represents only a waystation. Don't be greatly concerned by defining these concepts. You need only understand how these statements work to use them.

Basic I/O statements put information in memory through the keyboard, send information from memory to screen display or another device (printer or modem), and exchange information between memory and a storage device (cassette or disk). In Basic, I/O is as simple as pressing a keyboard character or typing in PRINT.

Examples in Print

The Print statement and variations of Print that create screen displays (Print @, Print Tab, Print Using) are I/O statements.

The Print statement displays one or several items. It displays literals (1, 40), variables (A, B1), characters ("This is fun") and string variables (B\$, MYS\$).

The statement Print 23 includes a line feed so that the next Print statement goes on the following line. However, if you put a semicolon after Print 23, the next Print statement appears



on the same line, one space after the first one.

Separating a series of values by commas prints them within predefined zones on one or more lines. For example, type in PRINT 1,2,3,4 and press the enter key. Then type in PRINT 1;2;3;4 and press the enter key. See the difference?

The Print @ statement puts information at a specific screen position (0-1023 on Models I, III, and 4). For example, PRINT @ 50, "pickle" prints the word pickle at position 50. The same rules apply when using commas or semicolons.

Print Tab is a formatter. It starts to print material a specified number of spaces from the left-most screen position (0-255). Type PRINT TAB(12), "I start at the 12th position" and press the enter key. Try Acreage Yield in Program Listing 1 to see how this works in a program.

Print Using is a modification of the Print statement. One way to use it is with dollars-and-cents amounts you want printed in flush-right format.

Try running Program Listing 2. Enter amounts ranging from a few cents

Program Listing 1. Acreage Yield program to demonstrate Print Tab.

```

100 RFM * ACREAGE YIELD * TRS-
80 MODELS I, III, 4, AND 100
110 CLEAR 256
120 DIM A$(3),C(3,3)
130 CLS
140 A$(1)="POTATOES"
150 A$(2)="CORN"
160 A$(3)="RICE"
170 INPUT "STARTING YEAR";YR
180 YR=YR-1
190 PRINT
200 FOR A=1 TO 3: FOR B=1 TO 3
210 PRINT YR+A;"YIELD PER ACRE
FOR "A$(B);
220 INPUT C(A,B)
230 NEXT B,A
240 CLS
250 PRINT "CROP YIELDS FOR "YR
"-YR+3
260 PRINT
270 PRINT TAB(6)"POTATOES";TAB
(16)"CORN";TAB(22)"RICE"
280 FOR A=1 TO 3
290 PRINT TAB(0)YR+A;TAB(6)C(A
,1); TAB(16)C(A,2);TAB(22)C(A,
3)
300 NEXT A
310 END

```

End

System Requirements

Models I, III, and 4

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BASIC TAKES

Program Listing 2. Dollars and Cents uses the Print Using statement.

```
100 REM * DOLLARS AND CENTS *
TRS-80 MODELS I III, FOUR, 100
110 CLS
120 A$="#####.##"
130 PRINT "PLEASE ENTER FOUR
MONEY AMOUNTS UP TO $1 MILLION."
140 PRINT
150 FOR Z=1 TO 4
160 PRINT "VALUE"Z: INPUT A(Z)
170 NEXT
180 CLS
190 FOR Z=1 TO 4
200 PRINT USING A$;A(Z)
210 B=B+A(Z)
220 NEXT Z
230 PRINT STRING$(10,"-")
240 PRINT USING A$;B
250 PRINT " TOTAL"
260 END
```

End

Program Listing 3. Pasteboards demonstrates Data, Read, and Restore statements.

```
100 REM * PASTEBOARDS * TRS-80
MODELS I III, FOUR, 100
110 DATA A,2,3,4,5,6,7,8,9,T,J,
Q,K
120 CLEAR 500: DIM A$(52)
130 C$="CDHS"
140 N=1
150 FOR S=1 TO 4: FOR R=1 TO 13
160 READ A$(N)
170 A$(N)=A$(N)+MID$(C$,S,1)
180 N=N+1
190 NEXT R
200 RESTORE
210 NEXT S
220 FOR A=1 TO 34
230 PRINT A$(A);" ";
240 NEXT A
250 END
```

End

to \$1 million. Line 120 defines the format for printing the amounts as A\$. The pound (#) signs represent positions for numbers. The decimal place in this example occurs before the second-to-last number. Line 2000 shows the form of the statement. You'll see the effect when you run the program.

Data, Read, and Restore Statements

The Data, Read, and Restore statements frequently control I/O for data arrays. To see how these work, run Pasteboards in Program Listing 3.

Pasteboards sets up a deck of cards from AC (ace of clubs) to KS (king of spades). The Data statement precedes numeric or string material in a line. The Read statement retrieves the data for use in an array or variable.

Line 110 in Listing 3 holds the data separated by commas. DIM in line 120 dimensions the array, but is not an I/O statement. The loops in lines 150-210 read the values into the array.

The Restore statement in line 200

Program Listing 4. Grand Inquisitor uses the Input statement.

```
100 REM * GRAND INQUISITOR * TRS-80 MODELS I III, FOUR, 100
110 CLS
120 PRINT "WHO IS THAT THERE?"
130 INPUT "WHAT IS YOUR NAME";A$
140 INPUT "HOW OLD ARE YOU";B
150 INPUT "WHAT ARE YOU DOING IN HERE";C$
160 PRINT"YOUR NAME IS "A$", YOUR AGE IS"B", AND YOUR PURPOSE: "C$
170 IF C1$<>" AND C$<>C1$ THEN GOSUB 220
180 IF A1$<>" AND A$<>A1$ THEN GOSUB 290
190 IF B1<>0 AND B<>B1 THEN GOSUB 320
200 C1$=C$: A1$=A$: B1=B
210 PRINT "RUN THAT BY ME AGAIN!": GOTO 130
220 PRINT "WHEN I ASKED YOU BEFORE, YOU SAID"
230 PRINT C1$
240 PRINT "IS WHAT YOU'RE DOING HERE."
250 PRINT "NOW YOU CLAIM THE REASON IS"
260 PRINT C$
270 PRINT "YOU BETTER COME CLEAN WITH ME."
280 RETURN
290 PRINT "I THINK YOU'RE FIBBING ABOUT YOUR NAME."
300 PRINT "IT CAN'T BE "A$" AND "A1$", CAN IT?"
310 RETURN
320 PRINT "COY ABOUT YOUR AGE?"
330 PRINT "WE'VE NARROWED IT TO"B1"OR"B
340 RETURN
350 END
360 REM * FOR MODEL 100, INSERT FOLLOWING LINES:
370 REM * 165 GOSUB 360
380 REM * 275 GOSUB 360
390 REM * 305 GOSUB 360
400 REM * 335 GOSUB 360
410 REM * 360FOR T=1 TO 2000: NEXT T: RETURN
```

End

Program Listing 5. INKEY\$ Collector demonstrates the INKEY\$ statement.

```
100 REM * INKEY$ COLLECTOR * TRS-80 MODELS I, III, FOUR, 100
110 CLS: CLEAR 260
120 A$=INKEY$
130 IF A$="" THEN 120
140 IF A$=CHR$(13) THEN C$=B$: B$="": CLS: GOTO 160
150 B$=B$+A$
160 PRINT @ 0,"OLD WORD: "C$
170 PRINT "BUILDING ANEW: "B$
180 GOTO 120
190 END
```

End

makes the next Read statement start reading the data from the beginning of line 110. The program reads in ranks A-K four times and adds the appropriate letter for suit each time through. Restore is a byte-saver.

Input Statements

The Input statement is exactly that—a statement that accepts data as input. Input pauses a program and waits for you to enter a value. Here's a simple example:

```
100 INPUT Z
110 PRINT Z
```

When you run Listing 3, the prompt is a question mark. The program waits for you to answer; however, it doesn't state a question. Program Listing 4 remedies that problem and shows how to use Input to get string and numeric information.

Listing 4 is an interrogation program that illustrates a program can take action based on a changed Input variable. It shows input formats for

strings in lines 130 and 150, and for numerics in line 140.

The program reacts suspiciously to any changes you make to your earlier answer, and continues until you press the break key.

INKEY\$ Statements

INKEY\$ is a cousin of Input: It's equal to the value of the last key pressed. I call INKEY\$ an I/O statement, but it's also a string function.

The computer strobes the keyboard rapidly and constantly to keep this value updated. Press another key and the INKEY\$ value changes. This way, you can have a program make decisions and take actions without stopping. Here's an example:

```
100 A$=INKEY$
110 IF A$<>"A" THEN PRINT C: C=
C+1: GOTO 100
120 PRINT: PRINT "You Pressed Key A":
END
```

This program continues running until you press the A key. I put in a counter

BASIC TAKES

to show the number of loops through the transaction. The usefulness of INKEY\$ will become clearer when you begin to include If...Then tests that act on an INKEY\$ value. You can set up many situations, one for each time you press a specific key.

Notice differences between the products of Input and INKEY\$. The former stops the program to wait for you to enter a variable of 0-255 characters; the latter can hold only a single character, or so it appears.

In Program Listing 5, INKEY\$ gathers INKEY\$ values into a second variable. When you run this program, type in a word and press the enter key.

Reading through Listing 5 shows you how the program collects the current word from A\$ values, then concatenates (adds) them to B\$ until you press the enter key. The program uses the string function as an I/O statement to input a value to memory. ■

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Relocatable Programs: Microcomputing's Hoboes

Judging from my mail, many readers are confused about relocatable programs and how to relocate them. Part of the problem lies in nomenclature; there's a big difference between a *relocatable* program and a *relocated* one.

A relocatable program is one you can run from any location in memory without making changes. Relocatable programs are often short because of the Z80 microprocessor's limitations.

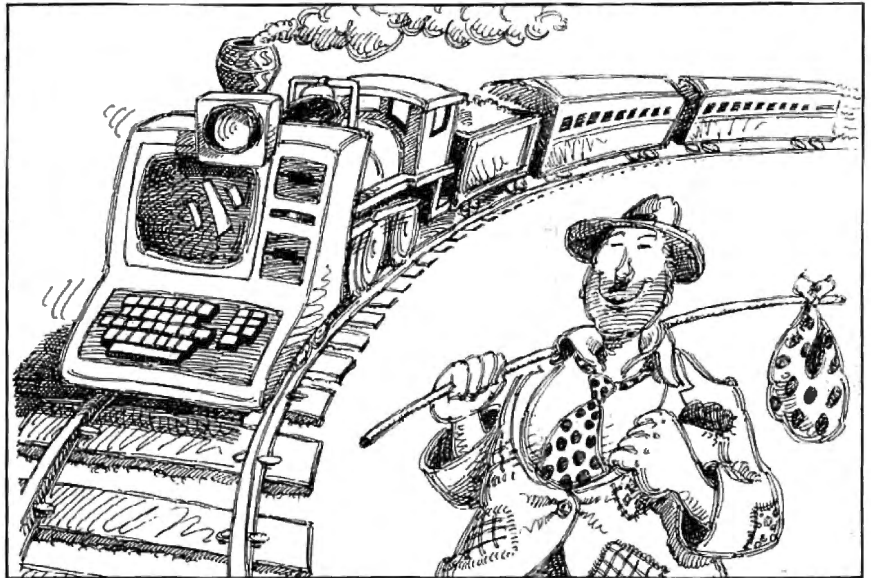
On the other hand, you can almost always write a program that will move itself to any place in memory, patch itself as necessary, and then run as a relocated program.

Unfortunately, the Z80 assumes that a specific program will always occupy the same position in memory; if you need to write a machine-language program that operates from anywhere in memory, you have to resort to some complicated programming.

A truly relocatable program is one that never has absolute references to itself, meaning that it includes no absolute jumps (as opposed to relative jumps) to any part of itself, no calls to addresses within itself, and no references to any internal data (except with some very tricky programming).

You can write a relocatable program by following a few rules. The first is to always use relative jump instructions (JR) instead of absolute jump instructions (JP). However, since JRs have a range of from -126 to 129 bytes, you must often build bridges of JRs and leapfrog from one to another to redirect execution in a long program.

You can also use the Model I/III 000B ROM routine or the Model 4's @WHERE supervisor call (SVC) to simulate a relative call instruction. (See my April 1983 column [p. 38] for how to use the 000B hexadecimal [hex] ROM routine.) With a little work, you can use the same ROM routine and SVC to find the address of a data table within a program.



Many programs, however, would be severely limited or run much slower if you wrote them completely in relocatable form. Yet you must almost always relocate programs like filters and drivers to protected high memory. Since you can't know what other programs will also reside in high memory, you must design these programs to run from any location that's open when you install them. In addition, they must have the ability to reset the appropriate pointers to protect themselves in high memory.

The Program Listing is a Model I/III video filter designed to work with Basic. When you run it, it swallows the first carriage return character sent to the video display. This lets you display more than one input prompt on a single line without

destroying other parts of the screen or resorting to INKEY\$ routines.

Enter Basic before you run the program. Use a CMD command to load the program and aUSR command to run it. If your DOS cannot load a machine-language program into memory (Model I TRSDOS is an example), load the program from DOS Ready, type in BASIC, and execute the program with aUSR command.

The actual filter begins in line 1130. Everything before that is the relocation module that moves the program to high memory. Of course, you only need to run the relocation module once, and then you can overwrite it with other programs or data; you don't need to worry about the space it uses in memory.

All methods of relocating programs follow the same idea but use slightly different techniques. First, you must capture the current high memory pointer, subtract the length of the program module from it, and reset it to protect the program after it relocates itself (see lines 380-430).

My program uses Basic's copy of the high memory pointer. If you write

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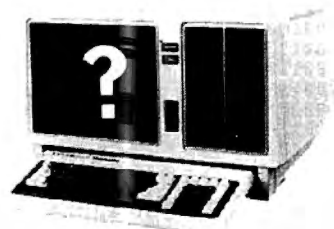
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Program Listing. Video filter for the Models I and III.

```

00100 ;No-Carriage-Return Filter
00110 ;
00120 ; This program must be installed
00130 ; after Basic is running.
00140 ; Load it either from Basic (with
00150 ; CMD"L" of TRSDOS 1.3, for example)
00160 ; or with the DOS LOAD command before
00170 ; entering Basic.
00180 ; Then, before loading or running a
00190 ; program, type
00200 ; DEFUSR = &H0000: A=USR(0): CLEAR
00210 ;
00220 ; The program will link itself to Basic,
00230 ; and move itself to protected high memory.
00240 ; It will lower Basic's string and stack
00250 ; area.
00260 ;
00270 ; Equates Section:
00280 LINK EQU 4004H ;RST 10H Vector
00290 NOCR EQU %' ;No CR flag
00300 SSTOR EQU 40A0H ;Ptr to string area
00310 BHIGH EQU 40B1H ;Ptr to Basic's High Mem
00320 VIDDDR EQU 401EH ;Ptr. to Video driver
00330 SPTR EQU 40E8H ;Ptr. to Basic's stack
00340 ;
00350 ; Initialize and relocate
00360 ;
00370 ;
00380 INIT LD HL,(BHIGH) ;Get top of Basic area
00390 LD BC,END-START ;Get length of program
00400 PUSH BC ;And save it
00410 XOR A ;Clear carry flag
00420 SBC HL,BC ;Calculate new BHIGH
00430 LD (BHIGH),HL ;Put it in place
00440 INC HL ;New addr. for START
00450 PUSH HL ;Save on stack
00460 LD BC,-51 ;Offset for string area
00470 ADD HL,BC ;Calculate new string area
00480 LD (SSTOR),HL ;And save it
00490 DEC HL ;Calculate Basic's stack
00500 LD (SPTR),HL ;And save it
00510 ;
00520 ; New addresses for top of Basic and string area are
00530 ; now in place. Next, change absolute addresses in
00540 ; main program
00550 ;
00560 POP HL ;Retrieve new START
00570 PUSH HL ;And save it again
00580 LD BC,START ;Current addr. of START
00590 XOR A ;Clear carry flag
00600 SBC HL,BC ;Calc. relocation offset
00610 PUSH HL ;Move to
00620 POP BC ; BC register
00630 LD IX,RELTAB ;IX==> reloc. table
00640 REL10 LD L,(IX) ;Get next value
00650 LD H,(IX+1) ; into HL
00660 LD A,H ;Get MSB for testing
00670 OR A ;Set/Reset Z flag
00680 JR Z,REL20 ;Go if done
00690 PUSH HL ;Transfer to
00700 POP IY ; IY register
00710 LD L,(IY+0) ;Get contents of location
00720 LD H,(IY+1) ; into HL
00730 ADD HL,BC ;Add offset
00740 LD (IY),L ;Put it back
00750 LD (IY+1),H ; in program
00760 INC IX ;Point IX to addr. of
00770 INC IX ; next location
00780 JR REL10 ;Loop until done
00790 ;
00800 ; Addresses in program are adjusted. Next, pick up
00810 ; link address then move program to high memory
00820 ;
00830 REL20 LD HL,(LINK) ;Get current RST 10H vector
00840 LD (EXIT1),HL ;And put in program
00850 LD (EXIT2),HL ; three
00860 LD (EXIT3),HL ; times
00870 LD HL,START ;Get current START addr.
00880 POP DE ;And new START addr.
00890 LD (LINK),DE ;Link to RST 10H
00900 POP BC ;Get program length
00910 LDIR ;Move it all
00920 ;

```

Listing continued

a program that loads and relocates from DOS, you'll need to use the system high-memory pointer = 4049 hex for the Model I and 4411 hex for the Model III. Both the system and Basic's high memory pointers always point to the highest unused and unclaimed byte of memory. After relocation, make sure the pointer is set to the first byte below your program.

My program contains one subtlety: The assembler determines the program module's length by subtracting the address of the end label from that of the start label. If the assembler is to find the correct length, you must set the End label to the first byte after the end of the program, (line 1710). Otherwise, the length will be 1 byte too short, and you'll overwrite your program's first instruction.

After the program correctly sets the high memory pointer, it increments the value in HL by 1 to point to the start of the program once it moves itself (line 440) and saves itself on the stack. Lines 460-500 reset two other values in Basic's low memory area: the pointer to the bottom of the string area and the pointer to the top of the stack area. If you write a program that operates from DOS, you won't need to worry about those values.

The Proper Address

If your program is completely relocatable, you need only move it now with an LDIR command and you're done. But, most programs contain absolute references to themselves. The next two steps change those references to addresses that will be correct once the program relocates itself.

First, you need to calculate the offset from the program's present location in memory to its new residence in protected high memory (see lines 560-620). The program has to add that offset to each of its absolute addresses before it relocates itself so it will know where to find its own routines and data areas.

The complicated part of the process starts with line 630. The last section of the relocation module is a table of addresses of absolute references in the program module. The relocation module must take each address from that table and find contents. Then the module must add the offset to the value found at each address and replace the old value with the new.

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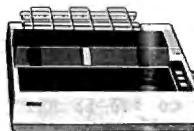
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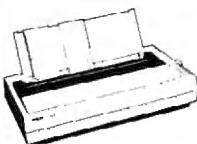
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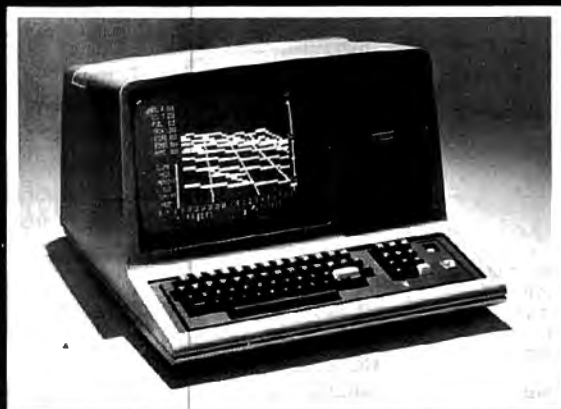
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THE NEXT STEP

Listing continued

```

00930 ; The program has likely been loaded over
00940 ; Basic's stack, so a RET won't work to
00950 ; get back. Take an alternate route, instead
00960 ;
00970 LD BC,1A18H ;Prepare to return
00980 JP 19AEH ;Back to Basic READY
00990 ;
01000 ; Here is the relocation table
01010 ;
01020 RELTAB DEFW RX1 ;Interior references table
01030 DEFW RX2
01040 DEFW RX3
01050 DEFW 0 ;Mark end of table
01060 ;
01070 ; This is the actual filter program that will
01080 ; reside in high memory.
01090 ;
01100 ; START is linked to RST 10H and must first check
01110 ; to see if RST 10H was called from Basic's parser
01120 ;
01130 START EX (SP),HL ;Save HL and get return
01140 LD A,L ;Get LSB for testing
01150 CP 5BH ;Test for call from 1D5BH
01160 JR NZ,NO ;Go if wrong call
01170 LD A,H ;Now test MSB
01180 CP 1DH
01190 NO EX (SP),HL ;Restore stack and HL
01200 JP NZ,$-$ ;Leave if wrong call
01210 EXIT1 EQU $-2 ;Location of exit addr.
01220 ;
01230 ; Now test for our no-CR character
01240 ;
01250 CALL 1D78H ;Get next character in A
01260 CP NOCR ;Do we have the character?
01270 JR Z,YES ;If so, get to work
01280 DEC HL ;Else backup HL
01290 JP $-$ ;And leave.
01300 EXIT2 EQU $-2 ;Location of exit addr.
01310 ;
01320 ; "no-CR" character was found -- set DONOCR as
01330 ; video filter UNLESS it is already set
01340 ;
01350 YES PUSH HL ;Save Basic's pointer
01360 LD HL,(VIDDVR) ;Get current video driver
01370 LD DE,DONOCR ;And filter address
01380 RX1 EQU $-2 ;Mark for relocation
01390 RST 10H ;Compare HL & DE
01400 JR Z,LEAVE ;Return if DONOCR is set
01410 LD (VIDDVR),DE ;Else set it as filter
01420 LD (OLDDVR),HL ;And save old address
01430 RX2 EQU $-2 ;Mark for relocation
01440 LEAVE POP HL ;Recover Basic's pointer
01450 JP $-$ ;and then return to Basic
01460 EXIT3 EQU $-2 ;through normal RST 10H
01470 ;
01480 ; The filter is installed, and will be activated
01490 ; when a CR is sent to the video. It will then
01500 ; unlink itself from the video driver.
01510 ;
01520 DONOCR PUSH HL ;Save HL and AF on stack
01530 PUSH AF
01540 LD A,0DH ;0Dhex is CR character
01550 CP C ;Compare char. sent to video
01560 JR Z,D010 ;Go if this is a CR
01570 LD HL,$-$ ;Else get old driver addr.
01580 OLDDVR EQU $-2
01590 POP AF ;Recover AF register
01600 EX (SP),HL ;Recover HL register
01610 RET ;Go to olddrv address
01620 ;
01630 ; A CR was found in the video chain
01640 ;
01650 D010 LD HL,(OLDDVR) ;Get regular driver addr.
01660 RX3 EQU $-2 ;Mark for relocation
01670 LD (VIDDVR),HL ;Restore as video driver
01680 POP AF ;Recover registers
01690 POP HL ; And return without
01700 RET ; processing CR
01710 END EQU $ ;Mark end of program
01720 END 402DH ;Return to DOS if RUN

```

In lines 640 and 650, the program loads one of the addresses in the relocation table into the HL register pair. A quick test (lines 660-680) determines if the program has reached the end of the relocation table. If not, the program moves the current value in HL to IX and loads the contents of the address into HL. The program adds the offset value, stored in BC, to HL, and puts the new value back in the program. Then it increments IX twice to point to the next entry in the relocation table.

The process isn't hard to follow, but the logic can be confusing. The relocation table contains a list of addresses in the main program. Each of those addresses contains an absolute reference to another address in the program. Therefore, IX is a pointer to a pointer to an address the program must change. This double indirect addressing has caused problems for more than one 2 a.m. programmer.

Lines 830-860 and 890 are unique to this program. Normally, 4004 hex and 4005 hex point to 1D78 hex, the RST 10H ROM routine. However, some versions of Disk Basic (and some packages that add extensions to Basic) change that address to suit their own extended commands. The program needs to know how to return to normal RST 10H processing. The relocation module must find the pointer and insert it into the program. It must also put the program's address into the RST 10H vector, so that the program becomes a filter to the normal RST 10H routine.

Finally, by line 910, everything is ready and the program module can move itself to high memory. HL points to the current beginning of the program, DE points to the first address in protected high memory, and BC contains the length of the program. After executing a simple LDIR, the program relocates itself. Normally, it could pass control back to Basic or DOS with a RET instruction. However, the program has loaded itself on top of Basic's stack, so you need to use an alternate exit. The return through 19AE hex, with BC containing 1A18 hex, is the most reliable and works on both the Models I and III.

The only remaining part of the relocation module is the table of absolute addresses in the program itself.

End

THE NEXT STEP

The program can generate that table in several ways. The most straightforward is the method shown here: Each absolute address in the program module has a special label associated with it, and the program uses that label in the relocation table.

If the program you want to relocate is short, you can easily attach a label to each absolute address. If the program is long, you may find this technique too cumbersome. You might consider some other ways to build a relocation table. One is to assemble the program module twice at different addresses, then write a short Basic program that examines the two copies, either on disk or in memory, to find any differences. The programs will be identical except for absolute addresses, and the Basic program can use the location of those differences to create a relocation table.

The program module (lines 1130-1720) is based on ideas I explained in January 1985 (p. 140). It is linked to Basic's parser; if it discovers a percent sign at the beginning of a Basic command, it links a special filter to the video driver to grab and ignore the next carriage return character sent to the screen. After the program intercepts one carriage return, the video filter unhooks itself from the video driver.

After you assemble the listing and run the relocation module, test it with the following short Basic program:

```
10 CLS
20 %INPUT "First prompt";A$
30 INPUT "Second prompt";B$
40 PRINT A$;" ";B$
```

When you run the program, it should display the second input prompt immediately after your response to the first prompt. The second input will not appear on a separate line.

Once you've written one relocation module, you'll find you can copy most of it into any other program. Except for the particulars of hooking your program to the system and creating a relocation table, each module will be identical. After you write one, you'll be able to focus your attention on the actual program, instead of how to move and protect it. ■

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Getting Your Configure In Shape

The Tandy 2000 has some powerful features that often go unused and unexplored. This month, I'll discuss how to tailor your system's configuration file to suit your needs and I'll introduce some commands for advanced screen and keyboard control. I'll also give you my first impressions of the newest version of MS-DOS.

Configure It Out

To take full advantage of the Tandy 2000's capabilities, you must configure your system properly. You normally do so by creating a file called CONFIG.SYS that MS-DOS reads each time it starts up. Table 1 lists the valid CONFIG.SYS commands.

The Break command tells MS-DOS when to check for the control/break (or control-C) key sequence. Usually, the default value is off, meaning that MS-DOS checks for the break sequence only when performing a standard input/output operation. By selecting the On option, you force MS-DOS to check for the abort sequence whenever your program performs an MS-DOS function.

The Buffers command lets you specify the number of disk buffers available to MS-DOS (1-99); the default value is 2. These buffers hold information your DOS reads from disk in your applications programs. This feature is important for an application such as a data base manager that uses random file access, because the likelihood of finding a record in the buffer increases as the number of buffers increases.

If you've allocated enough buffers, you'll notice a definite speed increase in program execution. However, with sequential access files, you'll gain little advantage from using a large number of buffers.

You have to use trial and error to determine the right number of buffers for your programs. If you open too many buffers, your system slows down because it spends more time searching



through the buffers than it would spend reading the file from disk.

The Device command loads drivers that extend MS-DOS. These drivers might replace an existing standard driver, such as ANSI.SYS (extended screen and keyboard control driver), or they might control optional equipment such as a mouse, or add features to the system, such as a RAM disk.

The Files command specifies the number of file control blocks that the MS-DOS system functions use for file access. The default value allows you to open up to eight files simultaneously; you'll get an error if you attempt to open more. Each file control block uses 39 bytes of memory in the resident portion of DOS.

The IBM-PC version of MS-DOS has one more configuration command, Shell, that lets you replace the DOS's command processor with a menu program. Unfortunately, the Tandy 2000's operating system doesn't support this command.

MS-DOS: A Question of Versions

I recently received my upgrade copy of MS-DOS 2.11.01 for the Tandy

2000 (for product information, see Table 2). This version is supposed to be as compatible with the IBM-PC as the 2000's hardware allows. I beg to differ, and I'll point out some annoying differences between MS-DOS 2.11.01 and PC-DOS 02.10.

First and foremost, the software upgrade lacks any new documenta-

Command	Definition
BREAK = ON/OFF	Establish the method of checking for control/break
BUFFERS = xx	Establish the number of available disk buffers
DEVICE = [d:][path][filename].[ext]	Instruct MS-DOS to load a device driver
FILES = XX	Establish the number of available file control blocks
SHELL = [d:][path][filename].[ext]	Specify the name and location of the top-level command processor to replace Command.COM

Table 1. Configuration commands.

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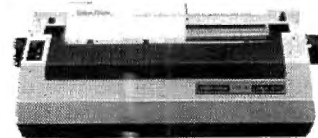
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tion, although I found many neat new programs listed in the directory. For example, the Mode command supports several new options, including

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Table 2. Tandy 2000 product information.

Code Sequence	Definition
ESC[*;*H	Move the cursor to the row specified
ESC[*;*f	Move the cursor to the column specified
ESC[*A	Move the cursor up one or more lines
ESC[*B	Move the cursor down one or more lines
ESC[*C	Move the cursor right one or more columns
ESC[*D	Move the cursor left one or more columns
ESC[6n	Output a cursor position report sequence
ESC[*;*R	Report cursor position through the standard input device
ESC[<u>s</u>	Save cursor position
ESC[<u>u</u>	Restore cursor position
ESC[2J	Erase display and home the cursor
ESC[K	Erase line from current cursor location
ESC[*;*...;*m	Set character attributes to specified values; see the <i>Programmers Reference Manual</i> for details
ESC[=*h	Set the screen-mode as specified
ESC[=*I	Acts the same as the set mode above but with automatic line wraparound disabled
ESC[*;*...*p	Redefine a key; see the reference manual for detail
ESC["string";p	

Table 3. Extended screen and keyboard control commands.

graphics screen dump routines for Radio Shack dot-matrix printers, and direct support for the CGP-220 color graphics printer.

However, the new MS-DOS is missing some PC-DOS utilities, such as Assign, which lets you change the logical disk drive assignments, and FDISK, which lets you allocate part of the hard disk to support an operating system other than MS-DOS.

The 2000's Format (or PCMaker) commands write only double-sided disks with nine 512-byte sectors per track. The PC's Format command lets you write single- or double-sided disks using either eight or nine sectors per track, to ensure compatibility with all earlier DOSes.

Worse, MS-DOS provides no way to allocate directory entries and space for its reserved system files, meaning you can't easily copy the operating system to a disk after you've stored other files on it.

The 2000's operating system doesn't have a utility comparable to PC-DOS's Tree command, which displays all the directory paths available and, optionally, lists the files in each subdirectory.

Prompt Action

Despite its shortcomings, MS-DOS 2.11.01 works better than previous versions. In particular, the ANSI.SYS extended screen and keyboard driver now accommodates all the functions listed in Appendix A of the *MS-DOS Programmer's Reference Manual*. You can use any of these control codes if the command DEVICE=ANSI.SYS is in your current CONFIG.SYS file. This is especially nice because the BIOS code (Basic input/output system) now supports use of different colors in a screen display.

Table 3 lists these advanced video screen features. You can use them within a program or from the DOS command level. For example, the following batch program segment uses the Prompt command to control the screen (Table 4 explains the special characters). You must type in the commands exactly as shown: ANSI.SYS is case-sensitive.

```
prompt $e[ = 3hd
prompt $e[0;44;37m $p [$t$H$h$H]$g$C[0m
```

When the 2000 executes this routine, the first command changes the video

display to 80-column by 25-line color text display mode. The second command (\$e[0;44;37m) sets the display to white letters on a blue background. The screen then displays the drive and current directory path name (\$p), followed by the time in HH.MM.SS format (\$t\$H\$h\$H). I used the \$h backspace character to remove fractional seconds from the time display. Next, the screen displays a > symbol and returns normal black and white video (\$e[0m).

Now for a more complex example. The following Prompt command displays a clock in the upper right-hand corner of the screen:

```
prompt $e[$e[1;1H$e[K$e[65C$t$H$h$H$e[  
[u$N$g
```

Using Tables 3 and 4, you can take this command apart: \$e[s saves the current cursor position; \$e[1;1H positions the cursor at row 1, column 1 of the display, and \$e[K erases everything from the cursor to the end of the line. \$e[65C moves the cursor forward 65 columns; \$t\$H\$h\$H prints the time; \$e[u returns the cursor to the saved position, and \$n\$g displays the MS-DOS prompt.

This is all well and good, but the technique isn't of much value in a batch file, since it works only with text displayed at the MS-DOS prompt. If, for example, you want to create a menu with a different color border around it, use the Echo command instead of Prompt.

Normally, you use Echo with the parameters on or off to enable or disable display of the commands executed in a batch file. However, Echo can also send control sequences to ANSI.SYS, as the Prompt command does. You must use EDLIN or another text processor that can write ASCII control codes to the text file to create your batch files.

The simple batch program below selects 80-column by 25-line color text mode, displays a menu with white letters on a blue background, and then displays the menu in normal black-and-white video:

```
echo off
echo ^V[[ = 3h^V[[0;44;37m
cls
echo Simple menu test:
echo A. choice one
echo B. choice two
echo ^V[[0m
```

2000 PLUS

Note the use of the characters ^V[to represent EDLIN's escape key; when ^V precedes a character, it represents that character's value with the control key pressed simultaneously.

One last application for the Echo and Prompt commands is worth mentioning. The ASCII code table in Appendix B of the *MS-DOS Programmer's Reference Manual* lists the codes for each key on the keyboard. Armed with this information and the last command in Table 3, you can use Echo or Prompt to redefine any key.

Proof Positive

Electric Webster, a fantastic spelling and grammar checker, is now available to Tandy 2000 owners. The program's 50,000-word dictionary occupies only 115,000 bytes of disk storage. Electric Webster proofreads a document and displays unidentified words; you can retype misspelled words, verify correct spellings, and view words in context.

Character	Definition
\$	The \$ character
t	The current time
d	The current date
p	The current directory
v	The MS-DOS version
n	The current disk drive
g	The > symbol
l	The < symbol
b	The ! symbol
—	A carriage return and line feed
s	A leading space
h	A backspace
e	The escape character (ESC, IBH)

Table 4. Special characters used with the Prompt command.

A Final Note

This is the last edition of 2000 Plus. According to *80 Micro's* most recent surveys, only a small percent of our audience owns Tandy 2000s, too small to justify continuing the column.

I appreciate the support and feedback I've received from readers. *80 Micro* will continue to publish information about the Tandy 2000 in its reviews and New Products, Reader Exchange, and Ask Tandy departments. ■

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

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Continued from p. 36

The Details

Any material you can express in words or graphics you can turn into effective computer-aided instruction with Act III. While it can't make up for a poorly designed lesson, it can provide a variety of display and testing techniques for improving lessons of any quality. Math and science teachers may need other computer-aided instruction resources as well, but language arts and social science teachers can use Act III to teach almost anything in their areas, from the alphabet to timed reading comprehension tests. The program even checks the readability of any lesson for a specific grade level.

Act III was originally designed to teach reading, and many of its niftiest features betray those goals. You can display text at a timed rate, specified by either teacher or student. It can go to the screen a word at a time, or by syllable, phrase, line, sentence, or screen. You can intersperse graphics or blink parts of the text you want to emphasize. And once you master the

graphics, you can add animation for emphasis.

One interesting feature is the "cloze" function. Cloze displays text with certain words omitted and the student must supply the missing words. The computer can record all the student's answers, including the number of incorrect tries. Cloze can also check student comprehension of written material or pinpoint reading problems. Teachers of exceptional children can use it to help assess a child's needs and then design Act III lessons specifically for him.

Act III's commands allow complete control of text display; you can display text anywhere on-screen, selectively erase part of the screen, or change the display in the message box.

The manual is divided into sections for each of the three major applications (Editor, Artist, INFOSCAN), with an introduction for each. It also has a section on the DOS. The documentation is well written and easy to understand. The general material includes an introduction to computer terms and an overview of the Act III system.

The sections on Editor and Artist begin with a tutorial and end with an outstanding reference section. Act III's authors favor a learn-by-doing method. The written tutorial assumes the user has the program up and running as he reads the manual.

Editor is easy to use, permitting full-screen editing with cursor control and insert/delete functions. Changing text is as easy as using a word processor. Control codes handle operations such as substantial cursor movements, saving and loading text, merging files, displaying a help screen, and printing. These codes use the Clear key in combination with another key. You can enter commands that control the text display on their own lines, embedding them in the text. You format these 62 commands with two periods and two letters.

These control commands are designed to be easy to remember. For example, you invoke the "jump, no match" command with ".JN" and the "jump, right answer" command with ".JR". You can run a syntax check on a lesson to see if you entered

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the commands correctly. You can also make a test run of a completed lesson and make changes until it is displayed the way you want it.

Artist is more difficult to master, because you need to understand how to use TRS-80 graphics to make a picture. The manual suggests that users ease into graphics by making borders to set off important sections of text. The graphics editor lets you enter ASCII codes for symbols or use several keys to draw directly on the screen. You can enter graphics into the text directly, through the Editor, or merged from Artist-created files.

The documentation's large loose-leaf binder is uncomfortable to handle. A spiral-bound book that could be folded into a one-page size would ease look-up problems. The only way to handle the manual is to lay it flat on the desk. Unfortunately, most computer work stations don't have that kind of room.

The reference section entries give format and function for each command. Each entry is rated for difficulty, with an example and an explanation

on how the computer processes it. The entry lists rules for use, gives a detailed coding example, and tells what function the command relates to. Where appropriate, it talks about possible errors and refers the user to related commands. This section is excellent and is the strongest part of the manual.

Conclusion

Act III is a useful tool for computer-aided instruction. It can make well-designed lessons more effective and poor ones more tolerable. It's easy enough to use so that anyone (who is willing to take the time) can develop a library of valuable learning tools. Once you develop a lesson, you can modify it for any particular need. Teachers of exceptional children, whether they are retarded, disabled, or gifted, may find Act III to be immensely valuable in meeting the needs of their students.

While Act III won't improve poor teachers or make up for any other deficiencies in the educational system, it does prove that computer-aided in-

struction has a far-reaching educational potential. It is a tool for better education and training, in a school or anywhere else people need to learn. ■

Debit to Cash

by Wynne Keller

★★★★

Tax-Prep runs on the Model 4/4P (64K), the Tandy 1000/2000 (128K), and the IBM PC and compatibles; it requires two disk drives and Multiplan. EZWare Corp., 17 Bryn Mawr Ave., Bala Cynwyd, PA 19004, \$129.95

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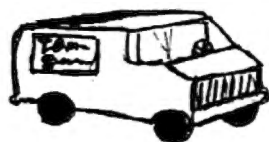
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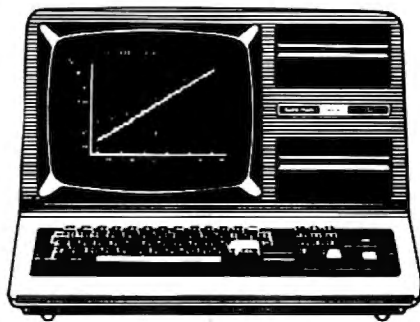


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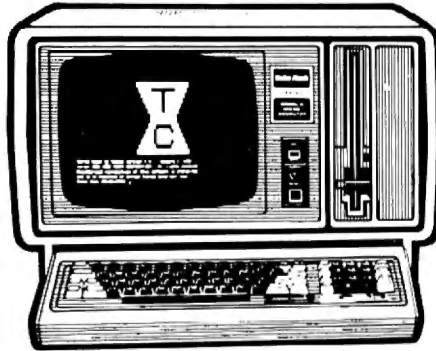
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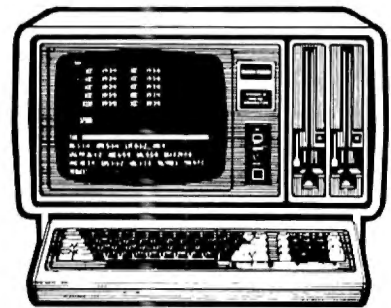
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the once-a-year filer than to someone preparing a series of annual returns.

The 1985 edition of Tax-Prep (for 1984 returns) includes templates for the forms 1040 (schedules A, B, C, D, E, F, G, R, SE, and W), 2106, 2119, 2210, 2441, 3468, 3903, 4562, 4684, 4797, 5695, and 6251. One other template on the disk cross-checks all forms for consistency. Tax-Prep printouts meet government requirements and you can submit them to the IRS.

I tested the program on a 64K Model 4P with two disk drives. Although Tax-Prep works with one drive, disk swapping would be so frequent that I can't recommend the program for those systems. Also, Multiplan in the 64K version requires a lot of disk access. If you use this program frequently, an investment in 128K would improve performance.

Filling in the Blanks

To use the templates, you first load Multiplan, then load any template with the Transfer Load command. Each template is named F followed by the IRS form number (the 1040 is F1040, for instance). Some forms take a long time to load, particularly if they use information from several other forms.

You start by filling in your name, social security number, dependents, and filing status on the 1040. Tax-Prep automatically passes these values to the other forms. While you can

complete the forms in any order, the most efficient way is to proceed as you would by hand, with the least-dependent form first.

Multiplan can do a lot of the calculations for you. For example, if you have W2 wage statements from more than one employer, type in the values with a plus sign between them and Multiplan adds them and displays your income total.

The big advantage to the templates is that you can make last-minute changes more easily. But after making a change on the appropriate form, you must reload and resave all the forms that took values from the changed form.

Line numbers on the computer forms match those on the IRS forms and you can use the GOTO command to rapidly access any line. Moving through a form is also simplified with a function key (F2 on the Model 4) that brings you to the next open cell key, because the Tax-Prep template locks out cells that aren't part of the form, or that shouldn't obtain values via direct input.

After you finish each form, you have to save it on disk with the Transfer Save command. If you don't do this, you'll lose your work; Multiplan doesn't warn you that you haven't saved a template.

Proper Form

The IRS requires that you send your 1040 return on an official form. But

they do sanction a computer edition with the front and back of a regular 1040 as two sheets of paper.

The Tax-Prep package includes 10 copies of the IRS computer edition 1040. Getting perfect alignment is tricky. The manual suggests you print one 1040 on plain paper, then hold it against the form with a bright light behind the paper and compare alignment. Adjust the margins as indicated, and try a printout on the 1040 paper. Using this procedure, it took me only three tries to get perfect alignment, so the 10 copies provided are plenty.

You can print all other forms on heavy green bar paper. The Tax-Prep package also includes this paper, along with an order form for more paper of either type.

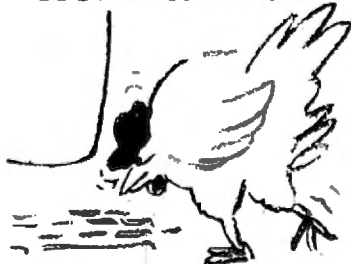
The documentation contains extensive disclaimers. If your return contains errors, EZWare disavows responsibility, even if a software bug causes it. To be sure your return is correct, you should double-check everything by hand. Many users will trust the templates and take their chances.

This Is a Test

I tested Tax-Prep by typing my 1984 return into the appropriate version of the program. Everything correlated perfectly except on Schedule A (itemized deductions). The template used my gross wages instead of my adjusted gross when figuring the 1 percent and 5 percent limitations for medical deductions. The values brought over

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from other forms appear at the bottom of each template. The Schedule A template claimed to be bringing over line 33 (adjusted gross income). But the value it listed for line 33 differed from the value I saw on-screen when I loaded the 1040.

This mysterious error turned out to be entirely my own. I assumed that if the 1040 was correct when I loaded it, it would be correct on the disk. Not so if the cell contains a calculated value. Such cells pass corrected information to other forms only after you resave them. Once I resaved the 1040, my Schedule A error disappeared.

I found it easy to make errors. In my case, the error was fairly obscure and I don't think I would have noticed it if I hadn't been comparing the computer with my actual return line by line. The more familiar you are with Multiplan, the less likely you are to make mistakes. The Tax-Prep manual suggests that if you do not already know how to use Multiplan, this is probably not the time to learn. I would agree.

A template on the disk is supposed to help detect errors by cross-checking every form. You can fix any discrepancies found by reloading and resaving the forms involved. This template will find discrepancies that don't exist if you don't use all forms on the disk (and you won't). You can ignore any errors for forms not used, but this process can make the cross-check a little confusing.

Tax-Prep printouts meet government requirements.

The Documentation

The manual comes in a small three-ring binder, with a tutorial, a description and printout of each template, and various helpful appendixes on topics like processing order, conventions, and cross-references for the templates. The instructions assume that you already know how to complete a tax return.

Same Time Next Year

Tax laws change sufficiently every year that you'll need a new version of the program. This is available to Tax-Prep owners at 40 percent off the list price. A cheaper solution would be to alter the templates if you're sufficiently adept with Multiplan. It could be a fairly time-consuming job, depending on how many lines on the 1040 you have to change and whether the tax rate tables have changed too.

Wrap-Up

Tax-Prep is for people who know how to do tax returns, and would be most useful to someone who does returns professionally. Each customer's return would be on a separate disk, and could conveniently be printed in batches.

If you use Multiplan throughout the year, you can link other Multiplan templates to Tax-Prep. If your only purpose is to do your own return, the high price, coupled with the fact that Tax-Prep isn't likely to save much (if any) time, will likely deter you. It could be a handy tool if last-minute changes in your return are the norm rather than the exception, or as a planning aid to see the tax effects of investment decisions. The more adept you are with Multiplan, the more useful you'll find Tax-Prep. ■

A Compiler for All Basics

by Thomas L. Quindry

★★★★★

Vivace runs on the Model III (48K) under TRSDOS 1.3 and on the Model 4/4P (64K) under TRSDOS 6.X or DOSPLUS IV; it requires one disk drive. Wittsoft Inc., 1302 41st St., Orlando, FL 32809, 305-423-5683. \$49.95

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February 1984: The Creator—new and improved data base management, also, tabulate and analyze opinion polls.

March 1984: Hinrich's word processor, a III to 4 conversion program, and a Machine-language arcade game.

April 1984: CP/M digest, Model III/4 conversion program, pie and bar chart program, and new Scripsit characters.

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```

5   CLS
10  CLEAR 15000: DIM A$(2000)
15  PRINT TIMES
20  FOR N=1 TO 2000
25  FOR M=1 TO 5
30  A$(N1)=A$(N1)+CHR$(25)+65)
32  NEXT M
33  N1=N1+1: IFN1=2001 THEN
    N1=0
40  NEXT N
50  PRINT TIMES
60  END
    
```

Figure. The program used to measure garbage collection in Test 12.

execution speed. Vivace doesn't give you a great increase in speed—compiled programs run about twice as fast as uncompiled programs—but it has other qualities that make it worthwhile. For example, Vivace-compiled programs cannot be listed or disassembled, preserving the code in programs to be sold. Vivace supports full error-trapping and Break-key recognition in the compiled programs.

The files Vivace generates are neither true Basic nor true machine language because of the way Vivace selectively compiles Basic commands. In fact, the only claim the manual makes is that

Program Test	Percent Execution Time
1. For...Next loop	100
2. Counting loop	63
3. Arithmetic statement using variables	77
4. Arithmetic statement using variables and constants	74
5. GOSUB loop	69
6. For...Next loop, GOSUB, and array set-up (DIM)	78
7. Array handling within a For...Next loop	79
8. Sieve of Eratosthenes	63
9. String manipulation using the MID\$ function	81
10. String manipulation using a bubble sort	88
11. Disk input/output and screen printing:	
Write	100
Read	100
Print	107
12. Garbage collection	15

Table 2. Test results of programs compiled using Vivace. Note that execution time is a percentage of the execution speed of the uncompiled Basic program.

Vivace lets you easily convert Basic programs to /CMD files. But Vivace does improve execution speed and it lets you compile Basic programs without first modifying them.

Registered users get unlimited, royalty-free distribution of the /CMD files Vivace generates, so you don't have to worry about copyright infringement if you want to sell a program.

Testing Vivace

To test the effectiveness of Vivace in speeding up program execution, I timed a series of program runs. I used the same programs used to compare the execution speed of the Model 2000 with other popular computers (see "Marking Time," May 1984, p. 96 for the programs used). In addition, I designed a 12th test to monitor garbage collection (see the Fig.). The results appear in Table 2.

As claimed, Vivace increases program speed by up to a factor of two, depending on program size and complexity. Tests 1-11 show that executing Vivace-generated programs took 63-107 percent of the time Basic source programs required. Most of the test programs executed in 74-81 percent of the time of the Basic program.

The tests also showed that functions such as disk read and write, screen display, and For...Next loops executed in about the same time they would in uncompiled Basic programs.

A striking difference in speed of the two programs showed up in Test 12, the test for garbage collection. Garbage collection occurs when a program places and replaces strings in the space reserved by a Clear command. Once that space fills up, the computer does its housecleaning and removes all strings no longer necessary.

In Basic, garbage collection can result in a long pause depending on the number of strings and the amount of reserved string space in a program. In Test 12, the program stopped three times for garbage collection (to observe the garbage collection delays, add PRINT @ 520, N as line 35 in Test 12). The pause in execution for the last of these garbage collection operations lasted over eight minutes for the Basic program.

Vivace-generated programs completed all the same operations in about a second. And the program Vivace generated in Test 12 ran in 15 percent

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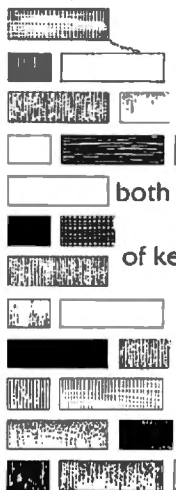
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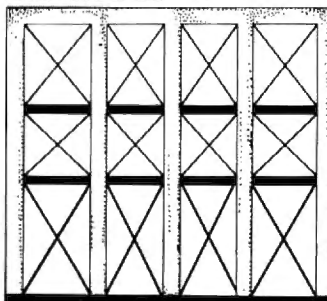
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If you invest in brick and mortar, then you should invest in our brickware, Investor III™. Designed by real estate professionals to work on the IBM PC or TRS-80, Investor III™ is a comprehensive software package that aids in investment analysis of property, whether commercial or residential, small or large. It shows both the tax and cash aspects of an investment opportunity and is flexible enough to allow you to vary a number of key assumptions (such as cash flow, phased investments, multiple mortgages, and tax parameters) and see the results in an instant. So if you are serious about brick and mortar, look at our brickware. It will help you lay a solid foundation for your investment strategy. Contact your local dealer.



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of the time of the Basic program.

In addition to running the 12 tests, I used Vivace on two Basic programs. One, a program that generates a maze, executed in 48 percent of the time of the Basic version. The other, an educational program with graphics, executed in approximately 71 percent of the time for the Basic version.

Vivace Features

Vivace's forte is its ease of operation and its total compatibility with Basic. The need for user input is minimal. Vivace lets you chain programs with the Run and Load commands. Vivace will bypass certain commands, like List, Save, and Edit; if Vivace encounters these commands, it skips over them—you don't have to rewrite your Basic program.

Vivace supports full error-trapping, too. For example, Basic On Error GOTO and Resume commands operate correctly. You can even terminate program execution with the break key.

In addition, Vivace lets you use command line arguments with pro-

grams. When you run a Vivace-generated program, you can enter words you want entered in response to program prompts after you type in the program name. The command line sequentially substitutes a word each time the program calls for input (with the Input or LINEINPUT statements), superseding normal keyboard input. When the command line runs out of words to insert, the program reverts to accepting input from the keyboard.

Using Vivace

When you compile a program with Vivace, you have to use the disk supplied. Vivace comes on a protected disk that includes a program to transfer TRSDOS (and DOSPLUS for the Model 4) to it. You also get a backup disk.

After specifying the input and output files for compilation, you can set a parameter string. The parameter string establishes the number of input/output files and protects memory size your program may need. These are optional; you enter them in much the same way you enter them from the

command line in TRSDOS before getting into Basic. Your TRSDOS manual doesn't document these commands, though they're available. The Vivace manual explains them.

You have to run Vivace-generated programs with a file called Vivace/LIB, which you can transfer to your working disks.

While the manual for Vivace is only five pages long, it's sufficient to learn how to use it.

Hardware vs. Software

Using software, Vivace speeds up most programs by about the same amount as a speed-up kit does using hardware. Where a hardware speed-up kit gives an across-the-board, consistent improvement in speed, Vivace improves the speed of certain programming functions to a greater degree than others. For example, programs with extensive string-handling routines will benefit most by Vivace. These include data bases, mailing lists, property management programs, and so on.

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Conclusion

If you need a general increase in program speed, have programs that do a lot of string manipulation, or want to distribute list-protected Basic programs, Vivace might be your ticket. It takes all of five minutes to learn to use and requires no special programming commands. While most compilers run faster, you have to modify your Basic programming; Vivace requires no modifications. ■

Today's Puzzler

by Wynne Keller

★ ★ ★ ★ ☆

Crossword Master runs on the Model III (16K) and requires one disk drive. Just Software, 128 Joann Drive, Moses Lake, WA 98837. \$9.95.

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Few games require so little equipment for such a pleasant challenge as crossword puzzles. Crossword Master goes one step further by taking the pencil and eraser out of

crossword puzzle-solving. As with any good crossword, I found the puzzles challenging but solvable.

Master Strategy

Crossword Master provides the puzzle matrix, displays the hints, and facilitates error correction. Using a computer to solve a puzzle provides several advantages over paper. You move the puzzle's cursor around the screen by pressing the arrow keys and a pointer indicates the direction of movement when you want to type in a word. To change your direction from horizontal to vertical, you press the slash key. As you move the pointer, Crossword Master displays the definitions for the words across and down for a particular square.

It's possible to check a solution in progress by pressing the question-mark key. The program marks any errors with parentheses. Unfortunately, the cursor does not return to its former position after an error check. It jumps to another portion of the puzzle and you have to move back to where you were working before.

The puzzles are numbered (30 on the disk) and scaled in difficulty. While some of the definitions seem obscure, that is true of paper crossword puzzles as well. Higher-numbered puzzles were larger and overlapped the screen. As you move the cursor around, the sections off-screen come into view.

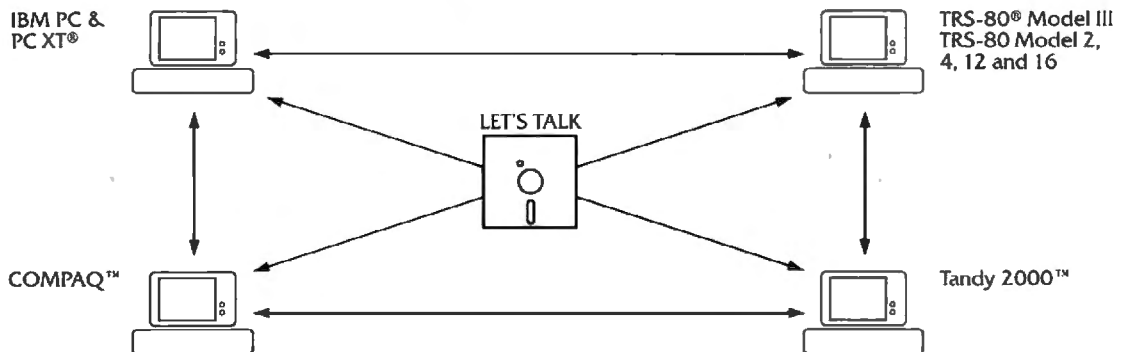
Drawbacks

Two possible disadvantages emerged to using the computer for crossword puzzles. One is the pointer system for typing in the answers. More often than not, I would forget to change the pointer's direction when I wanted to type in an answer, and it would appear down when I wanted it across. The other, less annoying, problem was the inability to see more than two hints at a time.

It was fun doing crossword puzzles on a computer, and I liked being able to check for errors. You can get a second disk of puzzles for \$9.95 (\$7 if you send in a blank disk). The cost of these puzzles works out to 33 cents apiece, a real bargain. ■

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a division of the goodman group, Inc. 12900 Preston Rd., Dallas, Texas 75230 (214) 239-6085

LET'S TALK includes all diskettes for each of the above computers. Suggested retail price \$179.00 + \$5.00 shipping

To Boldly Go...

The book *The Hitchhiker's Guide to the Galaxy* is now an adventure game from Infocom. Adapted from Douglas Adam's novel, *Hitchhiker's Guide* takes you on a trip across the universe as hapless Earthling Arthur Dent trying to escape the earth's destruction.

Hitchhiker's Guide to the Galaxy is \$39.95 from Infocom Inc., 55 Wheeler St., Cambridge, MA 02138, 617-492-1031.

Circle 569 on Reader Service card.

Terms of Communication

Omniterm2 is a communications package for the novice or sophisticated user that lets your Model 1000, 1200, or 2000 access communications services or talk with other computers.

Omniterm 2 can also access Xenix multi-user systems. The package includes a keyboard overlay, two disks, and documentation for \$175.

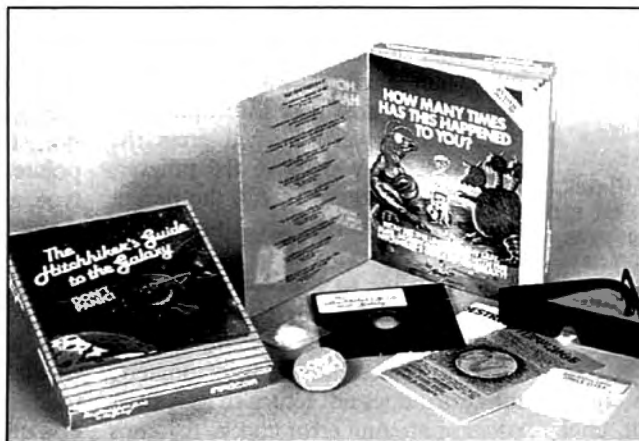
For more information, contact Lindbergh Systems at 49 Beechmont St., Worcester, MA 01609, 617-263-5049.

Circle 553 on Reader Service card.

On the Fast Track

Logical Systems Inc. (8970 N. 55th St., P.O. Box 23956, Milwaukee, WI 53223, 800-248-3535) offers a utility that adds zip to your Model 4.

The DSM4 disk virtual sort utility (\$99) eliminates manually sorting through



Infocom's latest adventure game leaves the Earth entirely.

individual applications programs by creating and maintaining an overall program index. DSM4 selects, sorts, and creates an index of up to 1,000 records.

Circle 552 on Reader Service card.

Slim Whitman—The Programmer

Most people don't know that Slim Whitman is one of the world's most popular programmers as well as an international singing star. In fact, his packages have sold over 10 million copies in Europe alone. Now Software Imports is bringing the best of Whitman's programs to the U.S. Included are "Checkbook Serenade," "Word Processing by Moonlight," "My Spreadsheet Amour," and "The Recipe Yodel."

The programs, originally written for the Timex/Sinclair, have been converted for nearly all currently available micros. To order your copy, call 1-800-555-5555. That's 1-800-555-

5555. Operators are standing by.

What an IDEA!

Traveling Software's new IDEA! outline processor for the Model 100 helps manage information. It incorporates a word processor and data base in one program for drafting articles, organizing lists, creating proposals, brainstorming, and scheduling appointments.

IDEA! is \$79.95, and includes a manual and introduction on audio cassette. The program is available at Radio Shack stores, or by contacting Traveling Software at 11050 Fifth Ave. N.E., Seattle, WA 98125, 206-367-8090.

Circle 551 on Reader Service card.

Games Made Here

Basic Adventure and Strategy Game Design for the TRS-80, by Jim Menick (\$9.95) shows beginning and intermediate programmers how to create TRS-80

Disk Basic computer games.

Tips for adventure game designers include how to create player puzzles, monitor player and room variables, and develop program vocabulary. Strategy-game designers can learn efficient program structuring and how to use algorithms and character graphics.

The book includes a glossary, an index, and a line-by-line breakdown of two game programs. Contact Facts on File Publications, 13050 S. Pulaski Road, Alsip, IL 60658 for more details.

Circle 554 on Reader Service card.

Getting Your Lines Crossed

FPTransfer from The Small Computer Co. (230 W. 41st St., Suite 1200, New York, NY 10036, 212-398-9290) lets you transfer files between any two computers.

This stand-alone FilePro enhancement program transfers all types of files, and can transfer files from single-user to multiuser systems.

FPTransfer is available for the Models II, 16, 1000, 1200, and 2000 for \$145.

Circle 555 on Reader Service card.

Crayola Plotter

The Crayola Plotter represents Crayola's entry into high technology. Using sophisticated, wax-based pens, the Crayola Plotter offers, the company says, "an optimum price-performance ratio." The pens,

MEGABYTES FOR MINI-BUCKS

Circle 455 on Reader Service card.

AS SEEN AT THE RADIO SHACK
COMPUTER SHOWCASES

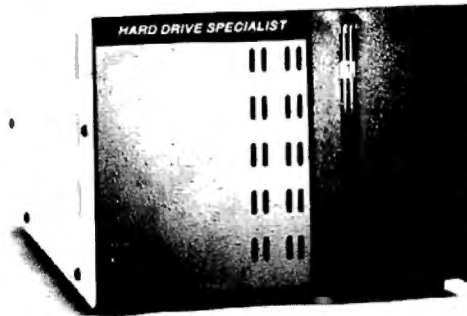
Model 1, 3, 4 Hard Drives

	Primary	Secondary
5 Megabyte —	\$ 795.	\$ 595.
10 Megabyte —	\$1095.	\$ 895.
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30 Megabyte —	\$1895.	\$1695.

(Model 1 add \$50.)

TRS-80 Hard Disk Subsystem Features*

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- * Built in power up diagnostics.
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- * Gold connectors used throughout for high reliability.
- * 1 year warranty



Shop and compare. Hard Drive Specialist has been building hard drive systems for years and have sold thousands of subsystems to satisfied TRS-80 customers. We fully support TRS-80 Models 1,3,4, and 4P computers on available hard drive operating systems. We use the latest state-of-the-art drives and controllers. Our drives all use buffered seek logic and plated media to result in almost one-fourth the average access times found on our competitors drives. Plated media results in longer platter life and high resistance to head crashes not found on coated media drives. We utilize high construction throughout including heavy duty power supply, cooling fan and gold edge card connectors. We back our drives with a one year parts and labor warranty and we're so sure that you'll like our drive that we offer a thirty day money back guarantee. So when it comes time to buy, look beyond the price and choose the best drive. After all, we are the Hard Drive Specialist!

HDS Multiplexer

\$1295.

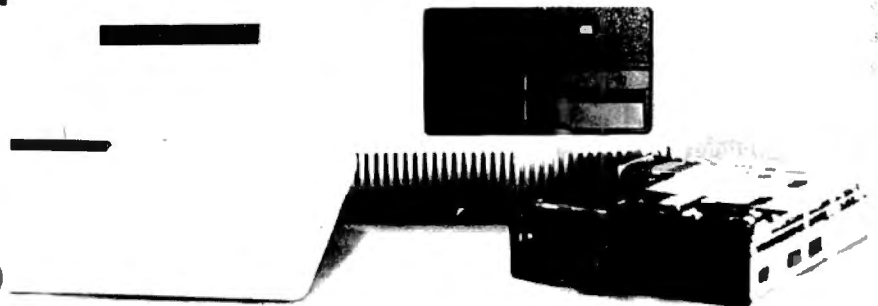
The HDS Multiplexer allows the usage of up to 4 Model III or IV systems using Dosplus 3.5, LDOS, TRSDOS 6.x, and DOSPLUS IV on a HDS Hard Drive. The standard package includes the Master Control Unit, Host Adapters for 2 Computers and 40' of cable. Each additional Host adapter add \$150. Each additional foot of cable add \$1. up to 100 feet per computer.

Model 3/4 Boot Rom \$39.95

Allows you to boot directly from a HDS Hard Drive using DOSPLUS. Versions available for useage with and without Multiplexer.

Tandy 1000, Tandy 1200, IBM, Zenith, and Compaq Hard Drives

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 - 10 Megabyte External \$1195.
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Order Line 1-800-231-6671

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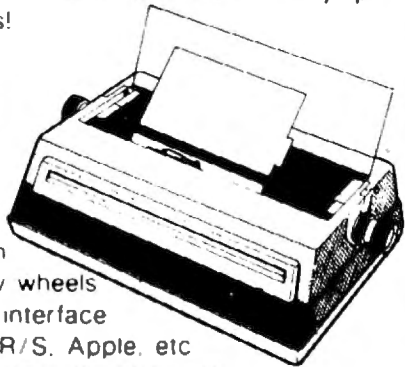
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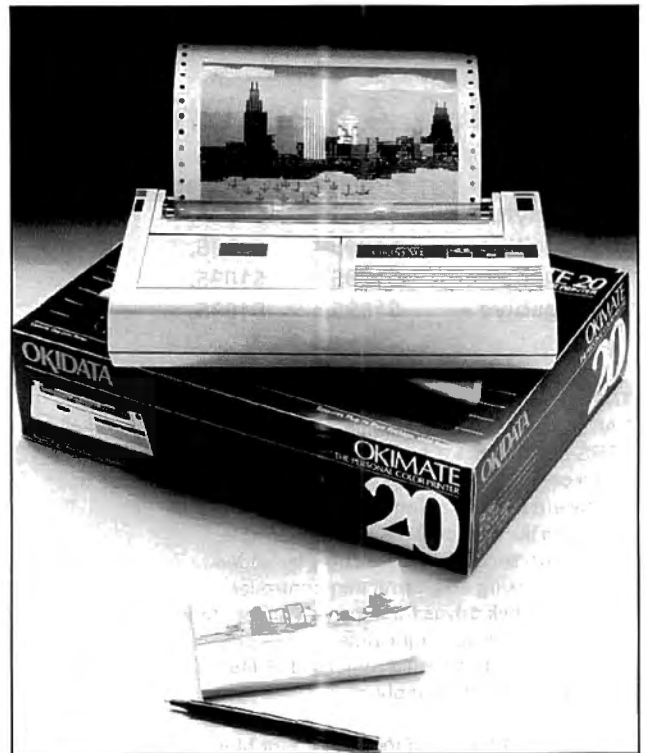
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NEW PRODUCTS



The Okimate 20 prints high-resolution color graphics and text.

available in any toy store, are simple to use: You just peel off the paper and stick them in Snoopy's paws. Your software and Snoopy do the rest.

Snoopy is made of highly durable plastic. LEDs in his eyes report on the plotter's status. The company says Grandpa Smurf and Michael Jackson will be available by summer.

For more information, consult your local Crayola dealer.

Color Prints

The Okimate 20 color thermal printer (\$268) creates color screen dumps on standard fan-fold paper or single sheets. It prints in letter-quality (40 characters per second) or draft-quality (80 cps) modes.

The Okimate includes two ancillary programs. Learn to Print is a tutorial on how to use the printer. The Color Screen Print program lets you dump screen images with a single keystroke.

The Okimate 20 also

prints on standard thermal paper. An optional interface kit is available for IBM PC-compatible computers. For more information, contact Okidata at 532 Fellowship Road, Mt. Laurel, NJ 08054, 609-235-2600.

Circle 556 on Reader Service card.

Packing 'Em In

TextPress (\$49.95) reduces the amount of disk space used in storing Model I/III/4 text by 30-40 percent. The program compresses ASCII text files for long-term storage and quickly decompresses files to their original form. TextPress replaces 127 repetitive letter combinations with single-byte tokens.

For more details, contact The Alternate Source, 704 N. Pennsylvania Ave., Lansing, MI 48906, 517-482-8270.

Circle 557 on Reader Service card.

Outside Lines

The Modem 80 communications package is now available for the Model 4.

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Tell more than 200,000 dedicated, interested TRS-80 users about your product or service with an efficient and economical **80 Micro** classified ad.

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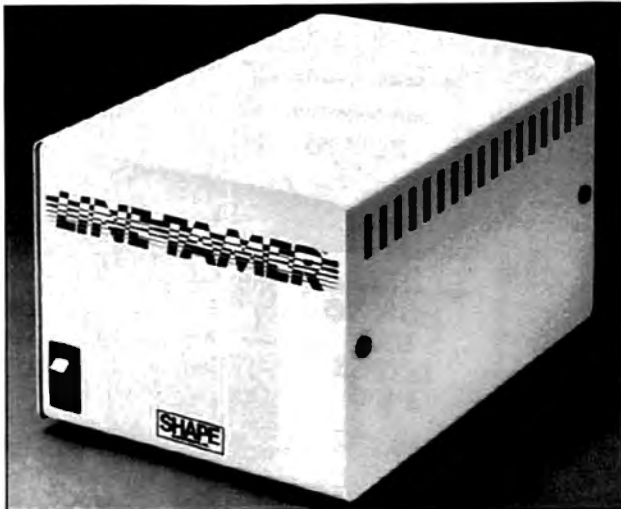
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NEW PRODUCTS



Line Tamer keeps your computer in constant, clean power.

Modem 80 4.0 (\$79.95) lets you transfer files with other computers and terminals. It features remote operation, error-free file transfers, and unlimited file lengths. On the 128K Model 4, Modem 80 accepts CP/M or MS-DOS text files.

Contact The Alternate Choice, 9505 W. Brown Deer Road, Milwaukee, WI 53224, 414-355-4544 for more information.

Circle 558 on Reader Service card.

No Charge

The Personal Computer 150 volt-ampere Line Tamer power conditioner (\$99) protects your computer from 99.5 percent of power source

aberrations including spikes, transients, surges, undervoltages, and overvoltages.

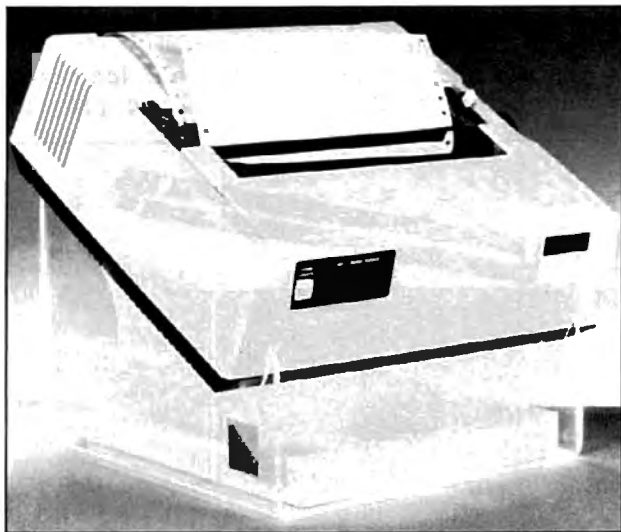
A 300 volt-ampere model is also available. For more information, contact Shape Magnetronics Inc., 901 DuPage Ave., Lombard, IL 60148, 312-620-8394.

Circle 573 on Reader Service card.

Write Angles

The Write Angle printer stand positions computer printouts for easy viewing. This clear acrylic one-piece stand allows paper storage below the printer.

Skid-protective feet hold the stand securely. Stands are available in three sizes. Prices start at \$29.95. Con-



The Write Angle keeps printouts in plain view.

Circle 347 on Reader Service card.

TRS 80 Computers

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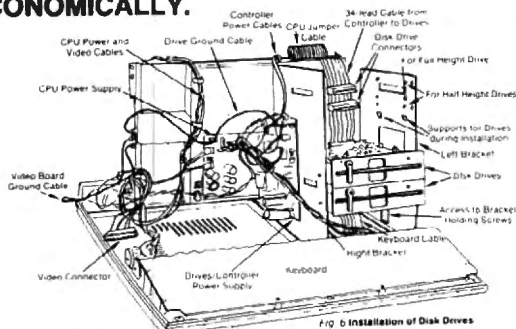


Illustration from E-C DATA's Disk Kit Installation Manual

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Complete Disk Kit w/ 32k M3 RAM w/o Drives†	250
Complete Disk Kit w/o Drives†	215
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Disk Installation Hardware w/Power Supply, w/o Controller	95
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RS-232 (V.24) Communications Interface Kit, M3/4	75
First 64k M4 RAM Expansion Kit	62
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M4 PAL U72 alone	30
TRSDOS 6.1 for M4‡	45
Disk Drive Shugart SA-455, Slim-Line, DS, 40 Tracks	205
Disk Drive Shugart SA-465, Slim-Line, DS, 80 Tracks	240

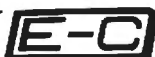
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Bell 103 to CCITT Internal Modem Conversion Kit	65
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‡ Only with Purchase of Disk Kit. Specify 40 or 80 Track Diskette.	
TRS-80 and TRSDOS are Trade Marks of Tandy Corporation, Fort Worth, Texas.	

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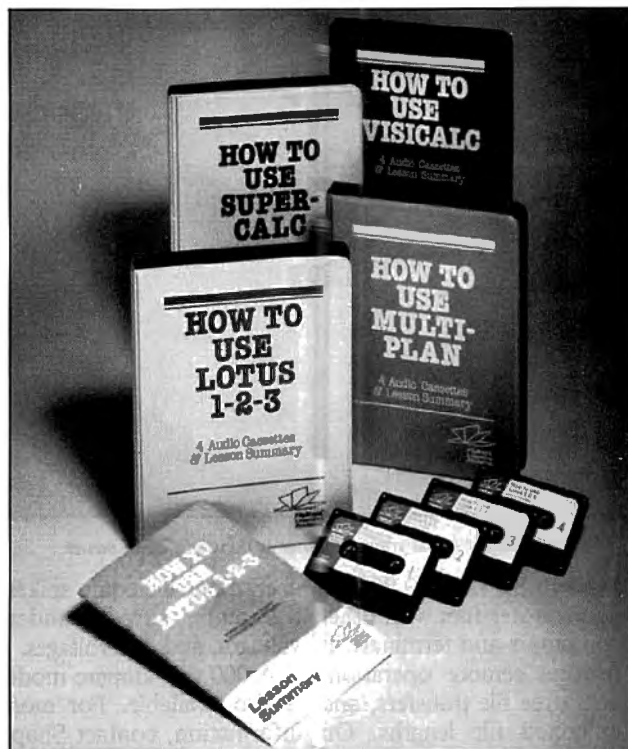
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NEW PRODUCTS



FlipTrack's cassettes help you get the most out of your spreadsheet.

tact Northeast Peripherals (RD#1, Box 44, Somerset, NJ 08873) for more details.

Circle 568 on Reader Service card.

Image This

The AlphaPro 101 daisy-wheel printer (\$399.95) prints at up to 20 characters per second (cps) and uses an intelligent printer cartridge to adapt to computers with Centronics or RS-232 ports.

The Model 101 features path-seeking logic to maximize print speed, a 93-byte buffer (a 4,000-byte buffer is also available), proportional spacing, boldface,

super- and subscripts, and reverse line feed.

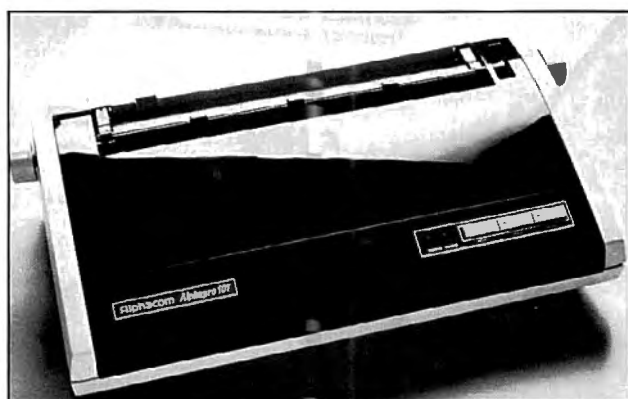
Contact Alphacom Inc. (2323 S. Bascom Ave., Campbell, CA 95008, 408-559-8000) for more details.

Circle 560 on Reader Service card.

Spreadsheet Knowledge

FlipTrack Learning Systems (999 Main, Suite 200, Glen Ellyn, IL 60137, 312-790-1117) offers audio courses for learning Lotus 1-2-3, Multiplan, VisiCalc, and SuperCalc.

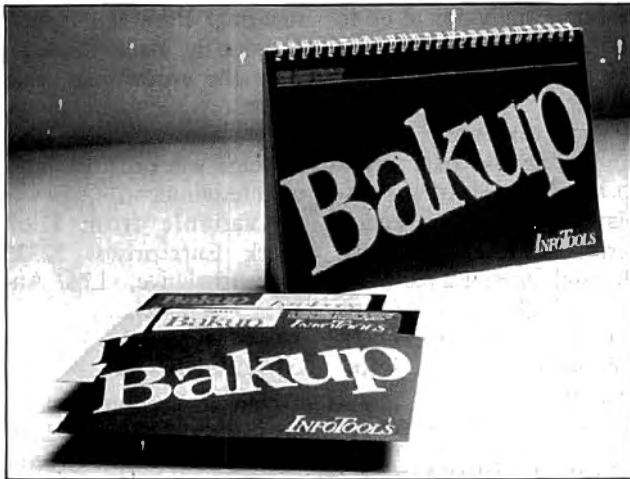
Tutorials lead you through basic program



Alphacom's AlphaPro 101 letter-quality printer.

NEW PRODUCTS

Circle 476 on Reader Service card.



Bakup quickly backs up Model 1200 hard disk files.

commands to more difficult operations. They cover building worksheets and templates to constructing more complex functions and analysis. Each course includes four audio cassettes and a quick-reference guide for \$75.

Circle 571 on Reader Service card.

Hard Copy

Bakup (\$149.95) is a high-speed back-up utility for the Model 1200's hard disk that automates and manages the back-up process, creates a data base of back-up information, and restores backed-up data.

After the first hard disk back-up, Backup copies only files you change. Backup features context-sensitive help screens, a backup/restore time and disk forecast, a reporting module, and disaster recovery mode.

For more information, contact Infotools at 10044

S. De Anza Blvd., Cupertino, CA 95014, 408-725-1151.

Circle 561 on Reader Service card.

Better BPS

The General Datacomm 1200 (\$699), a highly accurate 300/1,200-bit-per-second modem, features error-free performance under mode line conditions.

The Model 1200 automatically sets call parameters and can transmit and receive data simultaneously. The unit includes GDC communications software. The software, compatible with other popular modems and software, includes a two-year subscription to GDC's telecommunications update service.

For more information, contact General Datacomm, Straits Turnpike, Middlebury, CT 06762, 203-574-1118.

Circle 565 on Reader Service card.



General Datacomm's 1200 modem and communications software package.



MULTIDOS 80/64 - FOR THE MODEL 4

New for your Model 4...A completely unique DOS...Not a rehash of TRSDOS 6...Not just another Model III DOS...A totally redesigned operating system for your Model 4.

- flip between 64 and 80 characters on the screen; 32 and 40 character widths also available
- runs Model III software
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- for 4P owners, never load MODELIII/A file again!
- disk I/O code written for Model 4; get fewer errors than you get using a Model III DOS
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- includes all the new features in 1.7 MULTIDOS

MULTIDOS 80/64 reads many disk formats, including all Model I/III DOS' and TRSDOS 6. If you're a Model III owner thinking about upgrading, this makes the transition easy.

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NEW VERSION MULTIDOS FOR MODEL I/III \$89.95

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ZEUS for Model I, III, 4, or MAX-80\$79.95

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File Freedom

File Mover, from Elektro-konsult Software (Konnerudgt 3, N-3000 Drammen, Norway, 47-3-83-15-00) lets you transfer CP/M and MS-DOS files between microcomputers using different disk formats and operating systems.

The utility transfers up to 64 files over a serial link at up to 9,600 bits per second using a single command. A supplied utility lets you install File Mover on additional CP/M systems. Disk formats are available for the Models I and III (\$59.95), and for MS-DOS and CP/M computers.

Circle 564 on Reader Service card.

Digi-Copy

Personal Scanner is a graphics digitizer and text input device that converts drawings, photographs, type-

written documents, and other visual materials into files on the Model 1200.

This desktop-sized scanner operates in similar fashion to a copier. You insert a page of text and the scanner digitizes the text and sends it to disk within one minute.

The Personal Scanner is \$2487 from Electronic Information Technology Inc., 373 Route 46 W., Fairfield, NJ 07006, 201-227-1447.

Circle 574 on Reader Service card.

Upscale Pascal

Turbo Graphix Toolbox (\$49.95) is a high-resolution graphics system for Turbo Pascal that features window management capability.

Graphics procedures cover drawing charts and graphs for business, scientific, and general-purpose applications. You can store screen images in RAM for

real-time animation at up to 500 images per second, and can transfer them to disk or printer.

The windowing feature copies one part of a screen to another area of the display or scrolls a section across the screen. Contact Borland International (4113 Scotts Valley Drive, Scotts Valley, CA 95006, 408-438-8400) for more information.

Circle 559 on Reader Service card.

Bloopers, Blunders, And Boners

This hilarious collection of uncensored programming bloopers, blunders, and boners will have you and your friends rolling on the floor. How about an early version of Scripsit that aborts when you type the word "overbite"? Or a Basic compiler that doesn't

recognize Print statements? Imagine the yucks you'll get with the spreadsheet that doesn't accept numerical data! Always zany, this package will provide hours of entertainment.

Available from Dick Clark Enterprises, 12323 Madcap Drive, Los Angeles, CA 90027.

Gimme Shelter

Universal printer enclosures from Jensen Engineering Inc. cut printer noise and vibration. The enclosures come in 22- by 18- by 10¼-inch (\$146) and 26½- by 19- by 15½-inch (\$169) sizes that fit most popular printers. Cooling fans are available.

For more information, contact Jensen Engineering Inc., Box 7446, Santa Rosa, CA 95407, 800-358-8272.

Circle 563 on Reader Service card.

Circle 285 on Reader Service card.

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Circle 572 on Reader Service card.

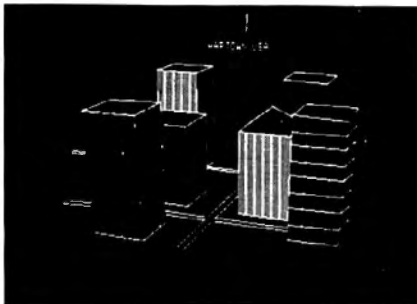
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New Products listings are based on information supplied in manufacturers' press releases. 80 Micro has not tested or reviewed these products and cannot guarantee any claims.

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Superior Hardware. The Grafyx Solution provides 153,600 pixel elements which are arranged in a 640 x 240 or on the Model III a 512 x 192 matrix. Hundreds of new business, personal, engineering, and educational applications are now possible. The hi-res display can be shown on top of the standard display containing text, special characters, and block graphics. This simplifies program debugging, text labeling, and upgrading current programs to use graphics. The Grafyx Solution fits completely within any tape or disk based Model 4, 4P, or III. Installation is easy with the plug-in, clip-on board.

Superior Basic. Over 20 commands are added to the Basic language. These commands will set, clear or complement points, lines, boxes, circles, ellipses, or arcs. The hi-res screen can be printed on any of 20 popular printers or saved or loaded to disk without leaving Basic. Areas may be filled in with any of 256 patterns. Sections of the screen may be saved and then put back using any of five logical functions. Labels can be printed in any direction. The viewing area can be changed. The entire screen can be complemented or cleared. Graphics Basic provides dot densities of 640 x 240, 320 x 240, 160 x 240, and 160 x 120, all of which can be used in the same display.



Superior Software. The board comes with over 40 programs and files which make it easier to use, serve as practical applications, demonstrate its capabilities, and serve as programming examples. The software works with TRSDOS 1.3, 6.1.2, 6.2, LDOS, NEW-DOS80, and DOSPLUS. The Grafyx Solution is also supported by a number of optional applications programs: Draw, Bizgraph, xT.CAD, 3D Plot, Mathplot, Surface Plot, Biorhythm & USA, Music.

The Grafyx Solution package is shipped complete for \$199.95 (reduced from \$299.95). A manual for review is \$15. Payment may be by check, Visa/MC, or COD. Domestic shipping is free on pre-paid orders. Texas residents add 5% tax.

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Software News And User's Group Gripes

Send your questions about Tandy 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: I have a Tandy 2000. It has such splendid graphics capabilities, I'd like to know if a drawing program similar to the Macintosh's MacPaint will ever be available for the 2000.

A: By the time you read this, DR Draw should be available. It's a super drawing program, although it doesn't work exactly like MacPaint. Considering the 2000's graphics capabilities, it's logical that other drawing programs will also become available.

Q: When I tried to update my Scripsit back-up disk from TRSDOS 6.01 to 6.01.02, I blew the disk. Can I safely update to TRSDOS 6.02? What patches do I need?

A: Be safe. Have your local Radio Shack store get you a copy of the 6.02 version of Model 4 SuperScripsit (catalog number 700-2252). Then copy your files to the new disk.

Q: I have MultiMate for the Tandy 2000. When can I get the dictionary disk?

A: Good question. When Tandy researched spelling checkers and correctors, we found a lot of good ones, including the one normally supplied with other versions of MultiMate. But Tandy chose to go with Houghton Mifflin's dictionary system; in our opinion, its unique algorithms did a superior job. MultiMate International agreed to link its word processor to Houghton Mifflin's dictionary for us. The dictionary is ready. MultiMate is now doing its part of the project, but it's taking longer than expected. At present, I can't give a firm date on when the product will be ready.

Q: Why does Tandy/Radio Shack refuse to support user's groups that purchase, recommend, and use the fine hardware and software your company offers?

A: Boy, I love that word "support." Seldom has one word meant so many different things to so many people. Your question is tough to answer, since I don't know exactly what kind of support you'd like.

Our field people often visit with local clubs to show equipment, answer questions, or speak to a group. Contact your local Radio Shack Computer Center; if someone from Fort Worth happens to be in your area on business at your meeting time, you might be able to arrange a visit.

You should direct technical or product-delivery questions to a nearby customer service representative (through a Computer Center) or use our customer service lines in Fort Worth. Remember, Tandy isn't staffed to provide custom programming or hardware help. You can route other questions through Mrs. Linda Miller, Marketing Information Department, 1700 One Tandy Center, Fort Worth, TX 76102. We do answer all mail.

If you have questions about product discounts, p. 3 of our computer catalog has a discount schedule for purchases in quantities of six or more. Our Special Marketing Group in Fort Worth will quote volume prices to any person or group planning to buy 21 or more computers. You can schedule deliveries over a six- or 12-month period, depending on the quantity. Submit written requests for quotations and terms through your local Radio Shack store.

By the way, here's an open question to user's groups: Would you like a monthly newsletter from Fort Worth? What should we include? Due to our limited people resources, the newsletter would probably be in the form of a typed, photocopied letter. Obviously, we can't supply proprietary informa-

tion, but if you're interested, send your suggestions to Ed Juge, Director of Market Planning, 1700 One Tandy Center, Fort Worth, TX 76102. Include your club's name and address, and the name of a contact person. Also, for our reference, please let us know when and where you meet, the number of members, and specific areas of interest.

Q: I own a PC-2 Pocket Computer. When Tandy discontinued publishing the TRS-80 Microcomputer News, I was in the middle of a series on Assembly language and communications. I feel as if I've been stranded. Do you know of a source for the rest of the information in the series?

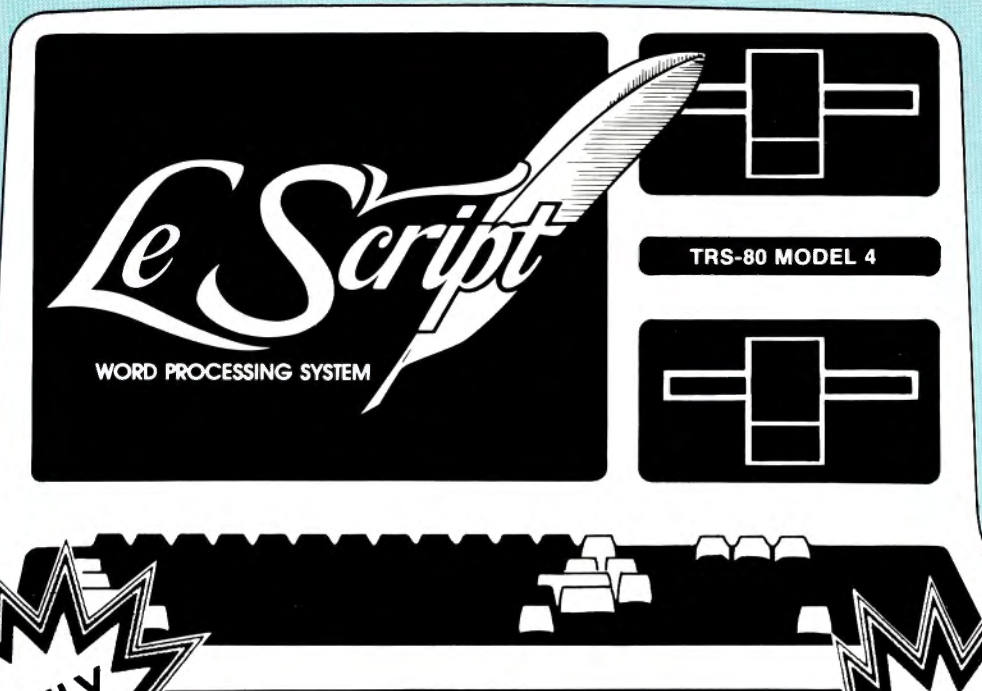
A: We're sorry for leaving you in the middle of the series. It would have been tough to discontinue a project like the News without stopping in the middle of something. As far as I know, the rest of the series isn't available because the author didn't finish it.

Q: Why did you discontinue the Model III Technical Reference Manual?

A: Since I get the same question about software and other accessories for the Model III and other discontinued computers, I'll answer in a general fashion. Any retailer or manufacturer is guided by one thing: demand. Enough people have to want a product if the retailer is to continue selling it. Retailers usually have to buy large quantities in order to sell a product at a reasonable price, and it's just not economically sound to buy 4,000 or 5,000 copies of a product if you're going to sell only 50 or 60 copies monthly.

In this case, you might try ordering a service manual from our National Parts organization; it should contain the same information as the Technical Reference Manual ■.

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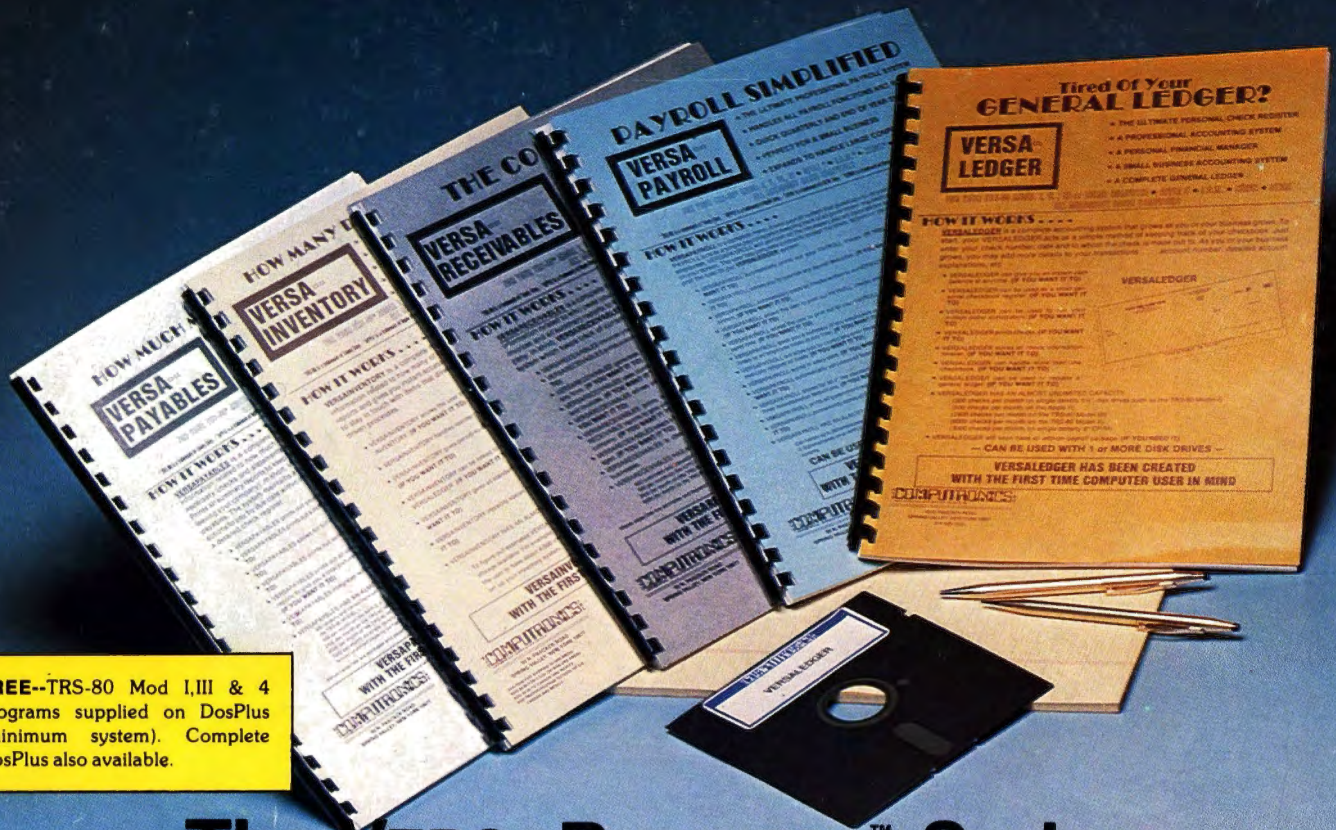
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