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80micro

A WAYNE GREEN PUBLICATION

the magazine for TRS-80* users

THE MODEL 2000

Tandy's Newest Micro
Their Boldest Move Yet

C•Notes
For the Model 100

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

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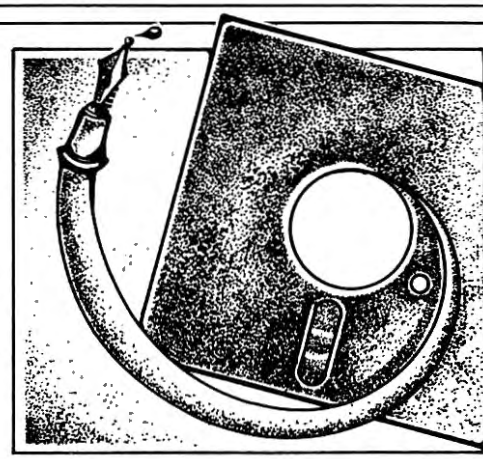
SIDE TRACKS

by Eric Maloney



Like new, low mileage

It certainly has been an eventful year for the TRS-80 world. While most companies were introducing one or two new products, Tandy turned over nearly its entire line, in the process filling almost every conceivable niche in the microcomputer market.

Tandy has developed an interesting and unique approach: They're selling computers like an automobile company sells cars. No matter what your need, there's a TRS-80 for you (see the Table).

Want a nice, compact travel car? Then try the Model 100. How about a durable pickup truck? You might test-drive the Model 4. Need a family vehicle? The Color Computer could fill the bill. If you need a van for lots of storage, you'll be interested in the 16B. Tandy can even give you a moped with the MC-10.

And now, to top it off, they've introduced their version of the Mercedes-Benz—the Model 2000. It'll not only get you where you're going, Tandy promises, but it'll get you there with style.

Tandy's machines come with a variety of engines. The Model 100, for example, has a fuel-efficient 80C85, while the 16B uses a powerful 68000 gas guzzler. The newest entry, the 2000, has a zippy 80186. And, of course, there's still the Z80, the slant six of microcomputers.

Want CP/M? They've got it. How about something with Unix? Step over here for a minute. Want to look at a machine with MS-DOS? Here's a sleek new beauty for you. Even TRSDOS is still in stock.

From a marketing perspective, Tandy's strategy has a lot going for it. They've managed to cover all the bases. No matter which road the consumer travels, Fort Worth is prepared to follow.

And they've put some pep back into the TRS-80 line. Those who have complained about the dull, conservative, grey suit the Tandy computers have worn can no longer gripe. TRS-80 users are going to see a lot of excitement over the next year or so.

But such a course is also fraught with danger. For starters, Tandy is making little effort to define each computer's market: The company expects the machines to sort themselves out. While the people at Fort Worth express confidence that the various computers will find their places—or, perhaps more accurately, that their places will find them—the possibility exists that different models will end up competing with one another. How, for example, will the Model 2000 affect Model 12 sales? Will the 4P hurt the 4?

Also, the number of systems could confuse the average consumer. Which TRS-80 to buy? While the careful and intelligent shopper will take the time to figure out what's right for him, many others will find it easier to simply go out and get an IBM or an Apple.

The responsibility to educate the potential customer will rest with the Radio Shack store clerks, many of whom lack the necessary in-depth knowledge of the systems and their capabilities. Training its employees may turn out to be one of Tandy's biggest challenges.

Then there's the question of whether Tandy can give proper attention to each system. They've been slow to respond to shifts in the marketplace before; will this slow them even more? Will they, for instance, move quickly enough to upgrade the Model 100 in the face of the many new portables being introduced? Tandy has a lot of plates spinning at once, and they'll need quick hands to keep them from falling off their sticks.

The fact that Tandy has been able to come out with so many computers in such a short time is a tribute to their manufacturing and marketing skills. Here's hoping they can follow up on their promises.

Model	Price
PC-4	$69.95
PC-3	99.95
MC-10	119.95
PC-2	199.95
CoCo 2	239.95
CoCo 2 (Extended)	319.95
CoCo (64K Extended)	399.95
Model 100	799.00
Model 4 (cassette)	999.00
Model 4P	1799.00
Model 4	1999.00
Model 2000	2750.00
Model 12	3199.00
Model 16B	4999.00
Model 16B Multi-user system	8397.00

You need a scorecard to keep track of the players: Tandy's current lineup. (Prices are for basic units, as shown in the 1984 catalog.)

The Model 4P

Tandy's timing was perfect—their 1984 catalog with the new transportable, the 4P, came out just as Osborne Corp. was going belly-up.

The 4P is a nice machine. It's the first transportable we've seen that is also an attractive desktop computer. It's a far sight sexier than the Kaypro, which looks like World War II vintage radio gear. The 4P's features, along with Radio Shack's CP/M, should make it competitive in the transportable market.

Unfortunately, Tandy chose not to market the 4P aggressively. This is, in some respects, understandable—the machine could very well take sales away from the Model 4.

But on the other hand, the 4P enters a market in which there is no longer a dominant leader. Tandy has the chance to take control, much as they did with the Model 100 in the portable field.

The Osborne was a boat anchor, and it sold like proverbial hot cakes. The 4P is a superior product. Tandy should re-evaluate their marketing strategy, and take advantage of this chance while they've got it. ■

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Compare the Tandy TRS-80 Model 2000 to the IBM® Personal Computer

Price Comparison†	Tandy Model 2000	IBM Personal Computer
Base Unit	$2750	$2104
2nd Drive	Included (720K)	$529 (320K)
Monochrome Monitor	$249	$345
Display/Printer Adapter	Included	$335
128K RAM	Included	$165
RS-232	Included	$120
MS-DOS 2.0	Included	$60
Total Cost*	$2999	$3658
Feature Description	**Tandy Model 2000**	**IBM Personal Computer**
Internal Memory	128K Standard	64K Standard
Disk Capacity Per Drive	720K	160K or 320K (optional)
Microprocessor Clock Speed	8 MHz	4.7 MHz
True 16-Bit Microprocessor	Yes (80186) 16-bit/16-bit data path	No (8088) 16-bit/8-bit data path
User-Available Expansion Slots*	4	2
Graphics Options		
Color Resolution	640 x 400	320 x 200
Number of Colors	8	4
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*Comparable IBM configuration with monochrome adapter and display, communications adapter, two 320K disk drives and 128K RAM.
†Manufacturer's pricing as of 9/1/83.

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INPUT

Monte Bug

My Monte program ("The Business of Planning," September 1983, p. 74) has a problem in the calculation of the standard deviation. Line number 8880 does the standard deviation calculation and uses variable ME(X), the mean, in its calculations.

However, the program does not calculate ME(X) until line 8890. Retype line 8880 as line 8895, or move it using a utility such as the DI command in NEWDOS/80.

To convert the program to another machine or language, I use a statement in line 180 that uses a PEEK (16539). This gets around the Model I's limitations of not letting the printer tab past the sixty-fourth column. You can delete this line for other computers.

Also, lines 4860, 4870, 4930, and 8080 use the FNB function, but you can replace this with a tab.

Ronald Cangro
7628 Regina Drive
Fort Wayne, IN 46815

Diagnostic Program Reviews?

The Wisconsin School Bus Association operates a Model III in a small office business environment. We use it in so many phases of our daily operation that down-time cripples us badly.

We have a few diagnostic programs, but don't know if they are effective. Surely some good diagnostic programs exist in the market that can thoroughly check our computer and its peripheral equipment, but we cannot evaluate their effectiveness.

Your reviewers might offer an invaluable assistance to many readers if they would field test and rate diagnostic programs. We have no other source of credible information on these programs.

Dick Rechlicz
Executive Secretary
Wisconsin School Bus Association
2830 Brookfield Road
Box 403
Brookfield, WI 53005

We plan to cover the various diagnostics packages early in 1984.—Eds.

Datapoint on ARCNET

I enjoyed the article, "ARCDOS for ARCNET," by Joseph Trojak (August 1983, p. 188). Although Dr. Trojak has a good grasp of the ARC network system, his article contains several misconceptions.

The terms ARC and ARCNET are registered trademarks of the Datapoint Corporation. The ARCNET network is the physical processing/office automation system.

ARC system, or ARC, is the total distributed architectural system, including software and processors, Datapoint uses to provide office automation functions. Dr. Trojak indicates that ARC is the operating system when in fact ARC system is the overall concept.

The basic philosophy behind the ARC network system is not the dedication of one or more processors to disk management, but the ability to attach multiple processors to share common resources (files, printers, storage devices, and communications facilities).

The requirements of the disk operating system demand that common resources be maintained by dedicated processors. A file processor or a processor dedicated to managing files is required to enable sharing of that file resource to the system.

The differentiation with the RMS operating system is that the dedication is no longer mandated. RMS is a multiple-tasking operating system where tasks can manage resources and can run in the network, rather than on a dedicated machine.

Datapoint's ARC systems are not incompatible. The Datapoint 1800 series operates under DOS.G.; our 1560 processors operate under DOS.H, and our integrated office systems operate under DOS.D (3800s and 8600s). Since the ARC network supports multiple operating systems concurrently, you can transfer files between versions easily.

Both DOS and RMS operate within the ARC network with a maximum interprocessor cabling run of four miles.

Finally, the ARC network system and ARCDOS can operate on the same network, but the file structure is incompatible.

Alan Malinger
Senior Manager, Product Marketing
Datapoint Corp.
9725 Datapoint Drive
San Antonio, TX 78284

Trojak's Response

Mr. Malinger's definitions of the ARCNET network and ARC system, and his statement of philosophy behind ARC are consistent with Datapoint literature. I will not argue with Datapoint's unique definitions.

However, although ARCNET easily handles the transfer of files between versions of DOS, a program written for a Datapoint minicomputer (e.g., the 3800) cannot be executed by a Datapoint microcomputer (e.g., the 1500). File compatibility is not system compatibility.

Finally, it is true that several vendors offer networks based on the ARCNET technique. Although the networks are electrically compatible with all the Datapoint equipment, they are not compatible at the LNOS level (ISO level 3) with ARC. For example, Netstar Systems' PLAN 4000 uses ARCNET for its electrical connections, and the Xerox Network System at the LNOS level.

Joseph E. Trojak
Johns Hopkins Hospital
600 North Wolfe St.
Baltimore, MD 21205

Powersoft on PowerDOT

Richard Green's review of PowerDOT (October 1983, p. 80) gave the product a fair and reasonable workout. Unfortunately, he reviewed an older, outdated version of PowerDOT: PowerDOT and its manual have undergone a complete rewrite.

PowerDOT II is a much better package. It sports a 60-page manual in a loose-leaf binder, and contains examples, screen dumps, and explana-

Continued on p. 12

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MPI*	5¼" Model 52	2	40/40	Full	239.00
MPI*	5¼" Mdl 501	1	40	Slimline	179.00
MPI*	5¼" Mdl 502	2	40/40	Slimline	239.00
MPI*	5¼" Mdl 902	2	80/80	Slimline	329.00
MPI**	8" Mdl 41	1	77	Slimline	399.00
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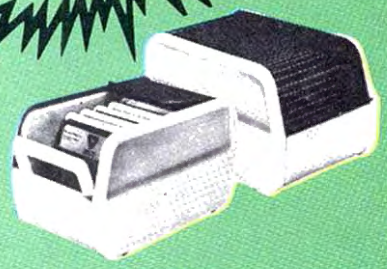

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Continued from p. 8

tions of new features.

To facilitate new drawing, we added a Circle command, an adjustable Angle command, and a Scroll command. We also have a hardware interface available for drawing and design using the Radio Shack Color Mouse on the Model III or 4.

Other new features include the ability to create graphics character sets that users can save to disk and use to create other screens, and compatibility with all DMP series Radio Shack printers.

Hopefully, this letter sets the record straight on PowerDOT II.

Dennis A. Brent
Powersoft Products
11500 Stemmons Freeway, Suite 125
Dallas, TX 75229

New Docs for LDOS Toolbox

Jim Heid did a fine job reviewing "The LDOS Toolbox" (September 1983, p. 200).

Jim mentioned that although he loved the software and gave it an excellent review, he was not completely happy with our documentation. Since his review, we have rewritten the documentation, and were able to incorporate Mr. Heid's suggestions and some new additions, including the elimination of reduced print size.

We typeset the entire manual and it is much more readable and usable than before.

Thank you for this opportunity to update Mr. Heid's review, and for an informative magazine.

Dennis A. Brent
Powersoft Products
11500 Stemmons Freeway, Suite 125
Dallas, TX 75229

Software Legalities

Regarding Carl Oppedahl's review of *Legal Care for Your Software*, by Daniel Remer (August 1983, p. 76), I am writing a book for Prentice-Hall on the same subject, and wish to express my disagreement with Mr. Remer's approach.

My main objection to *Legal Care for Your Software* is the pull-out forms the author provides. These forms do the public more harm than good.

It takes many long, hard hours of study and work before you can become a lawyer skilled in microcomputer law, yet the author (and reviewer) expects the reader to use Remer's forms to draft his own legal forms.

This is a serious mistake. It's the same as reading your first book on Basic and then trying to write a complex Basic program. It's simply not that easy.

The general public does not always understand the implications of what specific contract language means. For example, in many of his forms Remer implies that the prevailing party will get his attorney's fees paid. A clause like that is the same as playing Russian roulette. The plaintiff always expects

Error Trap

In our Directory of Software Manufacturers and Distributors (October 1983, p. 196), we erroneously listed J.F. Consulting, of Palm Desert, CA, as a software dealer.

J.F. Consulting is out of business, and RCM Computers (221 Hirschfield Drive, Williamsville, NY 14221) now supports their products.

Also, the address and software categories for Logical Systems Inc. (p. 220) were in error. Logical Systems Inc. (8970 N. 55th St., P.O. Box 23956, Milwaukee, WI 53223) markets software in the following categories: compilers, custom software, education, inventory control, inventory, operating systems, plotting/graphics, program generators, programmer aids, and utilities.

Small Computer Co. was also accidentally omitted from the October software directory. Small Computer Co. (230 W. 41st St., Suite 1200, New York, NY 10036) developed Radio Shack's Profile data-base manager, and sells enhancements for it.

International Software Sales Inc. was accidentally omitted from our Business Software Buyer's Guide (September 1983, p. 152). ISSI (P.O. Box 233, Newtonville, NY 12128) markets the following programs: Multi-company processing, general ledger, accounts receivable, accounts payable, inventory, payroll (with or without job costing), order entry, delivery ticket control, club management system, engineering, and professional management.

```
CLS:PRINT@271,STRING$(33,176):FORI=335TO783STEP64:PRINT@I,CHR
$(191):PRINT@I+32,CHR$(191) :NEXT:PRINT@784,STRING$(31,176)
30 PRINT@87,"*** M E N U ***":PRINT@920,"OPTIONS DESIRED ?"
40 PRINT@403,"1      XXXXXXXXXXXXXXXXXXX";:PRINT@467,"2      XX
XXXXXXXXXXXXXXXXX";:PRINT@531,"3      XXXXXXXXXXXXXXXXXXX";:PR
INT@595,"4      XXXXXXXXXXXXXXXXXXX";:PRINT@659,"5      XXXXXXX
XXXXXXXXXXXX";:PRINT@723,"6      XXXXXXXXXXXXXXXXXXX
50 FORI=405TO725STEP64:PRINT@I,"<->";:FORK=1TO50:NEXT:PRINT@I,"
   ";:IK$=INKEY$:IFIK$=""THENNEXT:GOTO50ELSEIFVAL(IK$)<1ORVAL(IK
$)>6THENNEXT:GOTO50ELSE60
60 ONVAL(IK$)GOTO70,80,90,100,110,120
70 CLS:PRINT"OPTION 1 PRESSED":END
80 CLS:PRINT"OPTION 2 PRESSED":END
90 CLS:PRINT"OPTION 3 PRESSED":END
100 CLS:PRINT"OPTION 4 PRESSED":END
110 CLS:PRINT"OPTION 5 PRESSED":END
120 CLS:PRINT"OPTION 6 PRESSED":END
```

Program Listing. Menu modification program.

80 ALERT

Thomas Holmes, president of Lindbergh Systems Inc., has informed *80 Micro* that his company has moved from 41 Fairhill Road in Holden, MA, to 49 Beechmont St., Worcester, MA 01609. All correspondence should be sent to this new address.

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NEW DEMO HOTLINE (212) 296 0399

VS 100

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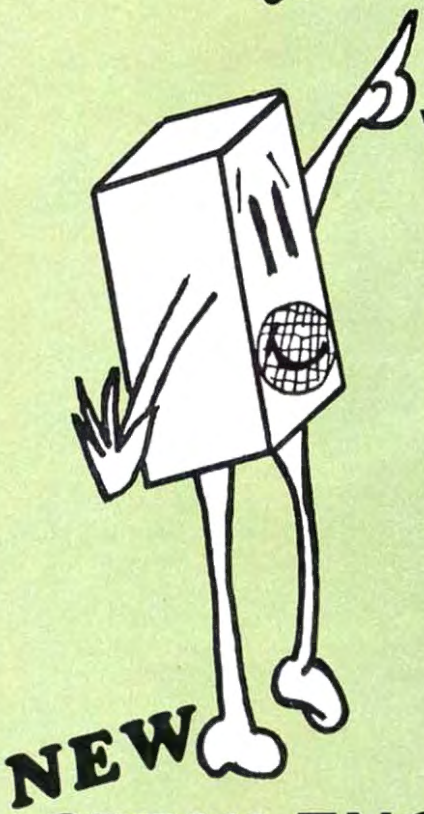

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to win, but if he loses he must pay the defendant's attorney fees.

L.J. Kutten
Attorney at Law
201 South Central
P.O. Box 16185
St. Louis (Clayton), MO 63105

Oppedahl's Case

In law, as in any other field, the danger exists that a lay person might come to harm trying to do something that would be better done by a professional. I share Mr. Kutten's view that a do-it-yourself book might promote this.

Not everyone who writes and sells software, however, can afford the attorney's fees needed to negotiate, draft, and sign a publishing contract. In addition, many writers end up dealing with organizations whose experience, legal talent, and financial resources far exceed their own.

For those writers, only two choices exist: deal with the publisher completely unprotected, or with the aid of a book like Legal Care for Your Software.

I agree with Mr. Kutten that problems exist with preprinted pull-out forms, especially because of differences in state laws. I suspect very few of the forms will actually be signed as they are.

The forms are, nonetheless, useful in at least two ways. If an author negotiates a contract from scratch, the forms provide a checklist of areas to cover. Also, when a publishing firm presents a writer with a publisher's standard contract, these forms provide a relatively neutral source of alternative language for the clauses that the writer wants to try to change.

Parties in a position of bargaining power (credit card companies, for example) routinely offer their take-it-or-leave-it contracts with a one-sided clause stating that their legal fees will be paid by the other party in the event of a litigation. My view is that such a clause, if present in a contract at all, should be written to apply to both parties equally.

Carl Oppedahl, J.D.
99 Park Ave.
New York, NY 10016

Software Rip-Offs

I am writing to you in response to Computer Shack's letter in September 1983 Input (p. 16) griping about software piracy.

I admit that piracy is a great problem to software authors, but companies that rip off software ideas created by others are just as bad.

Computer Shack is very bad about this. They often are not original in the themes of their games. Most of Computer Shack's games are rip-offs of other people's ideas, and software authors who go to the trouble of creating original games are being hurt by this.

David Smith
Box 17367
Mississippi State University
Starkville, MS 39762

Menu Modifier

Most menu-driven programs have boring menus, so I designed a menu (see the Program Listing) to use in the programs I write. The program adds some life to my menus and doesn't stare back when I'm deciding which option to choose.

Line 10 clears string space. Line 20 draws the square that holds the menu options, and could be used as a subroutine for many different menus if you include a Return command. Lines 30 and 40 display the exact options available. Replace the Xs in the program with your own options.

Line 50 lets you change the value of K to determine how fast the (-) scrolls through the menu and does all the necessary testing.

Line 60 determines to what part of the program control passes after the operator has determined the option.

Barry F. Balliet
3402 Pine Lake Village
Lindenwold, NJ 08021

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527

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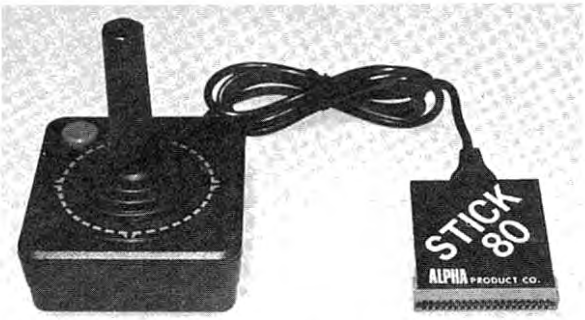

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Works with all joystick games.

Model IV: order model III version

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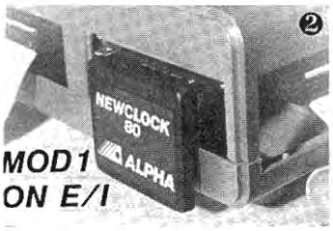

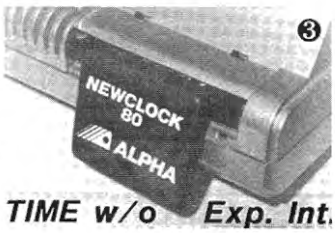

Wouldn't it be nice if your computer could always boot up with the right time and date and then stay accurate. Newclock-80 will enhance your Model I or III system with powerful clock/calendar/timer functions.

Using LSI (large scale integration) and custom circuits, Newclock-80 provides MO/DATE/YR, HR:MN:SEC plus AM/PM and day of week and even takes care of leap years! It continues to keep time and date with quartz accuracy when the computer is turned off or experiences a power failure. A single battery lasts over 2 years.

Compatibility: Newclock-80 is compatible with any operating system, including DOSPLUS, NEWDOS, LDOS. With its fully decoded circuitry it will work with any other hardware you may own. Bus expanders are available.

Installation is very simple, no tools, no disassembly, no soldering. Just plug it in, that's all. There is no power supply or messy cable. Newclock-80 plugs into the rear of the keyboard ❸ or side of the Exp. Int. ❷. Model III Newclock fits the 50 pin card edge (underneath) ❶

The Software: Newclock-80 is as easy to use as it is to install. -"SET", a Basic program, is used only once to set the time and date and select 12 or 24 hour format. -"TIMESTR", also in Basic, patches your computer "TIME$" function to read Newclock-80. It also adds "TIME$" to keyboard-only systems, a short routine is simply "poked" into low memory.

Newclock-80 uses 12 ports (176 to 188): 6 for the time, 6 for the date. The data is conveniently stored in decimal form, no conversion is needed. You can read or modify any digit using simple Basic "INP" and "OUT" statements.

No risk trial. Order your Newclock-80 today, see how easy it is to install and operate then decide within 30 days if you want to keep it. If for any reason you are not delighted with its quality and performance, you may return it for a prompt and courteous refund.

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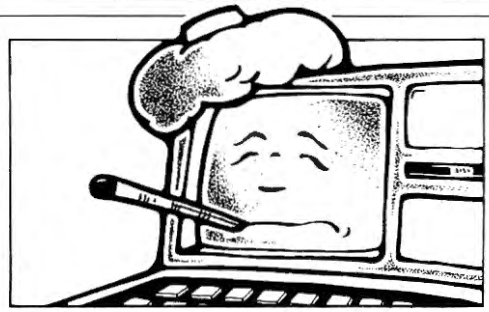

Looking for answers

Cassette Port Readings

How is it possible to deduce both amplitude and frequency through the cassette port? Also, what happened to EDF's Sound Stix program, and how can I get a copy of it? If anyone has a copy, I'm willing to pay photocopying and mailing costs for it.

Rick Sayre
4922 Cozad Way
Stockton, CA 95212

TTS Code

I need to contact someone who has worked with a TTS code system. I need information on an interface that will convert output from a Model III into TTS code readable by a GNT six-level paper punch.

Tom Baker
Box 97
Waitsburg, WA 99361

Linear Graphics

I'm searching for a machine-language routine that will draw a line from point to point on my Model III. I could also use some information on machine-language voice sound effects. Can someone help me?

Curt Salada
102 Log Cabin Road
Perkasie, PA 18944

Crossword Generator

I've been unable to find a crossword puzzle generator for my Model 4 and Okidata 92 Microline printer. Does anyone know of a company or an individual that has such a program on the market?

Kim Wehmeyer
802 Susquehanna Ridge
Independence, MO 64056

Stringy Floppy Writing

Does anyone know how to adapt the original cassette version of Electric Pencil for use with the Exatron Stringy Floppy?

Dave Moore
574 Tweedsmuir Ave.
Ottawa, Ontario K1Z 5P2
Canada

Radar Simulation Program

The Florida Institute of Technology is interested in running a Coast Guard-sanctioned radar proficiency course for ship pilots. We are looking for a Model II or III program that simulates the radar device and generates analog-to-digital coordinates to a radar rig. Can anyone help us out?

Joseph P. Pandolfo
Computer Lab Manager
Florida Institute of Technology
1707 N.E. Indian River Drive
Jensen Beach, FL 33457

New Computer Club

I'm a high school student interested in starting a computer club. Does anyone have any information on how to go about this?

Tim Pickenheim
RD #3, Box 244-B
Moscow, PA 18444

A Gift from Tandy

Tandy has given me an extra feature on my Model III Disk Basic that isn't mentioned in the manual or promised in their catalog. When I scroll through a program with the arrow keys, I lose 2 bytes of free memory for every line I scroll. Has anyone encountered this bonus feature and found out how to fix it?

Nate Salsbury
608 Madam Moore's Lane
New Bern, NC 28560

Chip Control Codes

I'm looking for some information on the WD1793 floppy disk controller used in the Model III. I already have the Model III reference manual, but what I really need are the control codes for the chip. Does anyone know where I can find additional information on this chip?

Scott Goehring
6205 North Tuxedo
Indianapolis, IN 46220

Help!

I'm looking for a Help file for my Model III version of LDOS 1.5.3 that's comparable to the PHELP/CMD The Toolbox uses. If you have a program like this, please contact me.

Terry Tanski
Box 299
Boyle, Alberta T0A 0M0
Canada

DMP Modification

Does anyone have a patch for Model III TRSDOS 1.3 that will display the entire error message rather than just Error X?

Also, does anyone know of a modification for the DMP 200 printer that will let me software-select the CR/NL DIP switch so I can switch from using the underline feature of Electric Pencil to list or print a Basic program on a different disk without wearing out the switch?

Robin L. Salmansohn
1855 Woodland Road
Abington, PA 19001

File Name Expansion

I'm looking for a way to expand the size of TRSDOS's directory beyond the current 80 file-name limit. My wife has a lot of recipes that she stores on disk, but she gets a Disk Full message after entering 80 file names even though there is still three quarters vacant space remaining. Does anyone have any suggestions?

William E. Baker
2419 Queen Ridge Drive
Independence, MO 64055

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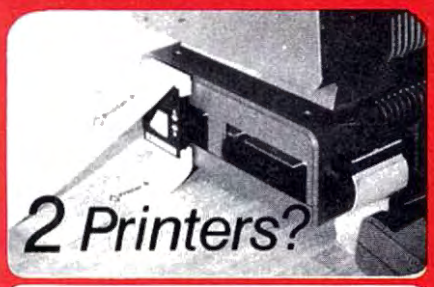

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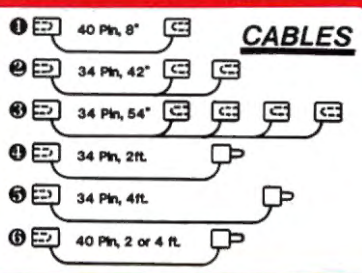

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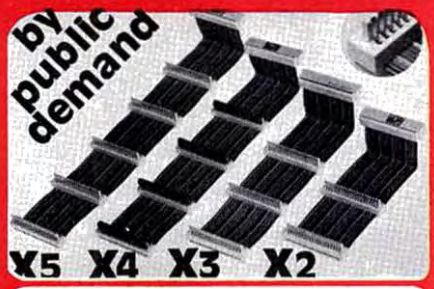

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GREEN SCREEN WARNING

IBM and all the "biggies" are using green screen monitors. Its advantages are now widely advertised. We feel that every TRS-80 user should enjoy the benefits it provides. But **WARNING**: all Green Screens are not created equal. Here is what we found:

- Several are just a flat piece of standard colored Lucite. The green tint was not made for this purpose and is judged by many to be too dark. Increasing the brightness control will result in a fuzzy display.
- Some are simply a piece of thin plastic film taped onto a cardboard frame. The color is satisfactory but the wobbly film gives it a poor appearance.
- One "optical filter" is in fact plain acrylic sheeting.
- False claim: A few pretend to "reduce glare". In fact, their flat-and shiny surfaces (both film and Lucite type) ADD their own reflections to the screen.
- A few laughs: One ad claims to "reduce screen contrast". Sorry gentleman but it's just the opposite. One of the Green Screen's major benefits is to increase the contrast between the text and the background.
- Drawbacks: Most are using adhesive strips to fasten their screen to the monitor. This method makes it awkward to remove for necessary periodical cleaning. All (except ours) are flat. Light pens will not work reliably because of the big gap between the screen and the tube.

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DEBUg

Take the Next Step

There is an error in The Next Step (August 1983, p. 30). The USR call location in Program Listing 1 for tape systems is incorrect. Line 140 should read: 140 POKE 16526,0: POKE 16527,127.

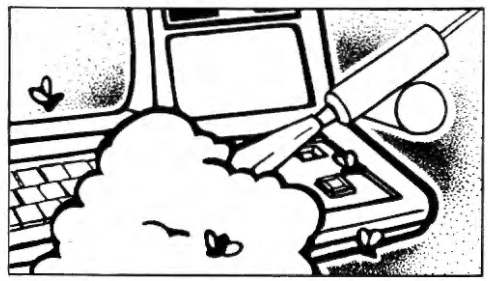
G.E. Casey
4020 Welmont Drive
Fayetteville, NC 28304

Assembling the Disassembler

David Cloutier's "Disassembler" article in C•Notes (September 1983, p. 283) contains several errors. Line 10530 doesn't work, but you can replace it with

```
S=((((LM*16)+RM)*16)+L)*16+R:RETURN
```

Lines 160 and 170 are duplicated and have the wrong mnemonics (Cloutier attempted to use Z80 mnemonics, but the Model 100 has an 8085 processor).



Also, line 1780 RETURN is missing and needs to be added.

James Cole
515 Aspen St.
Vandenberg, CA 93437

Still Searching?

On page 110 of our December 1983 issue, we published an article by Joseph Trojak entitled "Finding the Search Solution." The article was missing Program Listing 12. You can find that listing on p. 213 of this issue.—*Eds.*

New Transactions

I've received a number of calls from readers who've had a difficult time loading the machine-language FRMS utility in my "Financial Transactions Recorder" article (September 1983, p. 140). The problem is easily solved. Under "Getting Started" on page 150, the Dump information should be DUMP FRMS (START = F000,END = F008).

Also, I've found one minor problem that may mystify other users. During printing to screen in Task 3, the program sets both the Dummy and Dual On modes. This reroutes text meant for the printer to the screen. When you end the program (Task 6), line 6020 turns the dual mode off but leaves the dummy mode active. Thus, anything intended for the printer isn't sent. This remains in effect until the program performs a System"Forms" or System"Forms N".

To correct this situation, modify line 6020 so that it reads:

```
...:SYSTEM"DUAL OFF":SYSTEM"FORMS
N":PRINT@...
```

The newly added Forms N command deactivates the dummy mode and allows normal printer operation immediately after the program ends.

Jim Barbarello
R.D. #1, Box 241H
Tennent Road
Englishtown, NJ 07726

Don't Strip Yet!

The System Modifications box to Stephen Mills' "Strip Blackjack" (August 1983, p. 256) is partially incorrect. First, change line 130 (not line 30, as mentioned) in Program Listing 2 to:

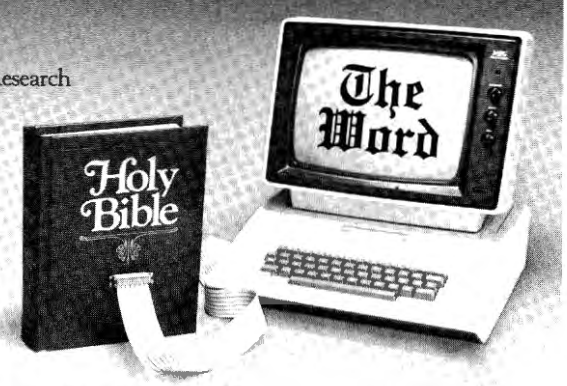
```
130 FORX=Z! TOZ!+72:READY:POKEX,Y
:NEXTX:DEFUSR4=Z!:POKEZ!+7,
PEEK(Z+1):POKEZ!+8,PEEK(Z+2):
Z!=PEEK(VARPTR(Z7$)+1)+PEEK
(VARPTR(Z7$)+2)*256IFZ!>32767
THENZ!=Z!-65536
```

Then change line 1600 to:

```
1600 DEFUSR=Z!:G=USR(-399):
G=USR(ASC(Q$)AND15):RETURN
```

And finally, change line 1880 as suggested, but don't change line 1480.—*Eds.*

For Those Who Seek.



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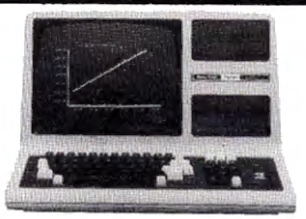

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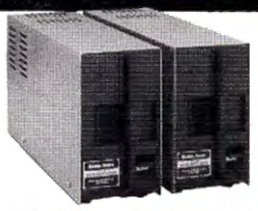

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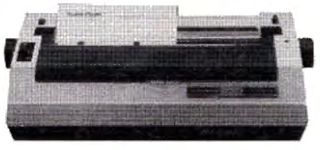

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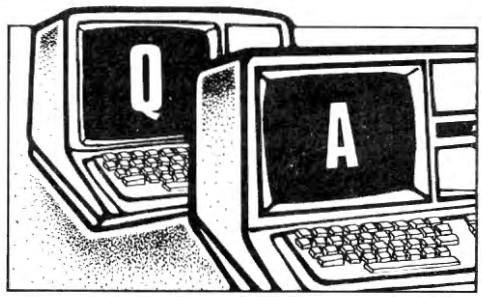

Send any questions or problems dealing with any area of TRS-80 microcomputing to Feedback Loop, 80 Micro, *80 Pine St., Peterborough, NH 03458.*

The problem solver

I have a 48K dual-disk-drive Model I with a Centronics 700 printer. I use it extensively with VisiCalc, which worked fine until recently. One day after I booted up the program and was about to execute, the computer reset. The next attempt just dropped the program and for the next 15 minutes it refused to cooperate; then it booted and worked fine. Now every time I use the program I have the same problems making it work.

All my other programs, system and Basic, seem to work perfectly. And the program works just fine on a friend's system. Can you help?

Ted Waite
Idaho Falls, ID

It sounds like either your disk drive is starting to go, or something is wrong with your VisiCalc disk. It could be that your disk drive has drifted out of head alignment, or that the motor speed needs adjusting. VisiCalc is a large program and a slight variation in motor speed during the time it takes to load could cause the problem. Similarly, if the drive head is slightly off the track's center, it might be picking up noise from adjoining tracks (which would cause a bad load) or just not getting the data off the disk correctly.

A less likely source of your problem might be the VisiCalc disk, which could be flawed. Your friend's disk drive might be aligned differently or have slightly better electronics, and thus would not notice the problem with the disk.

First, try a different copy of VisiCalc. If just switching program copies solves the problem, then the problem was your program disk. If that doesn't work, have your disk drive checked out. That should solve your problem.

Prior to upgrading to 48K (two disk drives from 16K cassette), I purchased several programs from Radio Shack: Series I Editor Assembler (26–2011), In-Memory Information (26–1508), and Scripsit (26–1505). My attempts to transfer these programs to disk have met with frustration and failure, even though I used the addresses given in the March 1982 issue of the TRS-80 Microcomputer Newsletter *(except Scripsit, which is now on disk).*

First, I really like the three programs and want to use them with my disk system. Second, while they are available for disk systems, I can't see the point of purchasing them just because they're on disk when the present ones work so well.

My question is: What are the correct addresses for transferring 26–2011 and 26–1508 to disk, and how do I get them to save and load data from disk instead of tape? Machine language is Greek to me, so any instructions will have to be step by step.

James Krywalski
Buffalo, NY

I can't help you with the addresses. As far as I know the ones given by the newsletter are correct. The second part, modifying the programs to use disk I/O, is almost impossible for anyone but a machine-language programmer. And even he or she would have problems. There's no simple procedure to change the programs to work with disk drives; a patch and additional coding are needed to implement such alterations.

You'll just have to put up with using the programs with cassette data until you can afford the disk versions. Sorry.

I'm currently designing an unusual software speed modification for the Model III. What I need is a great deal of technical information about the Model III Basic interpreter. Can you refer me to a public domain disassembler to use on the Model III ROMs? It has to be public domain because I can't afford to spend any money.

James Stallings
Rocky Mt., NC

There's no such thing as a free program. No matter where you get it, you'll have to pay something for the program, even if it's just for the cassette used to store the program. Anyway, *80 Micro* has published the listing of a Basic program for disassembling the ROMs. The July 1981 issue has the program ("Enhance Your Level II Basic," p. 202) and the February 1982 issue contains a debug for the program (p. 28). If you're lucky, you might find a friend with copies of these issues to loan to you.

If you can manage to scrape together the money, the IJG book *Microsoft Model I Basic Decoded* has loads of information regarding the techniques used by Microsoft in their Basic. The Model III ROMs and the Model I ROMs are almost identical, differing only in the I/O routines and a few other enhancements. The IJG book also includes a complete, commented disassembly of the Model I ROMs. I think you'll learn more from an hour or so with this book than you can learn in several weeks on your own.

My new Smith-Corona TP-1 printer has a peculiarity in interfacing with Radio Shack's Model I Scripsit: It won't hear two carriage returns in a row. It isn't a malfunction of either the TP-1 or Scripsit.

This, of course, throws off line spacing and top and bottom margins. Does anyone have a fix for the TP-1 that defeats its Telex-style treatment of carriage returns? Or a patch for disk Scripsit? Or perhaps a series of TRSDOS

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commands to get around this problem?

I'm also looking for a few lines of Assembly code for my Model I that will let me print the video display on my Epson MX-80 printer. I want to incorporate the routine into the freebie Term program Radio Shack gives you when you buy their RS-232 board for the Model I.

Robert Golstein
Tarzana, CA

Does anyone have a patch for Scripsit that will let it properly interface to the Smith-Corona TP-1?

The May 1980 issue of *80 Micro* has a screen print program invoked by pressing the I, J, and K keys simultaneously ("LPVIDEO," p. 136). It shouldn't be difficult to incorporate this program into your modified Term program. There're two Debug announcements for that program, one in the August 1980 issue (p. 16) and the other in the September 1980 issue (p. 14).

Actually, it shouldn't be that hard to write one yourself. All you have to do is change the keyboard scan routine to check for the special case of your screen print key, and a jump to a subroutine that scans the video from 3C00 hexadecimal (hex) to 3FFF hex and sends each character to the printer. For more information about the ROMs and useful routines you can access, get IJG's book *Microsoft Basic Decoded*.

Has anyone come up with a better method of mounting the RS-232 board in the Model I expansion interface (EI)? At least once a week (usually in the middle of a transmission) the board malfunctions and I have to take the EI apart and clean the RS-232 contacts. It'll work okay for a while, then I have to repeat the cleaning.

Tom Phoenix
Greensboro, NC

I have the same problem with my Model I. The problem is inadequate ventilation of the compartment containing the board. The board gets hot as you use it and linear expansion warps the board, pulling the connections apart and introducing noise. I've found that you can get pretty good contact for several weeks at a time by *not* tightening the two RS-232 screws all the way. When I start to have trouble with it, I just flex the board/EI cable a little and it's good for another week or so.

A friend of mine, Dennis Kitsz, suggests making a small insulated metal bar that you can put over the RS-232 connector and hold in place by the two screws. The metal bar would prevent the board from flexing, solving the problem. You will, of course, still have to clean the tin/lead contacts on the EI and RS-232 board connectors every once in a while, but at least it won't be every week.

Another solution was published in the May 1981 issue of *80 Micro*: hardwire the board to the EI, permanently solving the problems of poor connections and board flexing ("Hardwire the TLS-232," p. 202). Unfortunately, you have to be pretty good at soldering to accomplish this modification. It also has the implication that if you ever have trouble with any of the components on the RS-232, you can't just remove the board and replace it with another.

I have a Model III and recently bought some NEC memory chips in Japan to increase my system to 48K. When I powered up my computer, all I got was 48,082K, not 49,152 (1024×48). I took out the extra chips and checked memory, which indicated 15K plus. Is something wrong with my computer?

Also, when I type in NEW and then PRINTMEM, I don't get back what I started with. After several Loads, Runs, and News, I find that I've exhausted memory and get an OM error. Why?

Lance Cresswell
San Francisco, CA

There's nothing wrong with your computer. Basic grabs some of the first bank of RAM for it's own use, about 1,000 bytes total (the Model I only takes about 800 bytes). The computer subtracts these bytes from your available RAM, hence the difference between your computed memory and the actual amount left.

Your other problem is tied to the Clear command, used to reserve memory for string variable data. Programs frequently use this command to prevent OS errors from crashing the program, especially in programs with lots of string data, such as mailing list or data base programs. The amount of RAM reserved by Clear is unchanged by the New command. CLEAR 5000 removes 5,000 bytes from the number returned by the PRINTMEM command. The only way to free the memory is to issue a new Clear command, specifying a lower number. The computer powers up with 50 bytes reserved by Clear. Try issuing a CLEAR 50 command after the New command, and then PRINTMEM. You should always see the same number returned.

I own a 48K Model III single-drive system with NEWDOS80 2.0 and Model III Scripsit 3.2. I'd like to be able to use a do- or chain file on Scripsit that will automatically print a preselected letter or other similar task. I understand Scripsit uses its own keyboard driver, so it doesn't recognize characters stored in a do-file. I've tried to reroute Scripsit's keyboard driver to point to the ROM driver, but my machine-language skills are limited. Is this the correct solution?

I think this automation of Scripsit could open up a new world of data base and word-processor interfacing: run a chain file to load a selected letter, say, depending on a code in the data base, and print it while you sit back and watch it work.

Mark Read
Artarmon, Australia

Sounds like an interesting idea. One of the problems with it, besides the keyboard driver routine, is that you have to make sure to reserve memory in high RAM for the do-file and prevent Scripsit from using that area for its own purposes. I believe that NEWDOS80 uses its own keyboard driver routine, so check your technical documentation for information about it. Then route the Scripsit keyboard driver to the NEWDOS driver. That should get you on your way.

Has anyone else tried mating the do-file technique with Scripsit?

I own a 48K Model I that I recently updated with Radio Shack's Double-Density Board. Being clever and wanting to increase on-line storage, I also added a double-sided drive as my second drive. I now realize that TRSDOS 2.77DD doesn't support the second side. How can I access the second side? Can I patch TRSDOS 2.77D to do this? Is a hardware modification needed?

William Brown
Reistertown, MD

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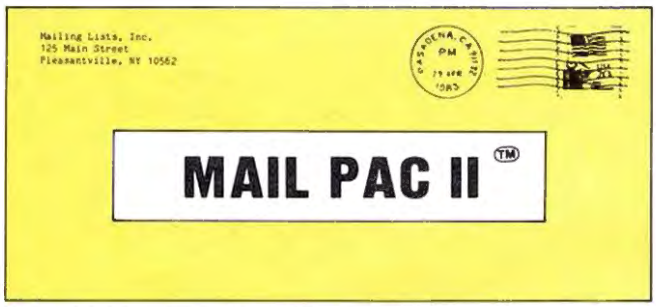

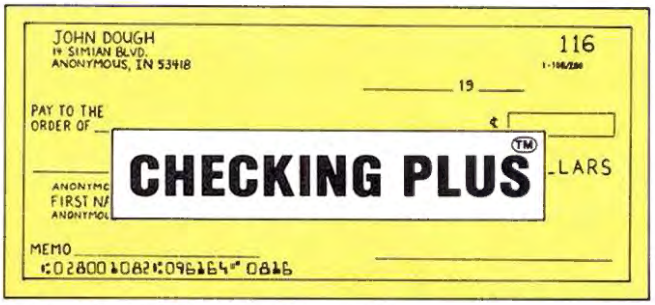

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I haven't heard of anyone who's patched TRSDOS 2.77DD for double-sided drives. Can anyone help?

Assuming that there's no patch forthcoming, your best bet would be to buy a new DOS. MULTIDOS (Cosmopolitan Electronics Corp., 5700 Plymouth Road, Ann Arbor, MI 48105, 313-668-6660, $99.95), DOSPLUS (Micro-Systems Software Inc., 4301-18 Oak Circle, Boca Raton, FL 33431, 305-983-3390, $149.95), NEWDOS80 (Apparat Inc., 4401 S. Tamarac Parkway, Denver, CO 80237, 303-741-1778, $149), and LDOS (Logical Systems Inc., 8970 N. 55th, P.O. Box 23956, Milwaukee, WI 53223, 414-355-5454, $129) all support double-sided disk drives and work with Radio Shack's Double-Density Board.

You don't need to make any hardware modifications.

I'm a serviceman stationed overseas. I have a Model III with 48K RAM and no disk drives. The shipping over here has caused a problem: After warming up for a few minutes, the characters in the first row seem to condense and become unreadable. I'd like to repair the problem myself, but don't know how.

Monserrate Pagan
San Francisco, CA

The problem is shock damage to the yoke assembly. Open up the case and discharge the video tube (or let it sit for a day), then grab the yoke and *gently* straighten it out. You may have to try several times before you get it right. If this doesn't work, have a TV technician take a look at the video electronics. You may have to replace the yoke.

If you don't understand what I mean in the above paragraph, then you probably don't know TV electronics well enough to attempt the repair yourself. If so, take it to a repair technician.

I have a Model I, Level II 16K cassette-based system with Exatron Stringy Floppy drive. I have many games with sound, but I don't like having to plug in an audio amplifier to the cassette port, and then hunting up batteries. I'd like to incorporate an amplifier circuit in my computer, but I need a stabilized voltage between 4 and 12 volts and I don't know where to find it inside the computer within easy reach to the cassette port.

In the June 1983 Feedback column you told someone how to install extra memory in his Model III (p. 350). Can I do this with my Model I?

Finally, sometimes, when I listen to my tape recorder by removing the ear plug, the sound is weak and I can hear the rolling of the motor from the speaker. If I remove the cassette and place my hand near the tape head, the rolling becomes louder. Is the head magnetized?

David Raymond
Brossard, Canada

There are two ways to tackle the audio amplifier problem. One is to mount the unit inside the computer (above the three-ROM satellite board, under the Radio Shack logo block on the right side of the keyboard), and the other is to run a power line from the internal power supply through the case, which you could then use to drive the amplifier.

The first solution works; I did it to my computer. Find a small audio amplifier board powered by 12 volts or less (5 volts is preferred). Attach it either to the computer circuit board with non-conducting tape, or to the computer case itself. Cut a slot in the case and orient the unit so that you can reach the amplifier's off/volume switch, which should stick out some. You may have to remove the amplifier from its case to do this right. Experiment with several positions to find the best one before you go chopping up the computer case.

Now solder the positive lead from the amplifier to one of the power traces on the computer's circuit board (the traces are facing up, the components are on the bottom, so the traces are easy to get to). Next, solder the black ground wire to the computer's ground trace. And finally, locate the cassette socket, identify the two leads that go to your cassette recorder (don't let the remote plug line confuse you), and then solder the two input wires of the amplifier to the cassette circuit.

This should put you in business, with an audio amplifier neatly hidden away inside your computer case, and an easily accessible volume knob for controlling it.

The other method is to find the amplifier you want to use, and determine whether it's 12V or 5V. Inside the computer, locate the appropriate power supply circuitry and then solder the two power supply leads to the positive and negative lines. Make sure you orient the wires correctly for plugging into your amplifier. If the amplifier is designed for using non-battery power (as in an ac adapter), this orientation is crucial. Usually, but not always, the center of the plug is positive and the perimeter is negative. Goofing up here could easily damage your amplifier, computer, or both. Once you've soldered the two wires in place, run them over to the cassette port, cut a small hole, and run them outside the computer. Solder the wires to a plug that will fit your amplifier, and you're all set.

Both of these methods require that you get the *Model I Technical Manual* (Radio Shack part number 26-2103, $9.95), which includes all the circuit diagrams showing you parts layout and circuit locations.

Adding extra memory to the Model I requires either buying an expansion interface that has the extra sockets for adding the memory, or modifying the CPU circuit board to make room for the extra chips. Microhatch (P.O. Box 501, DeWitt, NY 13214, 315-446-8031, $169) sells a kit called BIG MEM that replaces the 16K RAM chips you currently have in your keyboard unit with new 64K RAM chips, giving you a 48K system with the Level II ROM. You can disable the ROM if you want, and have a 64K RAM Z80 computer for CP/M. Holmes Engineering (5175 Green Pine Drive, Murray, UT 84107, 801-261-5652, $139.50) has a similar unit, the IM-2, with 32K RAM that brings your total memory to 48K RAM.

Several companies sell expansion interfaces for the Model I computer, including LNW Research Corp. (2620 Walnut, Tustin, CA 92680, 714-641-8850, $399, with disk controller, 32K RAM, and RS-232 unit included), Micro-Design (6301 Manchaca Road, Suite B, Austin, TX 78745, 800-531-5002, $469.95, with modem, disk controller, and 32K RAM included), and Holmes Engineering (see above for address, $150, memory not included, call for details). Holmes Engineering also has an expansion box for adding other peripherals like a disk controller, RS-232, and so forth.

It sure sounds as if your tape recorder's head is magnetized. I suggest you get a tape head cleaner and demagnetizer and use them on your unit. It should clear up the problem. If it doesn't, your tape recorder probably needs replacement.

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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
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32	STOCVAL1	Expected return on stock via discounts dividends
33	WARVAL	Value of a warrant
34	BONDVAL2	Value of a bond
35	EPSEST	Estimate of future earnings per share for company
36	BETAALPH	Computes alpha and beta variables for stock
37	SHARPE1	Portfolio selection model-i.e. what stocks to hold
38	OPTWRITE	Option writing computations
39	RTVAL	Value of a right
40	EXPVAL	Expected value analysis
41	BAYES	Bayesian decisions
42	VALPRINF	Value of perfect information
43	VALADINF	Value of additional information
44	UTILITY	Derives utility function
45	SIMPLEX	Linear programming solution by simplex method
46	TRANS	Transportation method for linear programming
47	EOQ	Economic order quantity inventory model
48	QUEUE1	Single server queueing (waiting line) model
49	CVP	Cost-volume-profit analysis
50	CONDPROF	Conditional profit tables
51	OPTLOSS	Opportunity loss tables
52	FQUOQ	Fixed quantity economic order quantity model
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74	LABEL1	Shipping label maker
75	LABEL2	Name label maker
76	BUSBUD	DOME business bookkeeping system
77	TIMECLCK	Computes weeks total hours from timeclock info.
78	ACCTPAY	In memory accounts payable system-storage permitted
79	INVOICE	Generate invoice on screen and print on printer
80	INVENT2	In memory inventory control system
81	TELDIR	Computerized telephone directory
82	TIMUSAN	Time use analysis
83	ASSIGN	Use of assignment algorithm for optimal job assign.
84	ACCTREC	In memory accounts receivable system-storage ok
85	TERMSPAY	Compares 3 methods of repayment of loans
86	PAYNET	Computes gross pay required for given net
87	SELLPR	Computes selling price for given after tax amount
88	ARBCOMP	Arbitrage computations
89	DEPRSF	Sinking fund depreciation
90	UPSZONE	Finds UPS zones from zip code
91	ENVELOPE	Types envelope including return address
92	AUTOEXP	Automobile expense analysis
93	INSFILE	Insurance policy file
94	PAYROLL2	In memory payroll system
95	DILANAL	Dilution analysis
96	LOANAFFD	Loan amount a borrower can afford
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Regarding unexpected reboots and the Gold-Plug 80 connectors, you're ignoring one 34-pin edge connector: the disk drive! My Tandon drives each use a cable to connect two printed circuit boards inside the drive. The data lines cross the rear board to get to the controller board. The same solder-coated edge contacts are used on the controller board as at the back of the drive.

Since I couldn't install a Gold-Plug 80 inside the disk drive, I had to carefully solder 13 wires between the two boards. These 13 connections are accessible after removing the drive cover (the inside connections on the other side of the circuit board are inaccessible, but all are ground lines, so it seems safe to ignore them). Each of the 13 lines on the controller board goes to plated-through connections near the edge, making it convenient to insert each wire into the hole for soldering. On the rear board, you can tack-solder each wire to the connector pins. You need small-diameter wire and a pointed soldering iron (low-wattage).

Since installing these new connectors in my drives, in addition to Gold-Plug 80s on the computer system, I've had no further unexpected hardware reboots. (I also replaced the Radio Shack cables with new gold-plated ones from Alpha Products, Woodhaven, NY 11421).

John Huffman
Winston-Salem, NC

Thanks for the information. Fortunately, not all disk drives use two boards inside, so not all of us have to go to the trouble you did to solve the problem. For the rest of us, if you have problems with disk reboots and you've already installed Gold-Plug 80 connectors, check your disk drives—they may need a Gold-Plug too. I'd be very careful about ignoring those ground lines, however; they're needed to help maintain data integrity by screening out electrical noise and RFI.

*I have two problems with my 48K Model I which came to light recently. The first, as a result of exploring Delmer Hinrichs' "3-D Printer Graphics" (May 1983, p. 236) while scanning COS(X)/(X) and SIN(X)/(X), where X varied from zero to 6PI by steps of .1PI, I found that the .1 factor changed in an unusual fashion. I had written X as A*PI where A varied in steps of .1.*

I'm at a loss to explain this or to dream up a fix. I previously had this trouble with a step of one, where the step was some consistent factor less than one. I traced this to a corroded connection leading to the expansion interface. I now have Gold-Plug 80s throughout. The present problem lies in the keyboard unit since I get the same results with the EI disconnected. Any suggestions or remedies?

Next, according to several sources I should be able to key in 256 bytes per input line, but my keyboard stops at 240. What's up?

Thomas Rogers
Morro Bay, CA

The problem is with the method Microsoft uses to manipulate numbers. I first ran into this problem on an IBM 360 computer in 1969, and then again on a CDC6400 in 1971, so the problem isn't peculiar to just the TRS-80 or Microsoft. The difficulty lies in that .1 is not a precisely defined number in binary math; .1 is to binary math like 1/3 is to decimal math. Repetitious calculations slowly build up to a large, noticeable error.

You've stumbled into that strange area of computation called numerical analysis, where the method used to compute the formula can actually affect the final answer. Since you can't change the method used by the ROM for math manipulations, you'll have to use a kludge to get the right answer (as they say in college physics, if the data doesn't fit the curve, fake it).

The only solution is to avoid using step factors of less than 1. Make the step 1, and divide X by 10 to get the proper step for your mathematical formula. This problem, errors with numbers less than 1, is frustrating when you're working with finances. I've had several questions regarding errors in dollars and cents and how to get rid of the trailing digits.

Your sources of information don't know what they're talking about. The Level II ROMs limit keyboard input to 240 characters, although you can make Z80 instruction jumps of 256 bytes. Level II ROMs use the bytes between 256 and 240 to tell the operating system the beginning and ending addresses of the character string, with a zero byte between this information and the string, a carriage return (at the end of the string), and a zero byte to separate it from the next string in memory. Also, some of those bytes are used to store the variable name (two characters plus type declaration) and a separator byte.

Some of the DOSes on the market have modified routines that let you key in 256 bytes, but the Level II ROMs won't.

In Basic, the extra spaces are used by the program line number, length of the line, address of the next line number, a zero separator between the beginning of the line itself, a carriage return at the end of the line and another zero byte separator (remember, the line editor has a total length of 256 bytes, which have to contain all that information).

In summary, the problems you've encountered are ROM related, and can't really be changed except by substituting the errant routines with new machine-language code that does the job correctly.

I'm using the EDTASM package in NEWDOS 2.1, which isn't supported by Apparat. I've found that when I use the A command to produce object code, the switches for printout, error catching, and so forth, don't work. Since the package is a modification of the original tape EDTASM, Apparat refers the user to the Radio Shack manual, giving only the specific changes made by Apparat.

The syntax for A is listed by Radio Shack as A (filespec) (,switch). The NEWDOS 2.1 EDTASM seems only to accept A, then it prompts for tape or disk output. Does an undocumented syntax change exist here? If not, is there a fix? I'm only a beginner and I don't want to invest in a new editor/assembler at this time.

For those using Newscript 7.0 and LDOS 513, you have to modify Start-up/MIN for LDOS. Newscript uses its own keyboard driver and, when you use the Clear/Break command sequence (which normally splits a Newscript line in two), Newscript and LDOS each read the break key once and return you to BASIC READY. To make the Clear/Break sequence work properly, include the following command in Start-up/MIN:

SYSTEM (BREAK = OFF)

A tip for LDOS users who have print-

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ers that accept single codes instead of requiring escape codes first: use the System (Graphic) command. You can then construct a filter, using XLATE/FLT, that will let you use some of the TRS-80's special characters and graphics symbols, but which most printers can't produce. I use graphics characters generated by two LDOS keystrokes to output special printer codes within VisiCalc, for example.

Mark Fagan
Toronto, Canada

The problem is the way you're specifying the switches. I've used NEWDOS 2.1 with the modified EDTASM for several years without experiencing any problems with the switches. You should type:

```
A filespec,switch,switch
```

Remember, the switches MUST be in uppercase. The blank space is mandatory. I know Apparat EDTASM works, just experiment a little.

Thanks for the tips.

I have a Model I with Holmes' 48K internal memory and an Exatron Stringy Floppy. I'm thinking of getting disk drives to take advantage of software for 32K and 48K.

What effect will my Holmes board have if it's operating with an MDX-2, Disk 80, or LNW Expansion Interface?

Ronald Mattson
Brockville, Canada

The presence of the Holmes board shouldn't make any difference to the expansion interfaces, as long as they don't include memory of their own. If they do include memory, then you'll have a conflict between the information in the Holmes IM memory and the memory in the EI. The end result will probably be blown memory or memory driver chips.

I'm an owner of a Model III, complete with a VR Data disk controller and two VR Data disk drives. After receiving a notification of reassignment to Europe, I asked some people at Radio Shack about making my computer work with 50-cycle current. Here are the answers:

- *"There's no way to do it, you'll have to buy another Model III in Europe."*
- *"You don't need to do anything as long as you use a stepdown transformer; the dc drives won't notice anything."*
- *"All you need is a transformer to convert from 220V/50 Hz to 110V/60 Hz."*

Three months later, here I sit listening to my drive motors turning themselves off and on, over and over, at about three-second intervals. Everything works fine, but I can't get used to the idea of my drives tearing themselves up like this. Can you help?

E.F.
Augsburg, Germany

"You've stumbled into that strange area of computation called numerical analysis."

As I recall, Model III TRSDOS comes with a utility called HZ50/CMD that's supposed to configure the Model III drives to work correctly with 110V/50 Hz current. Contact your closest Radio Shack dealer about getting a copy of this utility for your system.

My computer is a Model I Level II with 32K RAM LNW interface, one Tandon drive, and four BASF 6106 disk drives. At one time the BASF drives worked, one at a time, but I've changed the programming jumpers so much that they no longer work.

I can use the Tandon drive alone, but that's too restrictive. I want to use the Tandon with the BASF, or the BASF by themselves. I noticed that the Radio Shack cable has teeth pulled so that the position of the drive on the cable defines the drive number, but when I bought one it didn't help me.

Alfred Bowman
Gig Harbor, WA

The first thing you should do is buy the technical manual for the BASF 6106 drives. Software Support (One Edgel Road, Framingham, MA 01701, 617-872-9090, $14.95) has copies of the manual. You can also get the manual from BASF Corporation (Computer Hardware Sales, Crosby Drive, Bedford, MA 01730, 617-271-4168), but I don't know the price.

Now, for your problem: You can only hook up the BASF drives with a maximum of three drives on the system. The BASF drives are jumpered inside the case as either drives 1, 2, or 3. If you use the Radio Shack cable, then you must make sure that the drive jumper setting matches the pin select of the cable (first cable position drive must be jumpered as drive 1, position 2, jumpered as drive 2, etc.).

The Radio Shack disk drive system is designed as a radial chain, with each drive accessed separately. I'll tell you how to set up a BASF drive as drive 3 (which is where I have my BASF drive in my Model I system). Find jumper matrix JJ1 (a 6-pin jumper block). If pins 1 and 2 (bottom set) are connected, the drive is set as drive 1. If pins 3 and 4 (middle set) are jumpered together, it's drive 2. The top two pins set it up as drive 3.

Find jumper matrix JJ2 (a 14-pin jumper block beside JJ1). Jumper pins 3 and 4, and 9 and 10 together. This sets the head load option to radial. Jumper pins 5 and 6 together for radial select option.

Find the two 14-pin jumper blocks at the front of the drive. The one closest to the drive door is JJ4. Jumper pins 5 and 6 of JJ3, and 3 and 4 of JJ4 together to set the write protect of your disk to mean that a covered notch protects the disk. Jumper pins 5 and 6 of JJ4 together so that the LED on the door will light when the drive door is locked and the drive is spinning at speed. Jumper JJ3 pins 13 and 14 together for automatic head load.

These options should get your disk drives in operation until you get your own drive manual and can select the options you want.

I have a Model III dual-disk microcomputer. My problem is that I can't assemble my 185-record 12-extent source-code program with Radio Shack's Series I Editor/Assembler (only 35 bytes free, I get Symbol Table overflow).

I'm willing to spend up to $200 for a one-time solution. I've heard that Ra-

dio Shack's "Edit" assembler will fit my needs, but none of the local Radio Shacks know what it is. Can you help?

Vik Gavande
Austin, TX

You want MZAL, by Computer Applications Unlimited (P.O. Box 214, Dept FSBE, Rye, NY 10580, 914-937-6286, $149). This system of programs uses a linking loader to independently assemble written source-code modules into one program. The limit is 30,000 bytes for a symbol table, or your available disk space. For more information on this system, read the review in the October 1982 issue of *80 Micro* (p. 160).

UPDATE

In the October 1983 Feedback I said that the Alpha-Products joystick used the 5-volt line of the TRS-80 for a power source. Well, one of their technicians called me and told me that their unit doesn't even have a pin connection to that line, so it couldn't be using that line for a power source. Given that fact, I can't see any reason why the joystick would malfunction in the manner described by A.L.H., of Raritan, NJ (October 1983, p. 336). Sorry about that. ■

Terry Kepner is a freelance writer and programmer, and the vice president of Interpro. He's been writing about microcomputers since 1979.

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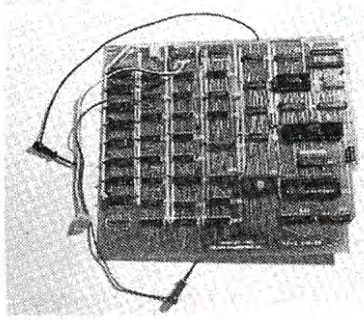

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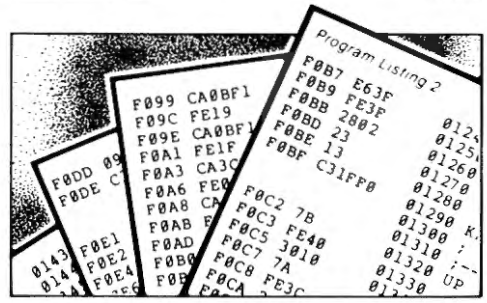

A programming potpourri

Wait! Before you read this column, follow these instructions exactly:
1. If you are using a disk system, specify zero files when you enter Basic.
2. Type Program Listing 1 into your Model I, Model III, or Model 4 (in Model III or ROM mode).
3. Make sure you've entered everything exactly as it appears.
4. Save the program to tape or disk.
5. After you save the program, run it.

Do you understand what happened? Should you list it again to take a better look? I'll leave what, why, and how in the air for a moment; I'll discuss this programming technique later in the column.

Strings on the Screen

I'm devoting this month's column to answering the mail and presenting some short, useful readers' techniques, as well as a few of my own.

First come requests from Model I/III and Model 4 programmers for ways of reproducing material that appears on the screen. Some of the requests have been spurred by a feature which I believe is unique to LDOS (Model 4's TRSDOS 6.0 is a licensed version of LDOS 6.0). The techniques are the same no matter what material you want to get from the screen.

When you boot an LDOS system disk, you are asked to enter the date in the standard MM/DD/YY format. As soon as you press the enter key, the computer processes the date and displays it in the more normal day, month date, year format. For example, if you enter 12/31/83, LDOS translates it to Sat, Dec 31, 1983. Every time you use LDOS's Date command, the date appears in the expanded format. It's a nice, though not critical, feature of LDOS.

Problems arise when you go to Disk Basic. If you enter the command PRINT DATE$, the familiar 12/31/83 returns. Since the day/date algorithm exists as a DOS library command, you can always use CMD "DATE" on the Model I/III or SYSTEM "DATE" on the Model 4 to display the expanded form. But if your program takes action based on the day of the week, or needs to use the expanded form in a printed report, you must somehow capture it in a string. The problem is how to do that.

To further define the problem, notice that the expanded form of the date always takes exactly 17 bytes. Also, assume that you've cleared the screen just before you issued the CMD or SYSTEM command. Therefore, you need a way to put the first 17 bytes on the screen into a string that you can further manipulate or use in a program.

The solutions for the Model I/III and Model 4 are completely different because the Model 4, running under TRSDOS 6.0 and compatible systems, does not use a normal memory-mapped video display (nor a memory-mapped keyboard). It has a special 2K of static RAM for the screen, but that memory isn't part of the 64K RAM available to the Z80 processor.

In simpler terms, you can't POKE characters to the screen or PEEK character values from the screen. (Actually, that's not quite true, but a Basic program can only directly address screen memory by some unusual bank-switching that may destroy values essential to

```
10 CLS: DEFINT A,I: DIM A,I
20 FOR I=16635 TO 16638: READ A: POKE I,A: NEXT I
30 DIM A(69): FOR I=0 TO 67: READ A(I): NEXT I
40 POKE 16548,0: POKE 16549,111: POKE 16633,139
50 POKE 16634,111: POKE 16635,139: POKE 16634,111
60 CLS: LIST
70 DATA 248, 110, 248, 110
80 DATA 28445, 10, 8224, 8224, 8224, 17730, 21587
90 DATA 22304, 21321, 17736, 8275, 8321, 18516, 8261
100 DATA 15872, 5231, 8192, 18464, 20545, 18768, 21317
110 DATA 8276, 17999, 18464, 19535, 17481, 22849, 21280
120 DATA 16709, -24237, 83, 28499, 30, 8224, 8224, 8224
130 DATA 8224, 8224, 8224, 21062, 19791, 28160, 10351, 8192
140 DATA 8224, 8224, 8224, 16712, 17490, 20041, 16928, 20306
150 DATA 18516, 21061, 83, 28553, 50, 8224, 8224, 8224, 8736
160 DATA 18516, 8261, 17742, 21592, 21280, 17748, 8784
```

Program Listing 1. Demonstration program.

```
1 REM ************************************
2 REM
3 REM  Program for LDOS 5.1.x to capture
4 REM   expanded DATE form in Basic
5 REM   string DA$ -- same technique can
6 REM   be used to capture anything on the
7 REM   screen in a Basic string.
8 REM
9 REM ************************************
10 CLS: CMD"DATE"
20 DU$="X"
30 POKE VARPTR(DU$),17
40 POKE VARPTR(DU$)+1,0
50 POKE VARPTR(DU$)+2,60
60 DA$=DU$
70 PRINT DA$
80 END
```

Program Listing 2. Model I/III solution for capturing the expanded date form.

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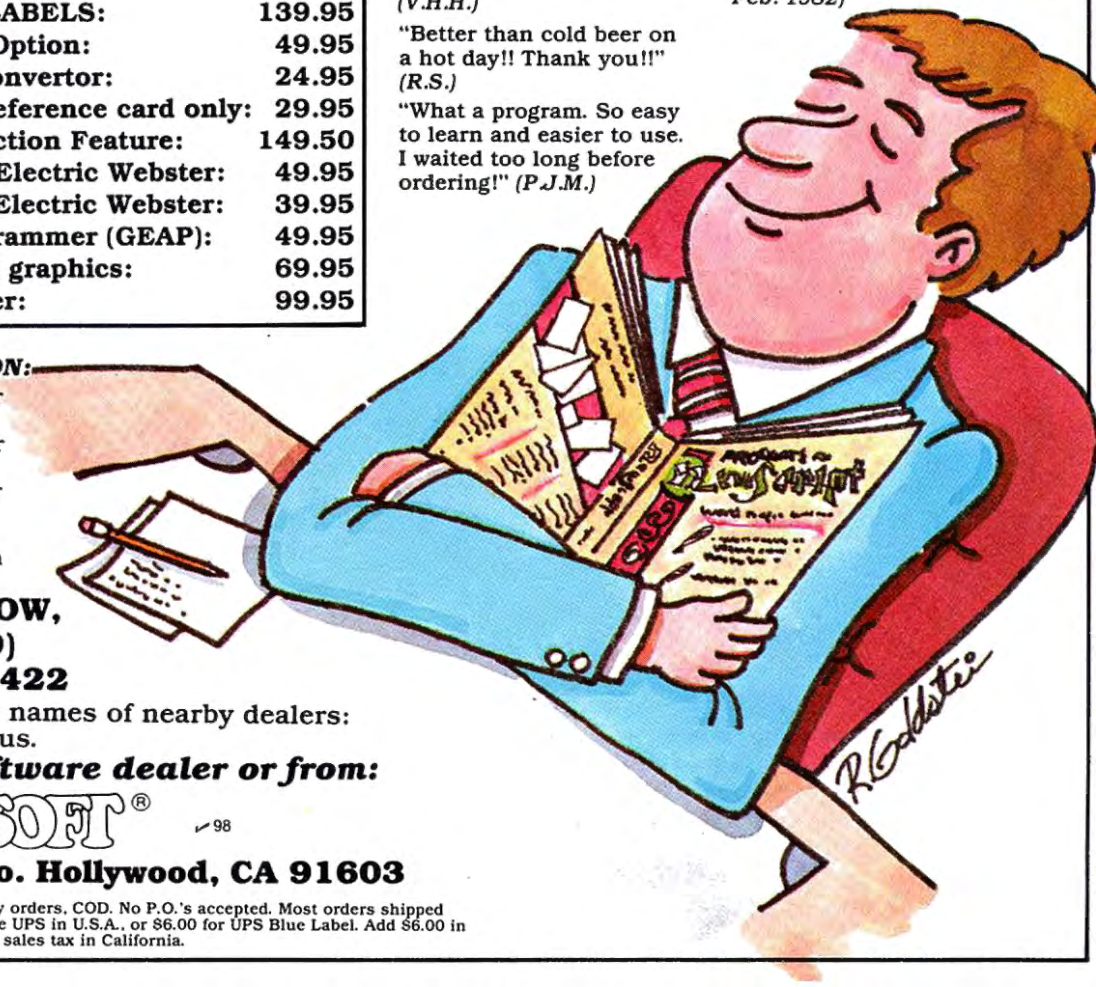

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the system—not a recommended technique).

I'll start with the Model I/III solution. Notice that Program Listing 2 is written entirely in Basic, without any machine-language subroutines. Until you're familiar with the technique, however, it may be a little confusing. The program creates a dummy string, DU$, expands it to 17 bytes, and points it to the beginning of the screen where the program displays the date. Then it transfers those 17 bytes to DA$, which it prints to verify that everything is in order.

You may remember from my last two columns that Basic uses 6 bytes in low memory to store information about a string variable. The actual characters are usually stored in high memory. The 6 bytes for DU$ would be:

03 hex	string type code
55 hex	"U" (2nd letter of name)
44 hex	"D" (1st letter of name)
len	length of string
lsb	Least significant byte (LSB) of string address
msb	Most significant byte (MSB of string address

The value returned by VARPTR(DU$) is the address of the fourth of these 6 bytes, "len."

Line 10 in the program clears the screen and prints the expanded date in the upper left corner. Line 20 creates the dummy string, DU$. The fun begins in line 30, where, by POKEing 17 into the fourth position in the variable entry, DU$ automatically becomes 17 bytes long.

In lines 40 and 50, change the address of DU$ so its information block in the simple variable table indicates that it contains 17 bytes beginning at 3C00 hexadecimal (hex), the beginning of screen memory. Then in line 60, DU$ is copied to DA$. This is a necessary last step, because DU$ points to or contains the first 17 bytes on the screen.

As soon as the screen changes, DU$'s contents change. Copying DU$ to DA$ transfers the present contents of DU$ (the expanded date) to a safe place in high memory.

DU$ points to the top of screen memory until you use it on the left side of the equal sign in a LET statement. Then the program points it back to the more normal high memory. You can use strings pointed to the screen to produce some amazing graphics written entirely in Basic. For examples, see my "Super Fast Graphics in Basic" in Volume 9 of the *Encyclopedia for the TRS-80* (Wayne Green Inc., 1982).

The Model 4 solution is slightly more complicated because it combines a Basic program with a machine-language subroutine. The Basic program is shown in Program Listing 3, the machine-language source code in Program Listing 4.

This program operates by creating a string, DAY$, of the required length.

Continued on p. 37

```
10 '***********************************************
20 '
30 ' Model 4 Program to capture TRSDOS's DATE
40 '  display in string DAY$.
50 '
60 'This program may be chained to any
70 '  program that wishes to display day/date
80 '
90 '***********************************************
100 '
110 CLS: SYSTEM "DATE"
120 X=1: DAY$=SPACE$(17)
130 WHILE X <> 0
140   READ X: CODE$ = CODE$ + CHR$(X)
150 WEND
160 Q = PEEK(VARPTR(DAY$)+1) + PEEK(VARPTR(DAY$)+2)*256
170 IF Q > 32767 THEN Q = Q - 65536!
180 Q% = Q
190 R = PEEK(VARPTR(CODE$)+1) + PEEK(VARPTR(CODE$)+2)*256
200 CALL R (Q%)
210 PRINT DAY$
220 COMMON DAY$
230 END
240 DATA 94, 35, 86, 175, 103, 111, 6, 17, 197, 213, 62
250 DATA 15, 6, 1, 239, 209, 193, 32, 5, 18, 35, 19, 16
260 DATA 240, 201, 0
```

Program Listing 3. Model 4 solution for capturing TRSDOS's date display.

```
                00100 ;SUBROUTINE FOR MODEL 4, TRSDOS (LDOS) 6.0
                00110 ;  WILL READ THE RESULTS OF SYSTEM "DATE"
                00120 ;  FROM THE SCREEN, AND SAVE THE PRESENT
                00130 ;  DAY/DATE IN DAY$ -- MUST BE PART OF
                00140 ;  A BASIC PROGRAM
                00150 ;
000F            00160 VDCTL   EQU     15        ;VIDEO SVC #
                00170 ;
8000            00180         ORG     8000H     ;FOR ASSEMBLY ONLY
                00190 ;
8000 5E         00200         LD      E,(HL)    ;GET LSB OF DAY$ ADDR
8001 23         00210         INC     HL        ;BUMP POINTER
8002 56         00220         LD      D,(HL)    ;GET MSB OF DAY$ ADDR
8003 AF         00240         XOR     A         ;A = 0
8004 67         00250         LD      H,A       ;SAVE IN H
8005 6F         00260         LD      L,A       ;HL = 0
8006 0611       00270         LD      B,17      ;B = # OF BYTES TO GET
8008 C5         00280 LOOP    PUSH    BC        ;SAVE COUNTER
8009 D5         00290         PUSH    DE        ;SAVE ADDRESS
800A 3E0F       00300         LD      A,VDCTL   ;A = VDCTL SVC #
800C 0601       00310         LD      B,1       ;VDCTL FUNCTION NUMBER
800E EF         00320         RST     28H       ;GET BYTE FROM (HL)
800F D1         00330         POP     DE        ;RECOVER STRING ADDR
8010 C1         00335         POP     BC        ;GET COUNTER
8011 2005       00336         JR      NZ,END    ;GO ON ERROR
8013 12         00340         LD      (DE),A    ;SAVE IN STRING
8014 23         00350         INC     HL        ;HL==>NEXT SCREEN ADDR.
8015 13         00360         INC     DE        ;DE==>NEXT STRING ADDR.
8016 10F0       00380         DJNZ    LOOP      ;LOOP FOR 17 CHARACTERS
8018 C9         00390 END     RET               ;RETURN TO BASIC
8008            00400         END               ;END OF ROUTINE
00000 Total errors
```

Program Listing 4. Model subroutine; TRSDOS 6.0 reads the system date and saves the present date.

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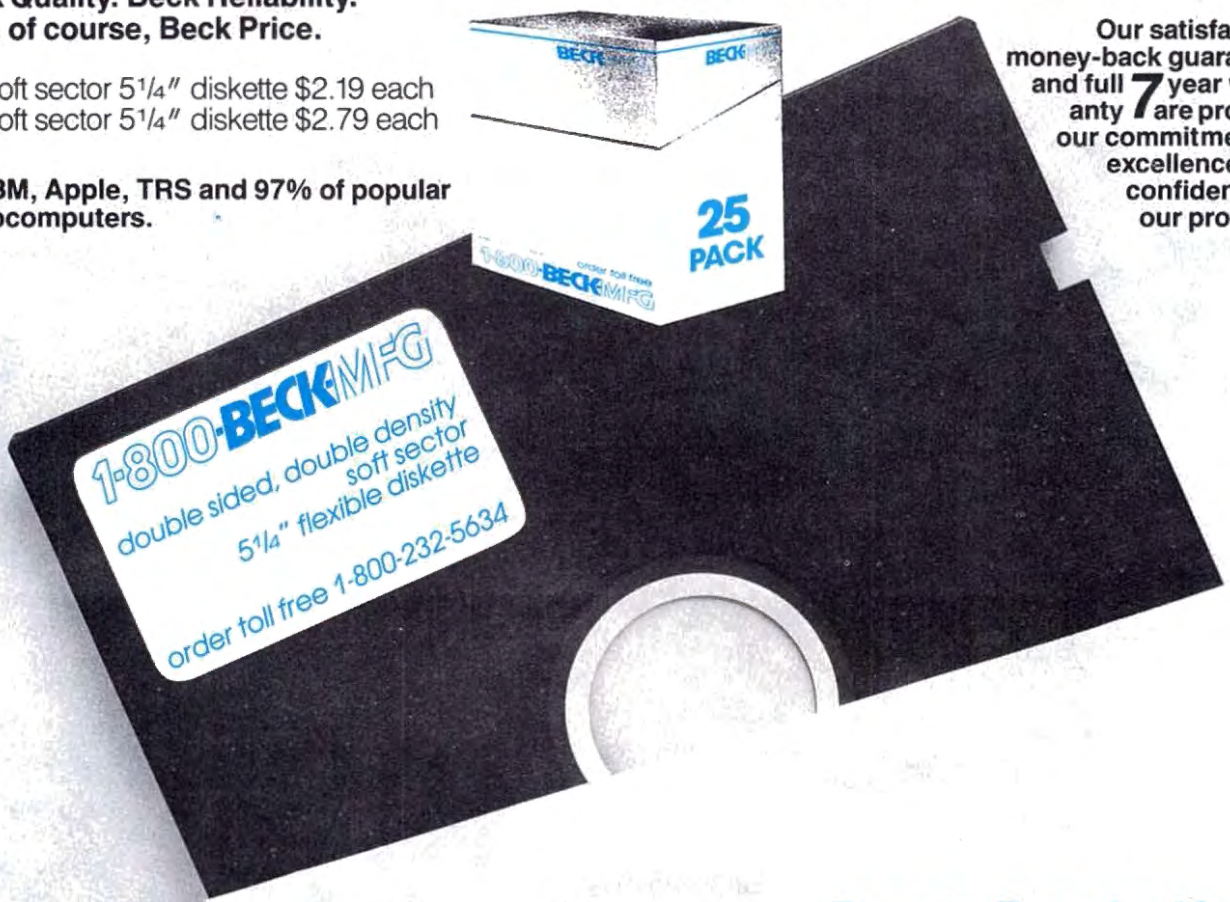

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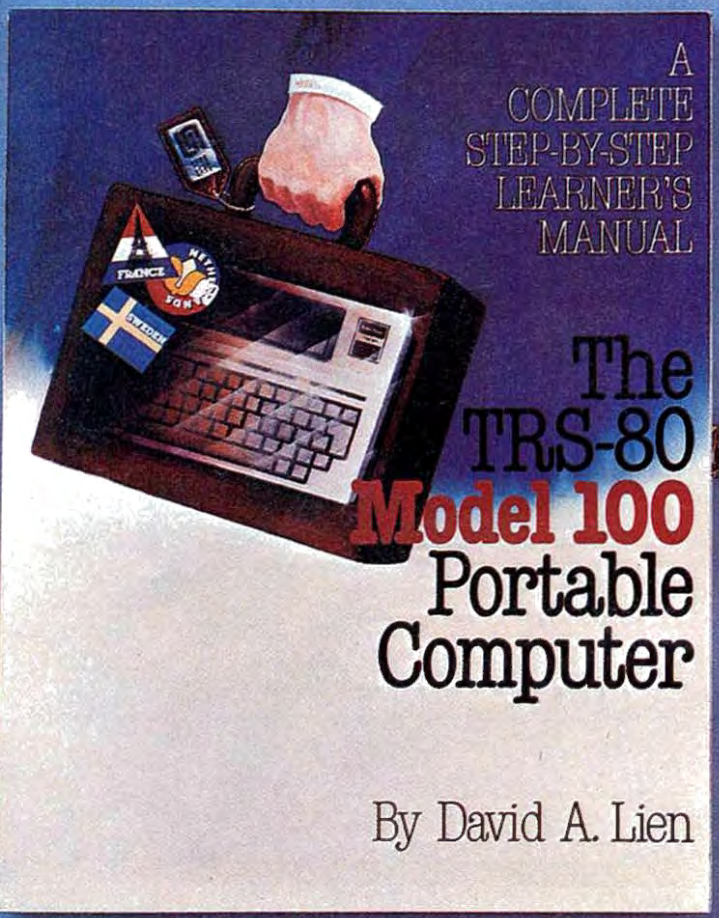

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Continued from p. 32

Then a machine-language routine reads each character off the screen and POKEs it into the appropriate location inside DAY$.

Line 110 of the Basic program clears the screen and forces DOS to print the expanded date form in the upper left corner. Line 120 initializes X to 1 then sets up DAY$ as 17 ASCII spaces. Lines 130–150 move the machine-language routine, stored in data statements, into CODE$. The routine is relocatable, so CODE$'s location in memory is unimportant.

Lines 160–180 find the location of DAY$, and place it in the integer Q%. Line 190 calculates the location of CODE$ (the machine-language code) and places it in R. Line 200 does all the work, calling the machine-language routine at R (the address of CODE$) and sending the address of DAY$ to the subroutine. Finally, line 210 prints DAY$ to verify a successful transfer, and then defines DAY$ as common so it can be sent to another program with a Chain command.

The only way to move from Basic to a machine-language subroutine on the Model I/III is with a USR command. Model 4 Basic has two different commands to call a machine-language routine, both much more powerful. USR, in Model 4 Basic, can pass a single variable of any type (integer, single-precision, double-precision, or string) to the subroutine. The Call command can pass an unlimited number of variables of all types to a subroutine. A fundamental difference between the Model 4 and the Model I/III machine-language calls is that both Model 4 calls pass the address of variables instead of the values of variables.

When the program passes only one variable with a Call instruction (Q% in our program), the machine-language subroutine in the HL register pair receives its address. Lines 200–220 of Listing 4 load the address of the 17 spaces in DAY$ into the DE register pair. The program sets register A to zero with an XOR A command and uses it to set both H and L to zero. (This roundabout way of zeroing the HL register pair avoids leaving zero bytes in CODE$.) Then the program loads B with 17, the number of bytes to transfer from the screen to DAY$.

Inside the loop, the program saves both BC and DE on the stack. Then it loads A with 15, the index value of the @VDCTL supervisor Call (SVC). None of the addresses of the DOS routines in TRSDOS 6.0 are documented. Instead, the *Model 4 Technical Manual* supplies a list of approximately 100 SVCs. Each SVC provides one or more functions for interfacing your routine to the system. SVC 15, for example, is a collection of 8 video control functions.

To get a character from the screen, your program must load the A register with 15, the SVC number; register B with 1 to select the read-from-screen function; register H with the row number of the character's position (zero for the top row of the display); and register L for the column number in the row (zero for the leftmost column). An RST 28 hex instruction then fetches the character, returned in the A register. If the program doesn't set the Z flag, an error has occurred during the transfer.

After each fetch, Listing 4 saves the character in DAY$ (line 360) and the program increments the HL and DE pointers for another fetch. It finishes by returning to Basic. If a fetch error occurs, the program returns immediately, and DAY$ holds only part of the date display.

You could add an error-checking loop to the Basic program to be sure that DAY$ doesn't end with a space, and to try the call again if it does, though I've used the routine many times and never seen an error generated. You could easily generalize this routine to read as many characters as necessary from the screen. Just remember to increment H for each new video row.

Another Model 4 Routine

Program Listing 5 shows a technique you can use on a Model 4 in Model III mode only. Line 40 forces A to alternate values of zero and 8. If you send a value of 8 to port 132, you enable the inverse video section of the Model 4's character generator, and can print inverse characters. To display an inverse character, set bit 7 of any normal character value to 1, creating a value between 128 and 255. Unfortunately, neither the ROMs nor DOS supports printing inverse characters on the screen, though it wouldn't be difficult to write a filter for the video driver to do so.

Back to the Beginning

So you thought you could get all the way through the column without actually typing in and running Listing 1, huh? Go back now and do it. Only those of you who have already run it

```
1 '************************************
2 '
3 '    Demonstration of Inverse Video
4 '          on the Model 4
5 '          in Model III Mode
6 '
7 '************************************
8 '
10 CLS: A=0
20 FOR I=0 TO 255
30   POKE 15360 + I, I
40 NEXT I
50 A = NOT A AND 8
60 OUT 132,A
70 FOR I=1 TO 500: NEXT I
80 GOTO 50
```

Program Listing 5. Inverse video on the Model 4 in the Model III mode.

```
10 REM -- Many of these lines will disappear
20 REM -- They could be used to hold a
30 REM -- Machine-language sub-routine
40 FOR I = 1 TO 7: Q=PEEK(16548)+PEEK(16549)*256
50   IF Q>32767 THEN Q=Q-65536
60   POKE 16548,PEEK(Q): POKE 16549,PEEK(Q+1)
70 NEXT I
80 REM -- Regular Program could start here
90 CLS:LIST
```

Program Listing 6. Routine to move Basic's pointer.

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may read the next part.

What's happening in this program? If you translated the POKE addresses in lines 20, 40, and 50 to hexadecimal, you probably already know. I adjusted several low-memory pointers to achieve this effect. Line 20 moves the Array Variable Table and Free Space pointers (40FB hex and 40FD hex) up to a higher location in memory (remember those pointers from last month?). Then the program loads array A(n) with data values. Each data value is a combination of 2 bytes of the tokenized form of another Basic program. Finally, the beginning-of-program pointer (40A4 hex), as well as the variable table pointers, are adjusted to the beginning of the array area, 6F00 hex. Essentially, one Basic program has written another!

Moving the pointer can lead to all sorts of interesting techniques. Though the one in Listing 1 probably has only limited uses, it does serve to illustrate a major point: Basic programs (except for the next-line pointers they contain) are completely relocatable. You can store the lines of a Basic program anywhere in memory.

Programs running under Disk Basic are located much higher in memory than those running with a tape system to allow space for the resident DOS modules and Disk Basic enhancements. Also, the number and type of files you select on entering Disk Basic alter the starting point of your program.

When you add machine-language routines to a Basic program, you have to worry about where to store those routines. You can put them at the top of memory, and protect them by setting the HIMEM pointer, or you can store them in low memory below the resident Basic program. It's easy to store programs in low memory with a tape system; unless you change the 40A0 hex pointer with a machine-language routine, the Basic program always starts in the same place.

It is more difficult to load a machine-language program below Disk Basic, because the value in 40A0 hex varies according to the number and types of files, and the DOS you use. However, if you load Basic before the machine-language program, life can be much simpler.

Load and run Program Listing 6. The first lines disappear when the program runs, because the program moves the 40A4 hex pointer up one line with each iteration of the loop. The program stores every line of Basic with a 2-byte header that points to the next Basic line. The 40A4 hex pointer holds the address of the first line in the Basic program. By moving that pointer, you can make the first lines invisible.

If you POKEd a machine-language program in the REM statements and then moved the 40A4 hex pointer, the subroutine would be completely invisible to the user. Better yet, it would remain in place no matter how many Basic programs you load and run. And

```
10 CLS
20 FOR I=0 TO 15: PRINT @ I*64+10,"FIRST SCREEN";: NEXT I
30 OUT 136,12: OUT 137,4: OUT 132,128
40 CLS
50 FOR I=0 TO 15: PRINT @ I*64+30,"SECOND SCREEN";: NEXT I
60 OUT 132,128
70 A%=4
80 FOR I=0 TO 6: FOR J=1 TO 200: NEXT J
90 A%= NOT A% AND 4: OUT 137,A%
100 NEXT I
110 OUT 136,13
120 FOR I=0 TO 255: OUT 137,I
130 FOR J=1 TO 20: NEXT J,I
140 OUT 137,0
150 FOR I=0 TO 31
160 OUT 136,13: OUT 137, (I-INT(I/4)*4)*64
170 OUT 136,12: OUT 137,INT(I/4)
180 FOR J=1 TO 100: NEXT J,I
190 OUT 136,12
200 FOR I=0 TO 500:A%=NOT A% AND 4
210 OUT 137,A%: NEXT I
220 OUT 132,4: FOR J=1 TO 900: NEXT J: OUT 132,0
230 OUT 136,12: OUT 137,0
240 OUT 136,13: OUT 137,0
```

Program Listing 7. Use the 2K video RAM to enhance regular programs on the Model 4.

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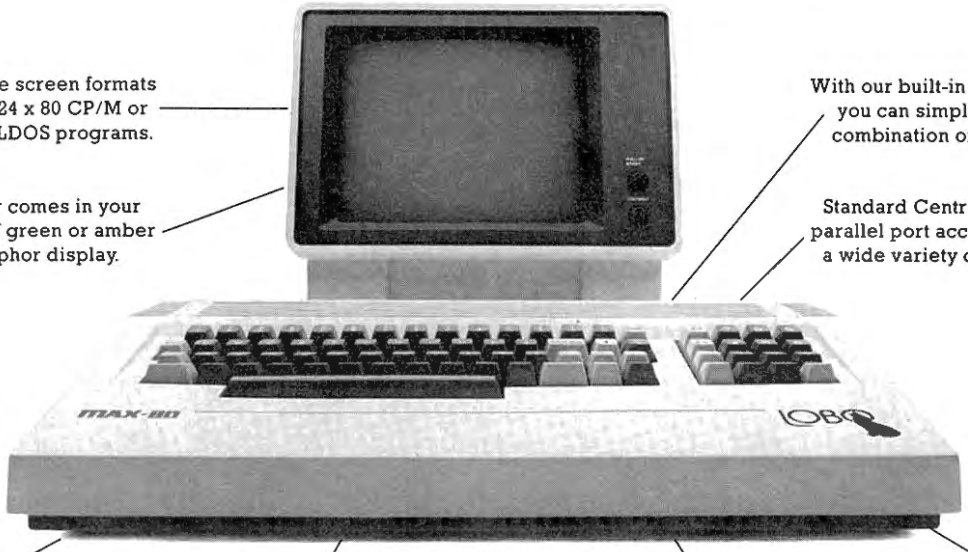

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best of all, it could contain bytes of 00 hex without adversely affecting the resident Basic program. It's absolutely safe.

As one reader, Jim Kyle of Oklahoma City, OK, pointed out, the addresses set by DEFUSR commands don't change with New, Clear, Load, or Run commands. Nor do the values in 16526/16527 for tape systems. Therefore, the same machine-language program is available once it's loaded and the relevant pointers are set.

One More Model 4 Routine

Jim Kyle has also done some explorations with the Model 4 video control that I think you'll find interesting. If you have a Model 4, put it into Model III mode, and run Program Listing 7. Be sure to let it run completely to the end. You should be surprised by the results.

If you don't have a Model 4, you might want to go to your local Radio Shack store or Computer Center and try it. It will work on all versions of the Model 4, from the 16K RAM tape-based model up to the 128K RAM hard-disk setups, as long as they are first put into Model III mode.

This program illustrates how the 2K video RAM enhances regular programs. If you're going to experiment with other port outputs, first pull the disks from the drives so you don't inadvertently turn on a drive and erase something.

The program operates by acting upon the CRTC (cathode ray tube controller) chip inside the Model 4. Output port 132 (84 hex) selects several systems options, including placement of the cursor (paging) inside the 2K of video RAM and toggling between the 64-character and 80-character display modes. Output ports 136 and 137 directly address the CRTC, in effect telling it the location, in the 2K of video memory, of the top of the screen. The CRTC sees the video RAM as completely circular, with complete wraparound from the end to the beginning, and it's impossible to send an invalid address.

With that introduction, you should be able to figure out how the program works, and use the same techniques in your own programs. You could, for example, change last August's screen swap program to use the other half of video RAM and save 1K of program memory space. ■

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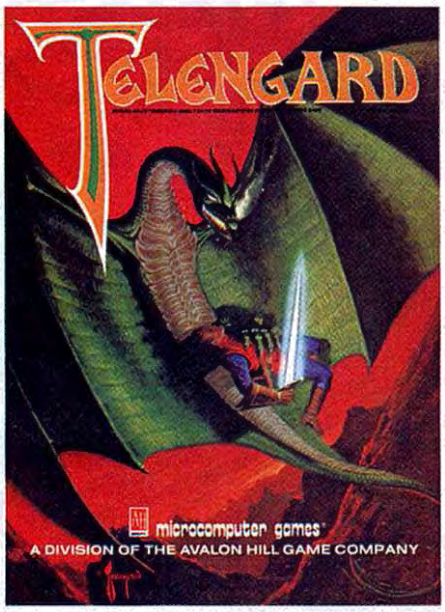

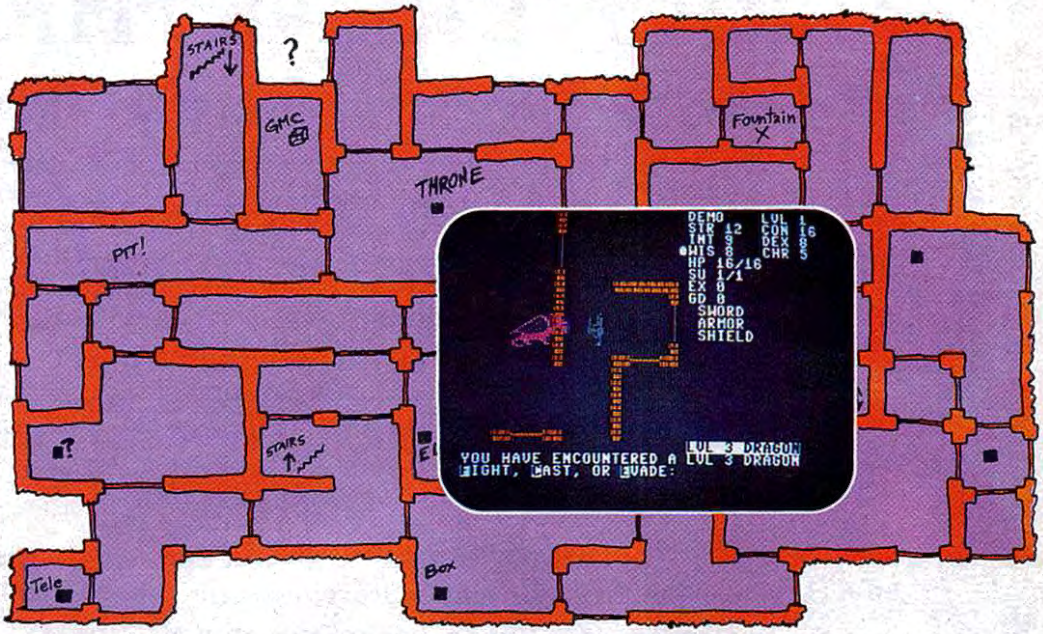

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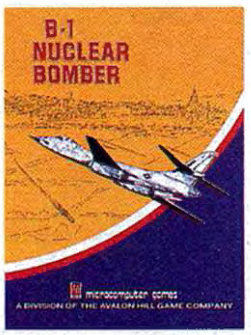

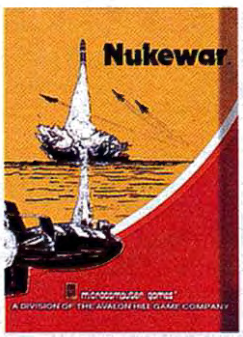

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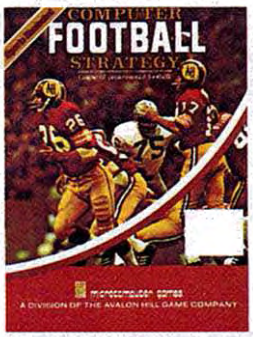

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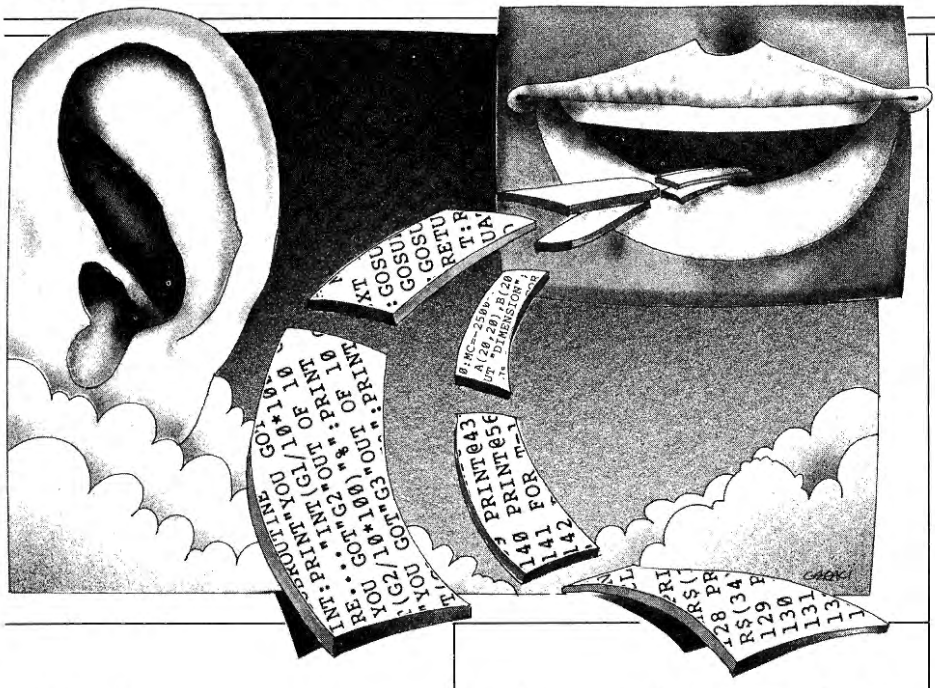
edited by Lynne M. Nadeau



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Our reviewers use a five-star rating system. One star represents the low end of this spectrum, while five stars represent the spectacular and high end of the spectrum.

★★★★½

The Talking Program
Ron Hutchinson
P.O. Box 28355
Columbus, OH 43228
Models I, II, III, 4, 12, 16, and Lobo Max-80
Votrax Type-n-Talk
$129.95

by Terry Kepner

The Talking Program is a neat machine-language program that allows visually handicapped people to use a computer. Instead of just sending information to the video display, The Talking Program verbalizes what appears on the screen. Thus, a visually handicapped person can both run and write programs.

The Talking Program integrates itself into your computer's disk operating system (DOS). In addition to this software, you also need the Votrax Type-n-Talk ($249.95) and its connection cable to give your computer a voice.

Once you install this program and turn on the computer, The Talking Program becomes transparent and you can switch its various functions in and out of use as your needs dictate.

Because the program integrates into the DOS when you execute it, any program that honors the DOS keyboard and video driver device control blocks (DCBs) works with The Talking Program. You're not limited to a few properly patched programs.

Thus, a visually handicapped person can use practically any Basic program because he can hear it. Programming becomes a cinch, as the system verbally echoes every keystroke. You can also use machine-language programs, but they, too, must honor the DOS keyboard and video driver DCBs.

I used The Talking Program on a Lobo Max-80 with LDOS and the Votrax Type-n-Talk unit. After installing the program on my DOS disk and setting it for automatic execution when I boot the disk, I tested it by turning off my video monitor and using the program "in the dark."

I was amazed at how easy it was to learn to use the computer without the monitor. The Talking Program vocalizes everything sent to the video display, including copyright notices.

Hearing the copyright notice also lets you know immediately whether the system is operating correctly. If the drives stop and the Type-n-Talk doesn't say anything, something's wrong.

It takes a while to get used to the Type-n-Talk unit's voice, but an adjustable knob helps by controlling the pitch and speed of the words. Volume is also adjustable.

The All Speech mode (speaking all the words as opposed to spelling them) has a few drawbacks: The program says "uldos" for LDOS, "kimd" for /CMD, and so forth. I quickly learned to switch to all spelling before asking for a disk directory.

The Talking Program has 10 major options, and an additional 16 or 24 commands for reading the lines of your display. F1 switches the program between Voice On and Voice Off modes, and F2 toggles between spelling everything and speaking everything. F3 turns punctuation speaking on and off.

F4 makes the program spell uppercase while speaking lowercase (select this before reading the disk directory), and returns you to speaking upper- and lowercase. ESC1 is speak or spell the current line (depending on F2's setting). ESC2 is speak or spell everything to the right of the cursor, and ESC3 speaks or spells the character under the cursor.

ESC4 speaks or spells this line and goes to the beginning of the next line. ESC5 tells you the current line and column cursor position. You use ESC6 to adjust the speed of the Votrax Personal Speech System, which doesn't have a separate speed control. ESCa through ESCp select display lines 1–16, respectively, for speaking or spelling.

All the computers support these features, but use different control keys since they don't all have function keys available. The II, 12, and 16 also have extra ESC keys, q through x, to take care of video lines 17–24.

Turning the voice off doesn't totally deactivate it. In both modes, the pro-

gram speaks any control or escape keystrokes, such as enter or backspace. If you want to totally disable the voice, you have to reboot the system and disable the program's autoload and execution by holding down the enter key.

The package's only drawback is its documentation, which is poorly written and somewhat disorganized. As a result you have to read the entire manual before you can fully understand what's supposed to happen and how. A severely visually handicapped person would require the assistance of a sighted person for initial setup of the program. Fortunately, The Talking Program's author, Ron Hutchinson, lists his phone number and invites anyone having problems to call him for help.

When I first received my copy of The Talking Program, it worked perfectly. However, when I tried using my LDOS disk instead of Hutchinson's, the initial configuration of the RS-232 port locked up my system.

Phone calls to Logical Systems revealed that Ron and I had different releases of LDOS 5.1.3, and my version didn't use precisely the same driver locations as his. Logical Systems gave Ron information to make his program compatible with all versions of LDOS 5.1.3.

At this time you get two versions of Ron's program on the distribution disk: the standard version, Talk, and Talk1. Talk1 is a special version for operation with Scripsit.

The Talking Program is a simple-to-use package for converting TRS-80s into talking computers. Although the Votrax speech unit takes getting used to and slows down operation of the computer (which waits for it to speak or spell its present data before sending more), that's a small price to pay for being able to use a computer.

For more information on which programs do or don't work with The Talking Program and on which computers, call Ron Hutchinson. I recommend this program to anyone who is visually handicapped. While not all programs work with it, enough do to make it a worthwhile investment. ■

★★★★½

Arranger II
Triple-D Software
P.O. Box 642
Layton, UT 84041
Models I, III, and 4
$49.95

by Ronald Cangro

The Arranger II is an excellent disk directory cataloging program for the Model I (with a double-density adapter), the Model III, or the Model 4. The self-booting disk recognizes the computer you're using and configures itself correctly on initialization.

If you own a single-density Model I, you can still order the original Arranger. It doesn't have all the Arranger II's features, but it's still one of the best disk libraries available.

Arranger II has several indispensable features and others that are simply handy. At the top of my list is the ability to recognize all major disk operating system directories; Arranger II treats all disks equally.

This program recognizes my TRS-DOS, NEWDOS/80, DOSPLUS, and MULTIDOS disks, not to mention LDOS and DBLDOS. It also automatically recognizes single- or double-density disks to provide compatibility with the Models III and I double-density systems.

The program is written in machine language, a big plus for speed. It sorts 1,500 file names in less than 40 seconds! The program and data reside on the same disk, which can store up to 11,000 programs with up to 255 file names per disk.

The Beginning

To use the Arranger II, insert the disk in drive zero and press the reset button. The program checks to see how many drives are active on the system and configures itself accordingly. It works with one to four drives of 35, 40, or 80 tracks. You can also use the 80-track drive to update 35- or 40-track disks automatically.

The main menu (see Fig. 1) gives you an idea of this program's power and flexibility. For those of you familiar with the original Arranger, Triple-D Software has corrected most of its shortcomings and added some new commands.

Your first step in using Arranger II is to rename all your disks. You must do this if you want to use the program in the automatic update mode.

Whenever you want to update a disk you've previously added to the library, insert it into the drive and enter the Update command with one keystroke. The program goes to the directory, searches the name, and automatically replaces the old data with the updated information. To use this feature, you must give each disk a unique name.

The program also uses the names to sort the disks, so it is advantageous to numerically name the disk (e.g., 001GAMES). You can use up to eight characters, letters, or symbols in any order.

The Filter function can selectively list disks of a certain category. For instance, if you set the condition for disk names to ???GAMES, the program lists only the game disks in your library.

The Rename command makes changing names easy. However, it contains one minor inconvenience when you rename a disk that's already in the master list. You must manually delete the disk in the master list and then add the disk with the new name to the list. The original Arranger did this automatically, and it's a feature that Triple-D should have retained.

Once you've renamed all your disks, you must enter them into the master list. This task is a little cumbersome with only one disk drive because of the necessary disk swapping. One nice feature is that the program never crashes.

If it prompts you to insert the Arranger II disk and you put in your only copy of a great arcade game instead, the program won't destroy your game. It

ARRANGER II—By Dan Foy

(A)dd a diskette	(U)pdate a diskette
(F)ind a program	(V)iew disk names
(S)can diskettes	(L)ocate free grans
(P)roduce alpha list	(R)ename a diskette
(T)oggle auto/manual	(B)ackup the Arranger
(M)anual add	(C)hange filter
(D)elete a diskette	(E)xit the Arranger

Command: (U)

Figure 1. Main menu screen.

checks first to see if you entered the right disk, then lets you know in a friendly way that you did something wrong.

The Add command initially enters all your disks. Arranger II prompts you to insert the disk you want to add and automatically does the rest. The program finds the directory, reads it in, displays it on the screen, and then adds it to the Arranger II file.

The program is smart enough to recognize an unformatted disk or one already on file, and lets you know its status. You can even print a disk label by pressing the clear key after adding or updating the disk.

In addition to recording the file names on an update or disk add, the program records the number of free grans, disk name, date last updated, disk type (system or data), density, and DOS type. The program doesn't determine the DOS type with a single-density disk, but sets it to SDEN. You aren't allowed a comment line describing the program.

You should have a printer on your system to take full advantage of this program. However, Triple-D realizes that not everyone has a printer or wants to print out a complete list all the time. Therefore, all the commands display data on the video screen.

If more information is present than can appear on the screen at one time, you can use the arrow keys to scroll up or down through the data. By pressing the clear key, you direct a printout to the printer.

SCAN Page 1

Disk Name	Updated	Density	Dos Type	Grans	Trks	Type
001GAME	08/06/82	SINGLE	SDEN	1	35	SYSTEM

ZAPPER/CMD STAR4/BAS TREK1/BAS STARGARD/BAS
CLIMBER/CMD NIGHTR/CMD

Disk Name	Updated	Density	Dos Type	Grans	Trks	Type
025GUESS	05/13/82	DOUBLE	NEWDOS/80	12	35	DATA

DOTS/CMD SAVE/BAS TALK/DAT PROG/BAS
VOX/CMD LIST LOAN TYPE/CMD
SKOOL/BAS ENTRAP

Figure 2. Sample Disk Scan command output.

ALPHA LIST Page 1

ACCESS.....027NEW1	CFB.....005TEST	DATE.....034DATA
ACCOUNT.....006BUSS	CHESS.....010NEW1	DEEPDIVE....003BGAM
ALIEN/CMD....002GAM	CLEM/BAS....004MUSIC	EDIT/CMD.....009SYSA
BASV20/ILF.....023SYSB	COM/CMD....028COMM	FLASH/BAS....065JUNE
BUDTRAK.....041BUD	CRYPTO/CMD..002GAM	GOLF/BAS....003BGAM
BUSGRA/CMD.057BUSN	DATE.....033BAKUP	KEEPER/DAT...014TEST
BUSGRA/DAT..057BUSN	DATE2.....033BAKUP	SAFETY/BAS..008DUMY

Figure 3. Sample alphabetical listing.

<< Change Filter Mode >>
Press ARROWS,<SPACE> to select,<ENTER> for menu,<@> to reset
→ Disk name: ???????? (All 99 disks allowed)

DOS Type allowed:
DOSPLUS NEWDOS/80 DBLDOS PROTECTED SDEN

Disk type: SYSTEM DATA

No. of tracks: 35 Other

Figure 4. Change Filter screen.

Commands

The View command displays the names of all the disks on file, including the date last updated, type of DOS (if the disk is double density), disk type, and number of free granules available.

The Scan command lets you page through your disk library a disk at a time. The pertinent disk data appears along with all the file names on the disk. You use the plus and minus keys to step through the library one disk at a time.

I find it inconvenient to press the key each time I want to advance to the next disk. It would be nicer to hold down the key for a continuous scroll.

If you want a printout of any individual disk, you use the clear key when the disk appears on the screen. If you want a complete listing of all your disks, press the shift/clear keys simultaneously (see Fig. 2). This is a handy feature.

The Find command searches the file for a specific file name and displays all disks on which it finds that file name. Arranger II also finds partial names. If you enter TEST as the file name, the program finds all file names starting with TEST, including Testing, Test/BAS, and Test/CMD.

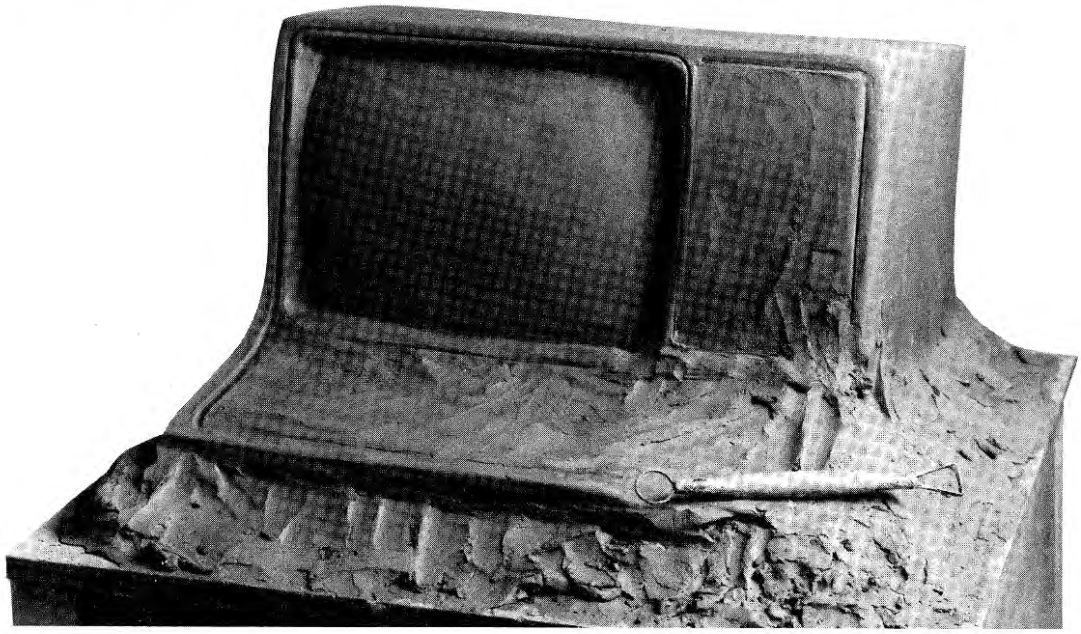
This doesn't work if you're looking for file names that end in TEST or that contain only a specific sequence of letters. You can also search for a specific extension, such as /BAS.

The Locate command is a timesaver. It quickly finds the disks that have a specified amount of free space. Arranger II asks you the minimum amount of free space you need, and you answer by entering the number of granules.

It then searches through all the disks and displays those that have at least that much unallocated space. This feature is great when you're trying to find enough space for a particular program.

Another useful command is Produce

Shape your TRS-80 to communicate with any computer you want.



Omniterm is the most flexible, powerful terminal program you can buy. Omniterm lets you adapt your TRS-80 to communicate with 99.9% of the world's computers. Your company's mainframe, for example. Or any other personal computer, time-sharing computer, or communications service.

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You can send all ASCII characters, even those that aren't on your keyboard. Reformat your screen to neatly accommodate any line length. Run your printer while you're sending or receiving data. And even review data that's scrolled off the top of the screen.

Omniterm's well-thought-out design makes it easy to use. You can get a status display of all functions while on line to tell you what's going on, and make any changes at the same time. You can create a special file of your settings to make it easier next time. You also get X/Y cursor control, single keystroke sign-on and auto-dialing. Even a phone directory. And lots more.

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Alphabetical List. You can output all the file names on the master list in alphabetical order, along with the disk name where they reside (see Fig. 3). You can specify a sort to include only a specific file extension, such as /CMD or /BAS.

As with the other commands, if you want a printout of this data, you can direct the output to the line printer by pressing the clear key. The program formats the data alphabetically by column in three columns of 60 rows per page. If you have more than 180 cataloged programs, the program spaces to the next page and continues printing.

The output on the video display also appears consecutively in rows, and the arrow keys control screen scrolling. A limitation of this command is that it can't specify printer options such as number of columns or lines per page. It would also be nice to have the date appear along with the title and page number.

Several commands new to Arranger II are Delete Disk, Manual Add, and Change Filter. The Delete Disk function lets you remove a disk from the master list.

The Manual Add command lets you type in the name and files of a disk rather than having the program read it automatically. This is useful for protected or nonstandard disks, such as self-booting games. The program sets the rest of the information to a default of protected DOS type, 35 tracks, and zero granules.

The Change Filter command is by far the most powerful (see Fig. 4). It lets you isolate any part of your disk library by setting up conditions based on the disk name, DOS type, disk type, or number of tracks.

A wildcard character selects the disk name. If you want to limit your searches to only those disks with a name beginning with the letter A and a Z in the third character position, you enter A?Z????? for the disk name. Mastering this command saves you a lot of time.

Toggle and Backup are two miscellaneous commands. Toggle switches from a manual disk name entry to automatic and back again. This is useful when you don't want to rename all your disks. The manual mode requires that you enter the disk name to add or update the disk. The automatic mode, the preferred method, reads the name automatically from the disk directory.

The Backup command lets you make a back-up of the complete program and associated data file.

Arranger II is a high-quality disk cataloging program. Triple-D took care to ensure compatibility and to maintain ease of operation. The program arrived promptly and the company is helpful in providing support. Also, Arranger II's error-trapping is excellent.

Now that I've used this utility, I don't want to be without it. If your library of disks is growing, you need Arranger II. I heartily recommend it. ■

★★★

VisiCalc Business Forecasting Model
Tandy/Radio Shack
One Tandy Center
Fort Worth, TX 76102
$99.95

★★★½

Vis/Bridge/Sort
$79

No rating

Vis/Bridge/RPT
Solutions Inc.
97 College St., Box 989
Montpelier, VT 05602
$79

★

Viz.A.Con
Abacus Associates
Suite 240, 6565 W. Loop South
Bellaire, TX 77401
$89.95

by G. Michael Vose

This is a look at some peripheral software, utilities, and enhancements to an existing program, VisiCalc. These four spreadsheet stretchers provide additional power and flexibility, including sorting, report formatting, consolidation of templates, and a business forecasting model series.

VisiCalc Business Forecasting Model

The VisiCalc Business Forecasting Model (BFM) is a series of seven templates for the popular spreadsheet program. These seven templates comprise four financial models (with three support templates) that permit business analysis and forecasting, including the projection of profit and loss, calculation of financial ratios, and balance sheet manipulation.

To use BFM, you need a Model III with 48K and at least one disk drive, VisiCalc/TRSDOS 1.3, and a printer. The BFM software presumes some understanding of both VisiCalc and financial modeling.

BFM is a complex financial analysis tool. It is designed primarily for manufacturing, distribution, and retail businesses doing from a few hundred thousand to several million dollars worth of business per year. BFM would be of little use in your family pickled-marigold preserves business unless pickled-marigold preserves really catch on.

The BFM templates provide an Income Statement to track the performance of a business over a period of time, typically one year; a Balance Sheet, a fiscal snapshot of a firm on a given date; a Statement of Cash Flow for predicting the amount and date of needed capital; and a Financial Ratios statement, a common method for determining a company's performance in its marketplace.

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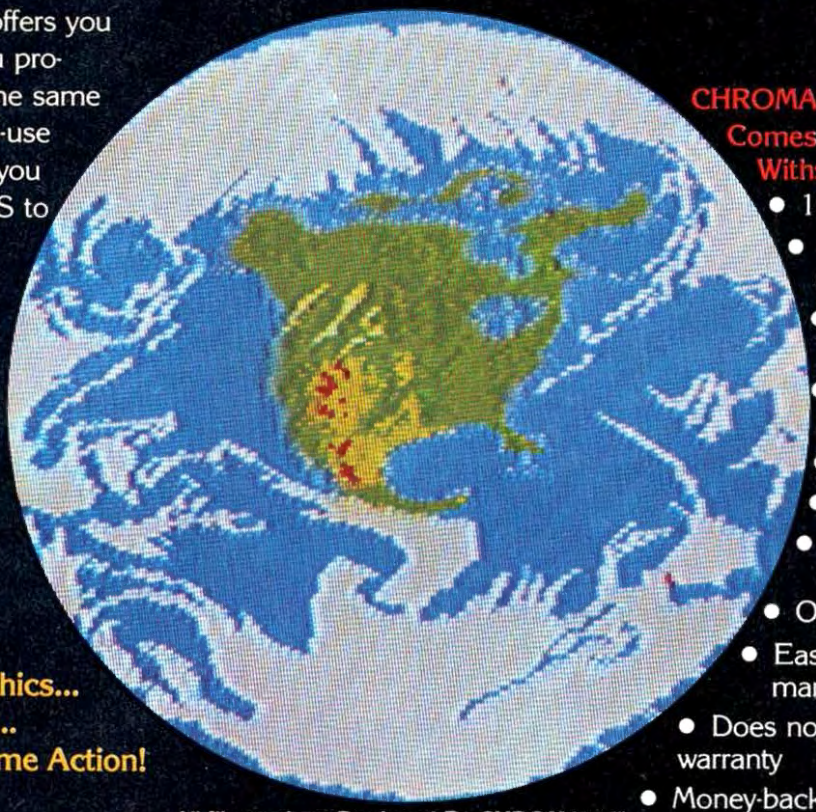

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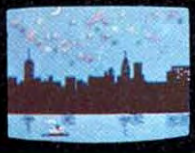

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SOFTRENDS

salaries, and assets and depreciation.

The support templates provide data for the four models. Some of the data in each model is used by the other models as well. The sections of a model used by another model are called *drivers* in the BFM lexicon. Drivers make use of VisiCalc's DIF (data interchange format) capability.

As you might expect, the BFM models can be quite large. BFM instructions suggest a minimum of two formatted data disks for building your company's financial models.

Because of its complexity, BFM is best used after studying the manual tutorial. This tutorial takes up 46 of the manual's 102 pages.

The tutorial also uses several sample templates included on the master disk. Together with the written material, these samples provide a walk-through of building four financial models for the fictional ABC Model company.

The sample templates contain most of the data for analyzing ABC Model's performance over a five-year period, and the tutorial's pages provide some additional data and instructions to enter it.

The seven tutorial lessons describe how you build the support templates, save these files, then load them into the appropriate model(s). The last lesson guides you through the complicated, labor-intensive, iterative calculation of interest rates.

The interest rate calculation requires that the program pass information in the Income Statement and Balance Sheet templates back and forth. This is necessary because banks use different interest rates depending on an assessment of the debtor's ability to repay, usually determined by the Balance Sheet.

The BFM models consider Interest Expense to be a cost of doing business, however, and include it on the Income Statement. Correct calculation of this expense can require as many as six exchanges between the two templates.

Each exchange involves saving the relevant figures in a DIF file, exiting the current worksheet, loading the other worksheet, then loading the relevant DIF file numbers. The program makes new calculations and you must repeat the process to return to the other template.

Presumably, other ways exist to calculate interest expense with less work. But for the manager without access to financial consultants, BFM's capability to make these calculations is an asset.

You can walk through the tutorial in one and a half to two hours. At its conclusion, most managers will have a good grasp of BFM's inner workings.

BFM's two principal strengths are its manual and its parent—VisiCalc.

Professionally prepared by VisiCorp for resale by Radio Shack, BFM benefits from being an application of VisiCalc. You can easily master VisiCalc in a few hours, unlike programming languages that can take years to master for complex applications.

Once you learn its command structure, you can concentrate on the important matters—your data. Most managers are familiar with important data about their firm or department.

A VisiCalc application benefits too from the relatively simple modifications that you can make to a template. Modifying a Basic or Pascal program can be a nightmare, but a spreadsheet is easy to change to suit your own particular need.

To make BFM easy to modify, as well as use, requires a good manual. The BFM manual has three sections. Section one is a 16-page outline describing what BFM does, its component parts, and what you need to operate it.

Section two is an excellent tutorial divided into seven lessons, none of which is too long. Section three is for reference, explaining the formulas used and their rationale.

The writing is cordial, professional, and jargon-free with short paragraphs and lots of individual headings. This makes possible the most comprehensive index I've seen in an instruction manual: six pages and over 500 cross-referenced entries.

BFM has a few weaknesses. It is complex, you can't print most of the models all at once, even in 132-column format, and none of the models are directly suitable for a specific business (not a weakness, but merely an inconvenience since modifications are easy).

These disadvantages are minor in the software business. The three-star rating is only because I believe BFM has limited appeal, mostly confined to managers and accountants of substantial businesses.

Vis/Bridge/Sort

Vis/Bridge/Sort is a VisiCalc utility

that sorts portions of a spreadsheet. It sorts numeric or alphabetic data using as many as five sort keys, and sorts rows or columns.

To use Vis/Bridge/Sort, you need a Model I, II, III, 12, or 16, 48K RAM, a disk drive, and VisiCalc.

The program works with special identifiers surrounding the data you want to sort. You insert these identifiers by opening up the borders of your spreadsheet using VisiCalc's /IR and /IC commands. Vis/Bridge/Sort uses negative numbers to specify a descending sort and positive numbers for an ascending sort.

Once the identifiers are in place, you save the worksheet as a DIF file. With this file in place, you exit VisiCalc and load Vis/Bridge/Sort: You answer a few prompts to tell the program which file to sort, whether you want a row or column sort, and the beginning row/column values.

The utility then takes over, sorting your file and reloading VisiCalc. You now load your old file and a file that invokes VisiCalc's Move command, which rearranges your original spreadsheet in sorted order.

You learn to use Vis/Bridge/Sort by following a manual tutorial that uses a sample data file included on the program disk. The tutorial takes about 20 minutes. In an hour's time, you can sort your own spreadsheets without difficulty.

You get a no-frills, 17-page manual that is accurate and simply written. The program is so straightforward in operation that you need little outside support. (The rest of the microcomputer software world could benefit from looking at VisiCalc manuals generally.)

All is not roses with Vis/Bridge/Sort, however. Its major problem is its price, $79. This is almost a third the cost of VisiCalc itself and might be too high for all but the most sort-happy spreadsheet jockeys.

Now that VisiCorp, and presumably Radio Shack in time, offers VisiCalc IV with built-in sort capability, maybe Solutions Inc. will lower the price on the product. A $29.95–$39.95 range would be much easier to take.

Another quibble I have with this utility is the need to clean up your files after sorting. You must go back to your unsorted file and take out the identifiers if you want to print or reuse the original data. While I understand that this difficulty probably doesn't have a solution, I couldn't help disliking this corruption of my original files.

Nevertheless, if sorting spreadsheets is a function you need in your work, Vis/Bridge/Sort is a valuable addition to your VisiCalc utility library.

Vis/Bridge/RPT

The company that offers Vis/Bridge/Sort offers another VisiCalc utility that provides (within printed reports) variable column widths, decimal point alignment, and segmentation of spreadsheets too large to print on a single sheet of paper—with the option of adding report titles, page numbers, and the date.

The Vis/Bridge/RPT utility also offers a function to create print image (ASCII) files on disk for use outside VisiCalc (telecommunications transmission, inclusion in word-processing reports, and so on).

Vis/Bridge/RPT is even easier to use than its cousin. You only need to insert a single column of identifiers at the top of your spreadsheet to tell the utility how to format your reports. These identifiers specify column width, column justification (left, right, center), digits after the decimal point, and omit or include column.

Once the identifiers are in place, you save the spreadsheet as a DIF file, exit VisiCalc, and load Vis/Bridge/RPT. You then answer nine prompts to print your formatted report.

You can specify a title that optionally prints at the head of each page, carry column and row labels from page to page when printing spreadsheets that don't fit onto single pages, and add page numbers and the date to each page—all by simply answering a few prompts.

Like Solutions Inc.'s other package, the manual is brief but complete. I did not rate this program because I could not fully test all its features. But like Vis/Bridge/Sort, it's a well conceived and executed program; only its price might be called into question.

Viz.A.Con

Viz.A.Con is a VisiCalc worksheet consolidation utility. It consolidates data from different worksheets, for example, to merge sales figures from Canada and the U.S. into a North American data file. The utility also provides report formatting with customized titles, row

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and column headings, and footnotes.

The program requires a Model III, 48K RAM, a disk drive, and TRSDOS 1.3/VisiCalc.

Viz.A.Con makes extensive use of the VisiCalc DIF capability. It is a disk intensive program—two disk drives are a practical necessity.

This is an extremely complex system. You must enter a minimum of 21 responses once you enter Viz.A.Con to prepare a new consolidation process. You do this after you create the separate spreadsheets that will be combined and save them in DIF format.

Unfortunately, the problems with this program are so numerous and apparent that it is difficult to imagine its use in a serious application.

The flaws I discovered immediately included that files to be consolidated have to be the same size (if they are not, you have to modify them). Viz.A.Con also prints reports with integer format for numeric data. Printing the data from VisiCalc overcomes this deficiency but adds more steps.

You have to keep notes on a form provided in the manual to keep track of what you're doing. The manual provides no tutorial and no sample data files to experiment with, and the manual, while extensive, does not explain how to use the program (possibly because no explanation exists).

Viz.A.Con is a classic example of a program that only its author could use. It's a nice try, but it incorporates all the inadequacies that VisiCalc is designed to avoid: rigid, over-repeated prompts; a preoccupation with the mechanics of its operation (you don't see your data for long periods and that makes me nervous); and a lack of flexibility. ■

★★★★★

Model 4 Technical Reference Manual
Tandy/Radio Shack
One Tandy Center
Fort Worth, TX 76102
Hardcover, 389 pp.
$24.95

by Mark D. Goodwin

Radio Shack has recognized the need to provide Assembly-language programming information by producing an excellent *Model 4 Technical Reference Manual*. This is also a complete reference manual for anyone who wishes to repair or modify his computer.

The *Model 4 Technical Reference Manual* comprises two major parts. Part one provides complete details on the Model 4's hardware, beginning with a brief but thorough description of the general hardware configuration.

This introductory section provides instructions for upgrading to 128K of RAM and for installing the Model 4 graphics board option. Next, the manual presents disassembly and assembly instructions covering the case, CPU board, FDC board, RS-232 board, main power supplies, disk drives, video monitor, and video board.

The remainder of the hardware section provides other information about the CPU board, the disk interface and drives, the power supplies, the video monitor, and the RS-232 board. This includes explanations of each board's major functions, schematics, component layouts, circuit traces, and parts lists.

The second part of the manual is a wealth of information for the Assembly-language programmer. It begins with explanations of disk organization and files, device control blocks, the drive code table, the disk input/output (I/O) table, directory records, the granule allocation table, the hash index table, and file control blocks.

"The sample programs demonstrate how you can use the SVCs in your own programs."

The manual then presents programming guidelines covering the restart (RST) vectors; checking the break, pause, and enter keys' status; and interfacing the task processor. Bank selection for 128K machines, and device drivers and filters are other topics of interest.

The rest of the software section explains supervisor calls (SVCs), presents sample programs, and documents a few advanced TRSDOS commands. The SVCs are TRSDOS routines that you can easily implement in Assembly-language programs. The routines cover keyboard input, printer and video I/O, disk I/O, and a host of other useful functions.

The sample programs demonstrate how you can use the SVCs in your own programs. They are quite good and contain sufficient comments to make them clear.

The manual also features an excellent table of contents and a complete index. This manual is definitely worth $24.95. Its information is essential for the Model 4 hardware enthusiast or Assembly-language programmer. ■

★★★★★

DWP-210 Printer
Tandy/Radio Shack
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by Charles Gulick

Radio Shack's DWP-210 is a superb and, at $799, competitively priced printer. It has all the quality for which the Daisy Wheel is famous, and the same interchangeable print wheels, but with 100 characters (see Fig. 1) instead of the 124 characters on the DWP-410 and Daisy Wheel II printers.

The DWP-210's 13-inch platen is 2 inches shorter than on its larger counterparts. Its speed is a respectable 200 words per minute. You have the choice of high-quality, multistrike carbon or nylon fabric ribbon cartridges, and you get original and two-carbon capability.

The unit itself has substantial, impressive construction. Its handsome, user-considerate design includes Tandy's new fawn gray case color.

Unless you work with foreign languages, you probably won't miss the 24 characters left off the 210's wheels. And you'll be pleased at some of the characters included, such as the copyright, trademark, and registered symbols.

So what's new? For one thing, the price is dramatically low for a printer of this quality. Judging by its weight (38 pounds, heavier than either the DWP-410 or DW II), this printer is built for serious, long-run performance.

Great news for Color Computer users is that the DWP-210 gives you a choice of serial or parallel interfaces, DIP (dual in-line package) switch select-

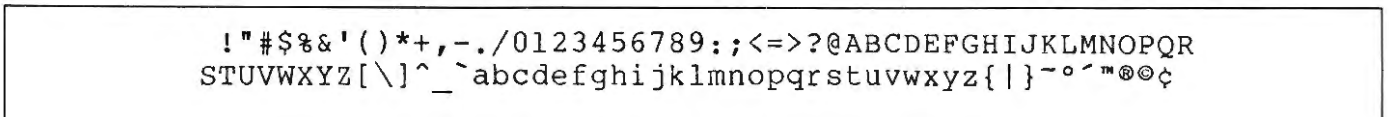

Figure 1. DWP-210 type font with Courier 10 print wheel.

able. Now the CoCo has a letter-quality printer.

This is the first Radio Shack Daisy Wheel printer to offer both interfaces, though several of the current dot-matrix printers do. The double feature is certainly a boon to desk logistics for anyone with more than one computer.

Besides the CoCo, the 210 interfaces with Tandy Models I, II, III, 4, 12, 16, and the new 100 portable. It offers a switch-selectable baud rate of 600 or 1,200 bits per second.

You can access all function switches, including the DIP set, from the printer's front/top. The DIP switch is neatly concealed under a sliding cover.

An operating panel at front left groups together the on line/off line and pitch select switches, and the power on and alert lights. The printer has a ribbon end photoelectric sensor plus paper-empty and cover-open detect switches.

The ribbon cartridge loads simply and takes just seconds. (By the way, the cartridge provided with my unit was in a Diablo package, which might tell you something.)

Changing the character wheels couldn't be easier—pull back a lever, slip out the resident wheel, and drop in a new one. You do have to remove the ribbon cartridge first.

A Courier 10 wheel comes with the printer, and a variety of other fonts will be available. The operating manual mentions special wheels, but doesn't describe what they will accomplish. At any rate, a DIP high/low impact switch suggests that something cute is coming.

"The ribbon cartridge loads simply and takes just seconds."

Print density and type uniformity are excellent, and by Daisy Wheel standards the machine is quiet—around 65 decibels. A "silence cover" is integrated into the streamlined design.

The DWP has automatic impact control, said to prolong print wheel life, and a bidirectional logic seeking feature that you should enable (DIP switch 6) for maximum printing speed.

One minor flaw: The rear edge of the cover, against which you tear off the printed copy, is not well supported so it takes a little care to assure an even edge. The best way I've found is to position the fingers of one hand lightly on the Plexiglas as you tear, without applying any downward pressure.

You can remedy the only other fault I find with the optional bidirectional tractor feed (26-1443). I'm using fanfold bond paper, and it tends to shift to the right when printing multiple pages. This is a minor inconvenience that I can overcome with a little manual attention.

All in all, the DWP-210 is a very well built and cost efficient Daisy Wheel printer, with all the most desirable features you could expect at its price. It should be able to hold its own against the competition and serve the serious user handsomely for a long time. ■

★★★★★

Soul of CP/M
Mitchell Waite and Robert Lafore
Howard W. Sams & Co. Inc.
4300 West 62nd St.
Indianapolis, IN 46268
Softcover, 391 pp.
$18.95

by Alan Neibauer

Soul of CP/M can have anybody writing and understanding Assembly-language programs within one hour. For those of you who find low-level languages frustrating and difficult to understand, this new CP/M manual is remarkable.

Soul of CP/M doesn't explain CP/M functions like DIR, STAT, and PIP; it's intended for persons already familiar with the popular operating system.

To get the most from the book, you'll need a CP/M disk with DDT, Load, and ASM. Model I users with recompiled versions of CP/M will have little trouble applying the logic and sample programs to their system.

But because Assembly language is taught using built-in CP/M system calls, it's difficult to transfer the techniques presented here to some non-CP/M systems.

Organization

Waite and Lafore make learning Assembly language easy because they use CP/M BDOS (Basic disk operating system) system calls that automatically handle most input and output routines. The calls provide a sort of library of subroutines that saves the novice from manually writing these functions into a program. You only have to learn basic calling sequences for each routine to perform complex input/output (I/O) tasks.

By linking the calls with the DDT debugging program, you almost have an immediate mode like Basic's with which you can experiment. You can write a short Assembly-language program, save it, and run it without the long compilation process. If you make mistakes, you can reload DDT and the program and check for errors.

The opening chapters introduce CP/M and explain the use of several basic system calls as well as a few Assembly-language instructions. By the end of the second chapter, however, you understand the mvi, call, rst, jmp, ora, jz, jnz, pop, push, inr, cpi, and ret instructions. The book covers the Console Output, Get Console Status, and Console Input calls.

To make this progress, the authors explain the use of DDT, CP/M's debugging monitor. They guide you through calling up DDT and placing it in the assemble mode. As you type instructions, the monitor automatically assembles them.

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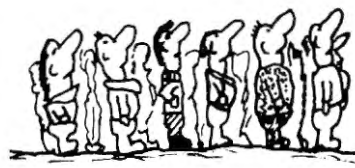

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```
0100   mvi   c,02   (prepare for system call)
0102   mvi   e,38   (place ASCII for 8 in E)
0104   call  5      (call console output to print character in register E)
0107   mvi   c,02   (prepare for system call)
0109   mvi   e,30   (place ASCII for zero in E)
010B   call  5      (call console output to print character in register E)
010E   jmp   100    (loop back to 100)
```

Program Listing 1. Assembled program to fill the screen with 80.

For example, to output a character to the screen, place the value 2 in the C register and the ASCII value of the character in E. The call is made to address 5, the console output system call location.

Writing an Assembly-language program to constantly fill the screen with 80 requires calling the routine twice. First, invoke DDT from the system prompt: A> DDT.

The program is written and assembled starting at location 0100, so enter the command a100. Now as you enter Assembly-language instructions, DDT assembles them. The final program appears as Program Listing 1.

Once you write the program, enter a blank line for the next instruction to exit the Assembly mode. The command g0 returns to the system prompt. Save the short program, still in memory, to disk with:

```
A> save 1 show80.com
```

You can load and execute the sample program, now saved on disk under the file "show80.com", directly from the system with A>show80.

By using the system call, you don't have to write the actual output (display) routine itself. In fact, you can write simple programs for input just as easily using the Get Console Status routine.

Use of these BDOS functions frees you from much of the mechanics of Assembly language and lets you concentrate on the logic and syntax.

For Model I users with recompiled CP/M, all the locations and calls explained in *Soul of CP/M* would jump to the wrong locations. However, since the Model I system was "moved" up 4200 hexadecimal (hex), adding 4200 to every location and call solves the problem. The short program in Listing 1 works on the Model I in the form shown in Program Listing 2.

As you learn the system calls, add 4200 hex to the entry points. The

```
a4300
4300   mvi   c,02
4302   mvi   e,38
4304   call  4205
4307   mvi   c,02
4309   mvi   e,30
430B   call  4205
430E   jmp   4300
```

Program Listing 2. Listing 1 for the Model I.

sample programs in the text work just as if they were calling the traditional CP/M locations.

Chapter 3 looks into more advanced nondisk system calls and has you write programs inputting data and outputting to both the screen and printer.

Chapter 4 introduces the ASM (assembler). By this time, you're quite comfortable with Assembly language and BDOS routines, so the move to assembling is painless. Assembly syntax and the ORG directive bridge the gap between using DDT and fully assembling programs.

Chapters 5 and 6 detail system calls for opening and writing to disk files, both sequential and random. Because of the powers of DDT, learning how CP/M handles disk routines is relatively easy.

Chapter 7 discusses the file and directory structure, explaining how to retrieve erased files and use wildcards. Stack management and the system bit map are discussed and illustrated in programs.

For those having withdrawal pains from Basic, the eighth chapter deals with merging Basic and Assembly-language programs. The authors cover the subjects of locating Assembly-language programs, passing parameters between Basic and Assembly language, and automatically POKEing hex files for use by Basic programs.

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chapter deals with modifying the CP/M Basic Input/Output System (BIOS) itself for special printer configurations or other tasks. Performing major surgery deep in the heart (or soul) of CP/M is remarkably easy.

The book ends with several useful appendices detailing hexadecimal notation, 8080 instructions, CP/M system calls, and a summary of DDT commands.

Soul of CP/M does have some limitations. It isn't a general Assembly language text. Because of its focus on CP/M system calls, you can't automatically run sample programs on a standard Radio Shack computer even if the 8080 and Z80 instructions are compatible.

Since MS-DOS (for 16-bit systems) uses similar system calls, however, the basic theory works if you make changes in the instructions themselves.

If you're using CP/M and wish to learn about its heart and soul, this book is for you. ■

★★★★½

VEDIT 1.15e
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Model II, CP/M
$150

by Charles R. Perelman

VEDIT is a full-screen text and program editor that offers you complete keyboard customization and lets you tailor other editing operations to your liking. It's easy to operate, of good quality, and flexible. VEDIT offers many word processing features and responds to your commands quickly.

Produced in various formats for CP/M, CP/M 86, and MS-DOS, VEDIT for the Model II has two ready to run versions, one for Pickles & Trout CP/M and the other for all other Model II CP/Ms.

You can develop your own customized editor with a menu-driven program covering keyboard layout, use of special characters, a wide range of formatting and operational controls, screen parameters, buffer size, and sign-on message.

The beauty of setting up your own keyboard is that you can duplicate commands you've learned for word processing or with another editor for controlling cursor movement and other functions.

You can implement alternate keys for a command. For example, on the Model II you can use the arrow keys and the control key with your favorite letters or numbers for four-way cursor movement.

As soon as you install the familiar controls, you can use the visual mode of the editor without constant reference to the manual. Learning time to use VEDIT with reasonable speed is minimal.

If you consistently need a particular format or want to implement specific cursor, tab, indent, and similar parameters through use of extended commands, place this information in a special file with INI as an extension. VEDIT calls them automatically on start-up.

In addition to a wide variety of commands for full cursor movement about the screen, to beginning or end of words or paragraphs, for next page or prior page, and to the beginning and end of the text buffer, visual mode includes most basic word processing functions. You can delete characters, the next word, a prior word, the end of a line, or an entire line.

You can also insert, automatically indent, set the right margin, word wrap, format paragraphs, and set text markers. The Undo key is a neat facility that restores a line altered by insertion or deletion (except where you deleted the entire line) prior to additional cursor movement.

You can use 10 text registers for cut and paste operations and VEDIT prints any part of a file. These impressive features give VEDIT a great deal of flexibility. You can painlessly extract from other files or programs for insertion into your current project.

You essentially get screen display on the printer, although you can embed control codes or nonprinting lines for a formatting program.

VEDIT's documentation is a pleasure. A four-page supplement for Model II owners describes the specific installation files, critical customization information, and sample customizations for keyboard and other parameters that coincide with the furnished, ready to run command files.

The balance of the 8½- by 11-inch manual is approximately 150 pages long, generalized for all versions of the software. Therefore, this includes functions not available for the Model II.

It's well organized, nicely spaced, easy to read, and written in reasonably concise, plain English. I was disappointed by the number of typographical errors that are cosmetic distractions. The table of contents is adequate and the helpful index contains references to all commands in visual and command modes.

Appendix A's details for customization are useful and informative, and follow the sequence of menus you encounter in setting up your personalized editor.

Other appendices contain a help list with explanations of all editing commands, an expanded description of error messages to help you interpret cryptic messages or recover from error conditions, and a reference to two limitations (bugs) in VEDIT.

To handle lines exceeding 258 characters, you need a customized version of VEDIT that you can obtain from Compuview. This shouldn't be a problem under normal circumstances.

The second bug occurs if you try to read a file originated with a word processor, such as WordStar, that sets bit 7 of some characters. You're likely to see a messy display of inverse video and strange characters, and you won't be able to process the file properly with VEDIT.

Conversely, formatted files produced with VEDIT end lines with hard carriage returns like the nondocument WordStar mode and might require considerable editing for satisfactory printout with a WordStar type word processor.

Manual contents are arranged in a friendly and efficient manner. An initial brief overview introduces beginning word processing and visual and command modes.

A tutorial with graphics aids gives sequential steps for use of each visual mode function key and some of the command mode functions you're most likely to use while editing. A quick reference to the appropriate page of this section tells you what you need to know to use each feature.

The next chapter offers more descriptive information for the visual mode. A

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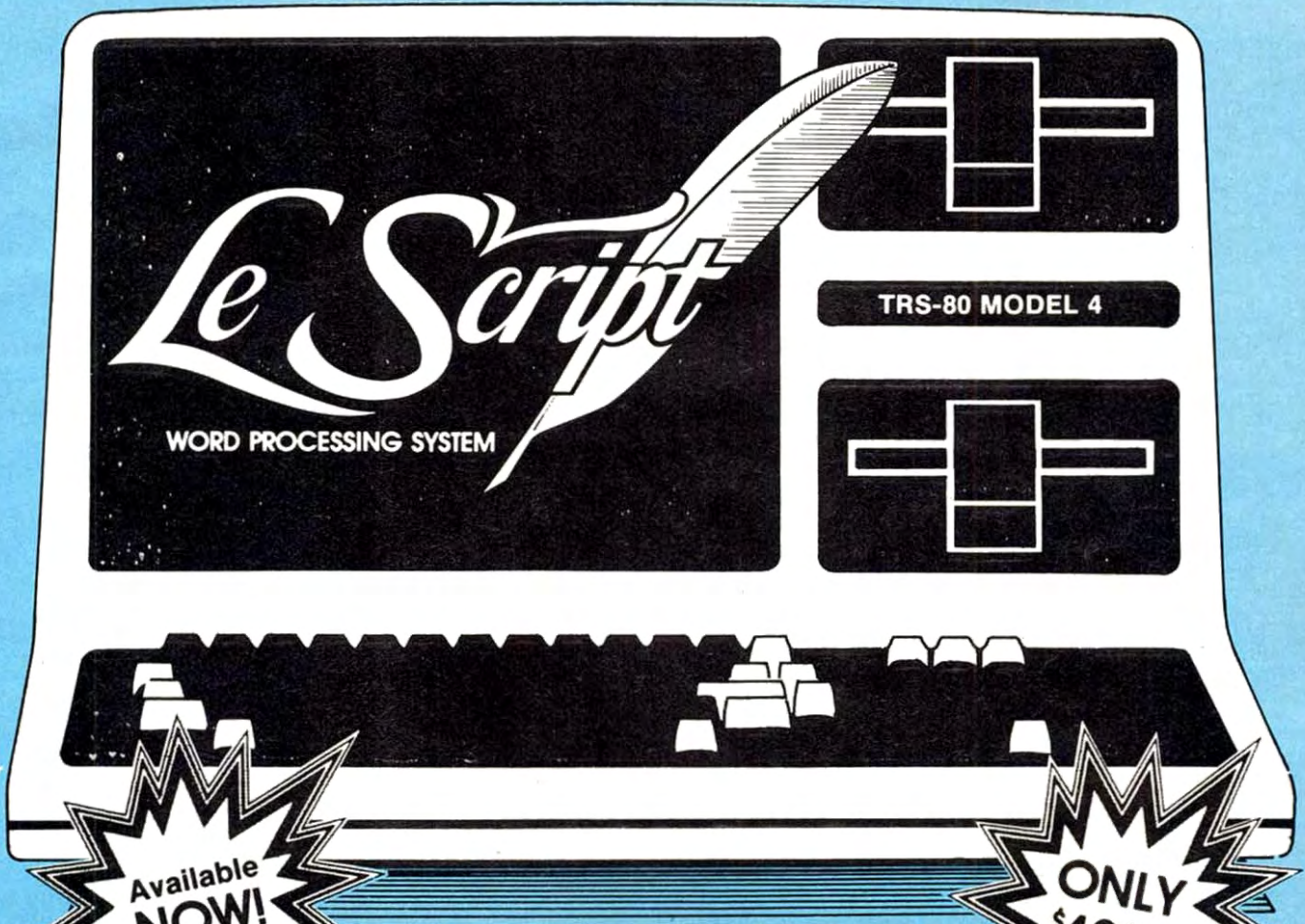

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fairly involved discussion of command mode usage precedes an expanded version of the reference list of commands in Appendix B. This section concludes with reference manual type descriptions, examples (some of which are complex), and comments for each editor command.

The manual is easy to use and quite complete in its coverage. A cardboard Help sheet with editor commands on one side and spaces for keyboard controls on the other, or a Help screen with this information, would be welcome additions.

Using VEDIT

If you've used the CP/M editor ED, you'll feel comfortable with the VEDIT command mode. Most of the same commands perform simple functions, and they generally operate identically. VEDIT goes beyond ED with numerous improvements and an entire series of extended two-letter commands that begin with E and two-letter register commands that begin with R.

Since it's easier to perform common editing functions in the visual mode with control keys, you use editing commands primarily with execution of macros, search and replace functions (a full repertoire including wildcard characters), and beginning and ending edits.

You use extended commands for program parameters that you set once and then forget at the beginning of each new session. Register commands let you accomplish all kinds of multiple file inserts and concatenations.

Perhaps the most outstanding improvement to ED is the powerful command macro function. You create complex combination commands to perform sophisticated search and replace, to set up formats for a file automatically, and to edit multiple files.

For repetitive edit functions or formats, you save a great deal of time by writing and saving a library of macros on disk that you implement for future edit sessions by calling the file name.

Manipulation of 10 text buffers gives VEDIT substantial clout. You can take data from several files and store it in the registers to append to or insert into the current program.

Put previously defined macro files into registers or store macros defined for the present edit in text registers for later use. Calling the register executes the macro. Any buffer is immediately available for readout to the screen or printer whether it contains text or a macro.

Screen action with VEDIT is noticeably more rapid than with WordStar and similar programs. VEDIT automatically buffers large files to and from disk. The automatic indent feature and insertion capabilities are useful in pulling previously written routines into a new program and maintaining a structured outline or indented program format.

"Screen action with VEDIT is noticeably more rapid than with WordStar and similar programs."

When you use the paragraph format function on the last paragraph of the current text, VEDIT has a nasty habit of scrolling all the text off the screen. You are left with a cursor descended several lines into a blank screen.

For further editing, you must use a command to recall the prior page or paragraph, neither of which returns the cursor to the end of the file or the spot from which you started formatting. A similar fate awaits when your ZEND function key flips you to the end of the file.

Unfortunately, the repeat key function that permits repetition of given procedures a specific number of times from the visual mode doesn't work with the Model II. You can use the repeat key on the Model II with keyboard commands if you have sufficient digital dexterity to reach all the necessary keys concurrently.

Disk Full error messages can make a user weep, particularly since they always occur after two hours of impossible editing and with an impending deadline. VEDIT treats these problems like a champ, letting you close part of the file on your current disk and insert another disk for saving the balance. All screen editors and word processors should have this capability.

If you save your revised file with the original file name, VEDIT designates the old file a .BAK file. Disk directories are accessible without leaving VEDIT, which facilitates working with other files on the same disk. With all these abilities, the VEDIT com file is packed into only 14K.

Compuview offers an interesting technical support option that they claim is elected by nearly 40 percent of VEDIT purchasers. For $50, you receive two new releases of VEDIT approximately six months apart as they continue to upgrade the software.

If you like to patch together programs and text from data in several other files, and want to minimize the time required to become acquainted with a new tool's commands, get VEDIT and customize the visual mode controls to the sequence you already know or the one you've always wanted to use. ■

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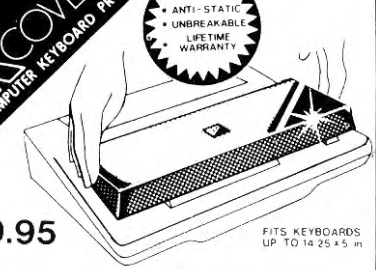

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Lynn Video Instruction Series:
Using TRSDOS 6.0
Written by Michael Sokolewicz
Produced by Ron Lynn
Lynn Computer Service
6831 West 157th St.
Tinley Park, IL 60477
$39.95 (VHS or Beta format)

by Jim Heid

Using TRSDOS 6.0 is a perfect example of how not to produce a videotape instruction course. This two-hour tutorial on the disk operating system for the TRS-80 Model 4 is poorly recorded, poorly narrated, and neglects to exploit the potential of video instruction.

The Video

The video portion of *Using TRSDOS 6.0* consists of a shot of a Model 4's screen—nothing else. The most action you'll see is a flashing cursor. No shots show the beginner how to turn on the computer, how to insert a disk, or how to boot the system.

> *"Using TRSDOS 6.0 is a perfect example of how not to produce a videotape instruction course."*

The video doesn't use superimposed titles explaining a command's syntax. Even when *Using TRSDOS 6.0* explains a command that uses a printer, the camera remains trained on the video screen.

Worse yet, the camera doesn't show the whole screen at once. When a display fills the screen, the camera pans slowly from left to right.

The Audio

The audio portion of *Using TRSDOS 6.0* is worse. The sound quality is poor, with lots of popping P's and an overall tinny sound.

The narrator speaks in a monotone throughout. She goes from one command to the next without the slightest pause or change in inflection.

Her delivery is inconsistent, too. Sometimes she pauses for several seconds for no reason; other times she races along.

The audio and video aren't perfectly synchronized, either. Sometimes the narrator starts on a new command while the screen still displays the results of the previous one.

The information presented in *Using TRSDOS 6.0* is accurate, but it isn't geared toward the type of person who would need a video instruction course—the beginner.

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length, and parameter are tossed around without a single definition. Much of the script is awkwardly written and filled with run-on sentences delivered at breakneck speed.

Summary

Video is a powerful instructional medium, but the producers of *Using TRSDOS 6.0* miss the boat. They try to stuff too much information into the tape. It takes lots of experimentation and reading to fully exploit the power of TRSDOS 6.0. It cannot be taught (or learned) in two hours.

Using TRSDOS 6.0 doesn't tell you anything that isn't covered in the manual. If you want to learn to use TRSDOS 6.0, get a couple of blank disks, sit down at the computer, open the manual, and try each library command, experimenting as you go. You'll learn TRSDOS and you won't spend $39.95. ■

★★★★½

Datagraph
Models I, II, III, 12, and 16, LNW-80
48K, two disk drives suggested
Printer
$79.95

★★★

Pie Chart Option
$34.95

Micro Software Systems
Microplot Inc.
1815 Smokewood Ave.
Fullerton, CA 92631

by Thomas L. Quindry

Datagraph is a Model I/II/III graphing program that lets you generate high-resolution dot-matrix graphs and plots with specified printers (listed in Micro Software Systems' advertisements). You can also produce pie plots with the pie chart option.

Overall, Datagraph is a worthwhile program. It's versatile and easy to use, and it generates professional quality graphs.

The program does have some drawbacks, however. At times, it generates unnecessary line feed commands, an annoying inconvenience. Also, it always prints the name of the file from which the program draws data on the graph, a feature that should be optional.

System Configuration

For this review, I used the Epson MX-80, MX-100 version of Datagraph with my MX-80-compatible printer. Check with Micro Software Systems to choose the right version if your printer is not listed. More than 14 versions are available for different computer configurations.

Datagraph uses data that you've saved in a VisiCalc Data Interchange Format (DIF) file. If you don't have VisiCalc and are a fairly good programmer, you can create a Basic program that saves data in DIF format to use with this plotting program.

The Basics

Datagraph is a hybrid Basic and machine-language program. It lets you plot up to 1,000 data points on a graph. You can combine linear plots, stairstep plots, bar graphs, and relative bar graphs on the same graph (see Figs. 1 and 2).

Datagraph's linear plots can incorporate a curve-fitting enhancement that provides more plotting points than the straight-line connection between points you get with conventional linear plots. You can specify the number of points the program interpolates between data points. You also have the option of adding customized labels for the horizontal and vertical axes (see Fig. 2).

"Datagraph lets you plot up to 1,000 data points on a graph."

You can plot graphs in any size from 1 inch by 1 inch to 7 inches by 24 inches. The smaller sizes are limited only by the number of horizontal and vertical divisions you specify.

A key describing the data set and line type or symbol appears at the top of the graph if you name your data set. This lets you draw unnamed reference lines on the graph that don't show on the data key.

You can suppress the grid within the graph if you prefer. This is most useful with bar graphs. Grid lines are solid lines, not dotted.

The program has an auto-scaling function that sets the minimum and maximum values and increments of the X and Y axes. It uses a data statement within the Basic program to provide rounded scale increments that are easy to determine and are divisible numerical values. This gives you easy-to-read graphs.

You can change the values in this data statement to suit special situations. In addition to auto-scaling, you can specify the minimum and maximum values of X and Y for a graph. This overrides the auto-scaling feature for setting these values if the graph meets certain conditions. The manual describes the reasoning behind this and the procedure in great detail.

Using Datagraph

First, the data you use must be in a DIF format to generate the information you want plotted. I'll assume you're using VisiCalc for this procedure. This is strictly a tabular operation where the program lists information on the electronic spreadsheet in column or row orientation.

The only restriction is that the X and Y coordinates of each curve you want plotted have a one-to-one correspondence (i.e., they must be aligned and parallel to each other on the worksheet). If the X and Y data are distributed along rows, the corresponding values must be in the same column. If column distribution is used, they must be in the same row.

For plotting purposes, the program considers Y the dependent variable and X the independent variable. Plots that contain several curves can use either the same set of X values for plotting or a different set of X values. Thus, one curve can have more plotting points than another. Standard increments between points are unnecessary.

You should also place any specialized horizontal or vertical scale labels on the worksheet at this time. You can use only one set of vertical scale labels, but you can use as many horizontal scale labels as you wish. You can place any other extraneous information you want on

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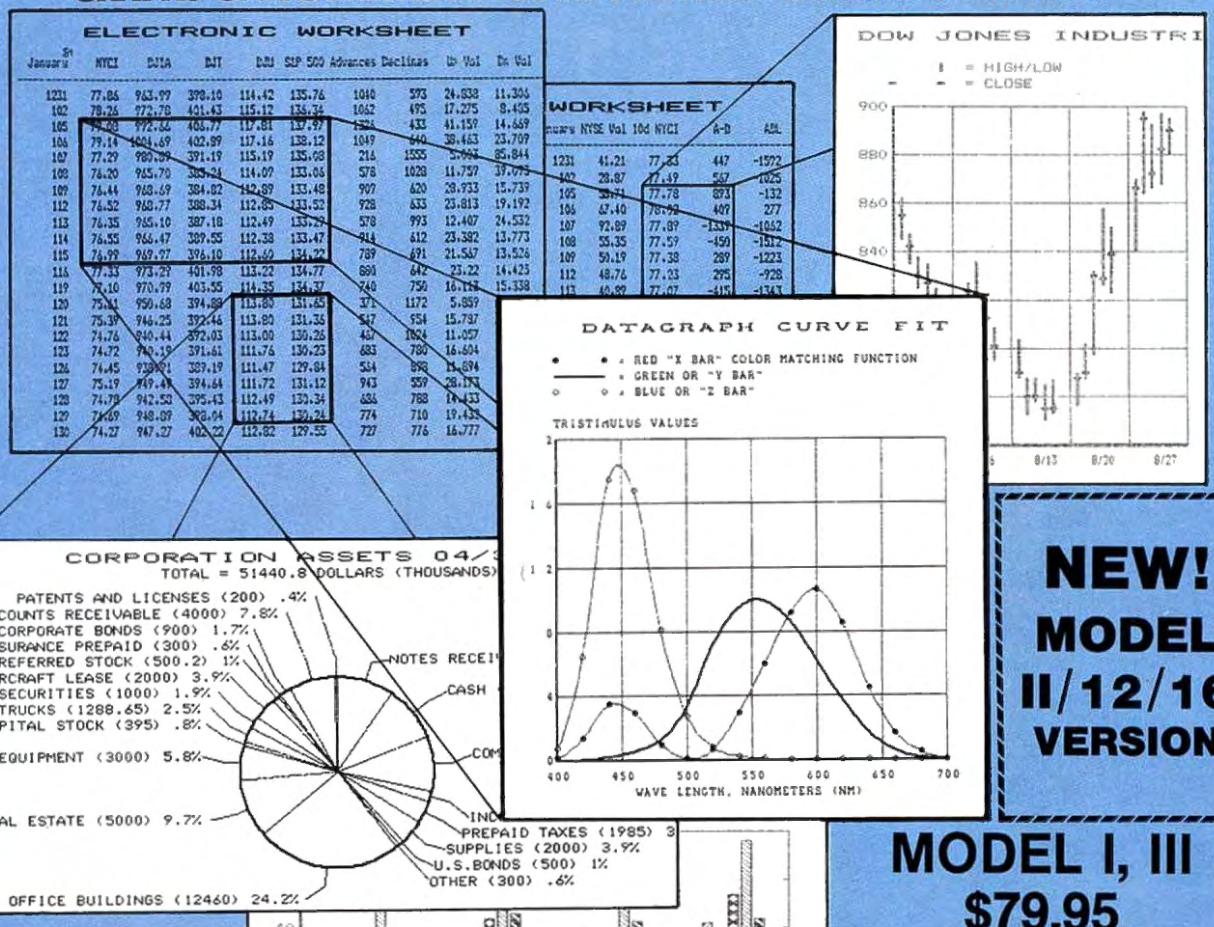

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DOS
- TRSDOS 1.3, 2.3, 2.0, 4.2
- NEWDOS, NEWDOS/80
- DOSPLUS 3.4/5, LDOS 5.1

DISK DRIVES
- SINGLE DRIVE
- DUAL DRIVE (PREFERRED)

GRAPHICS PRINTER:
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- MX-100, FX 80/100
- LP VIII, DMP 200-2100, 120
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TRADEMARKS: DATAGRAPH (MICRO SOFTWARE SYSTEMS); VISICALC (VISICORP); TRS-80 (TANDY CORP); DIF (SOFTWARE ARTS INC.); PRISM (INTEGRAL DATA SYSTEMS)

the spreadsheet. Not all the information on the spreadsheet must appear on the resulting graph.

After you include all plotting information on the spreadsheet, you must save it in the DIF format. The VisiCalc manual explains this procedure.

Next the VisiCalc spreadsheet generates a table that provides specifications for Datagraph on how and what to plot. Datagraph produces a file called Form/DIF that provides a ready-made table. All you do is fill in the blanks on this table and save it in DIF format.

This form includes places to enter the graph title, data file you want used, date, vertical and horizontal labels, size of graph, divisions, minimum and maximum scale dimensions (optional), data descriptions, location of data descriptions on the data file (rows and columns), and line type desired.

A feature for the horizontal division specification is selection of a calendar scale. If specified, the months appear in place of the numbers 1–12 on the bottom scale. For numbers greater than 12, the remainder after subtraction of multiples of 12 determines the month.

The most powerful control on the forms page is the line type specification. You choose one of 12 different line types from a symbol table.

Each line type specifies a symbol used for data points, the maximum number of interpolation points, and the symbol used for interpolated points. This is a straight-line interpolation unless you specify the curve-fitting option.

You can generate your own line types and symbols and save them in this file. However, doing so destroys the file supplied with the Datagraph program. You can manually restore the original line types by copying the symbol and other information from the Datagraph manual.

It would have been much easier to create separate symbol files. One more entry on Form/DIF could indicate which file to use.

Use the line type specification on the Form/DIF sheet to specify the type of graph you're plotting. Just giving a number gives you a linear plot. The letter C followed by a number before the line type specification invokes the curve-fitting routine for the number of interpolation points you specify.

The letter S gives you a stairstep graph. The letters B and R produce bar graphs and relative bar graphs, respectively.

A relative bar graph plots the bar between two points using two sets of data for the Y scale. For both types of bar graphs, you must also specify the relative offset in the horizontal direction. This lets you determine the order in which multiple bar graphs appear on the graph.

The letters V or H specify vertical or horizontal labels to replace the numerical label that normally appears. You can center horizontal labels on a grid line or between grid lines.

You can also print the horizontal label in regular or condensed mode. If you specify regular mode when you have insufficient space, the program uses the condensed mode. If you don't have enough room for the condensed mode label, an error message appears before plotting commences.

Pie Charts

The letter P generates pie charts. The

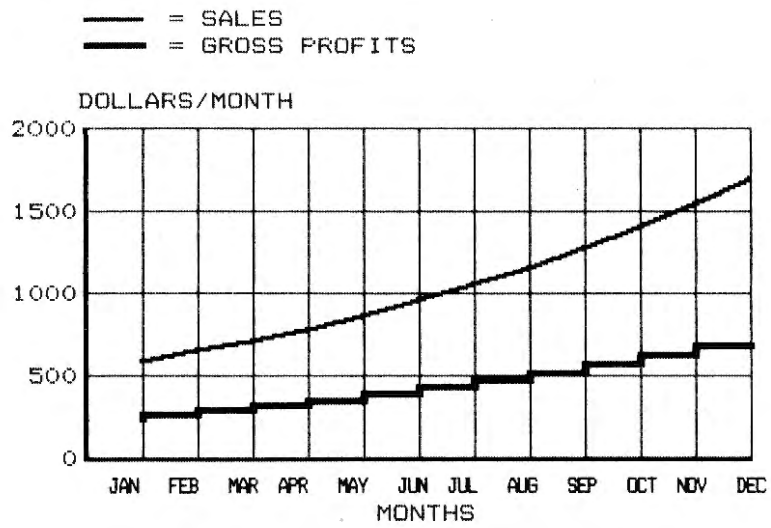

Figure 1. Linear and stairstep plots with calendar label option.

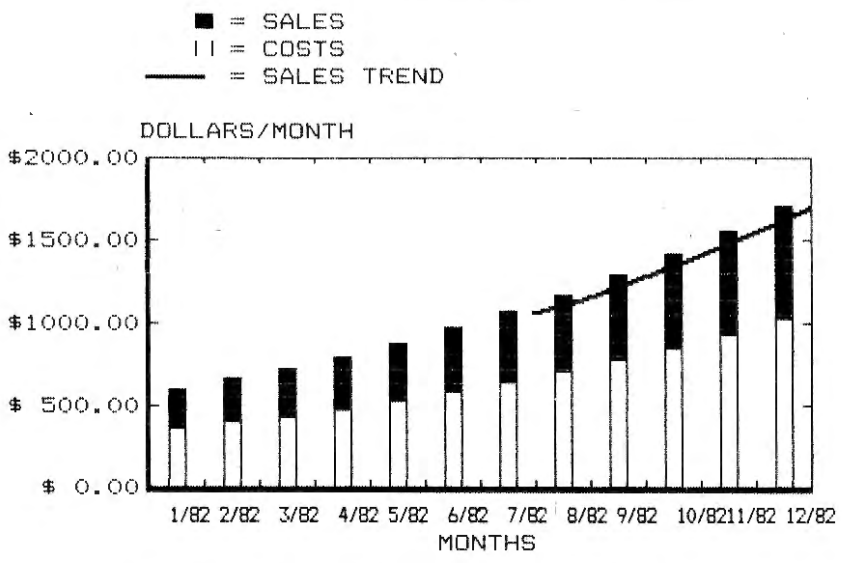

Figure 2. Bar graphs and relative bar graphs combine with a linear plot.

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Pie Chart Option costs an additional $34.95. You can specify different line types for the pie diameter and dividing spokes. Pie charts can be anywhere from 1 inch to 3 inches in diameter.

The same Form/DIF format specifies the information for pie charts. You don't need all the information requested and you should change some of the labels on the Form/DIF spreadsheet form. I made up a Pieform/DIF spreadsheet by making label changes to Form/DIF.

You need two entries for each pie chart data point: a label entry and a data entry. The main fault I found with pie chart generation is that you have limited space for pie chart labels. If a label is too long, the program truncates it. As few as five characters or as many as 22 characters are available for your label depending on the segment's location on the pie and the pie's size.

All segments of the pie are white. No cross hatching or coloring of segments is possible. I am still impressed with the program, though; the Pie Chart Option is useful.

Problems and Praise

Two annoying conditions exist in Datagraph. First, you must turn on the printer when using the program, so printer initialization results in a line feed. When you go to VisiCalc, another printer initialization to different conditions sends another line feed command. Your page gradually creeps up.

The second problem is the label giving the graph file and date that appears in the upper right corner of the printout. The program contains a method for suppressing the date but not the graph file. This is relatively easy to change since the label is printed from the Basic program.

The Datagraph manual is difficult to read because of the many enhancements made to the original program. Rather than upgrade its manual, Micro Software Systems has taken the more expedient route of adding sections describing the enhancements.

Thus, some information you read early in the manual is corrected later. It would be more prudent for Micro Software Systems to rewrite their manual than to confuse the user.

Other than the contradictions, the manual does explain what is happening and what to expect. The only confusion I experienced was in using horizontal labels.

When centering labels between grid marks, you must specify an extra label entry. Also, when using numeric labels, you must be sure that VisiCalc specifies a label rather than a value. The manual does not explain these two points.

One serious limitation I see for business graphics is Datagraph's inability to plot logarithms. You can fool the program into producing log plots, but it's no easy task.

Micro Software Systems has done a fine job in programming Datagraph. It is surprisingly quick in generating graphs, and it contains a good selection of error messages. A repeat feature lets you plot as many copies of a graph as you wish. Color plotting is also quite impressive.

The pattern that Micro Software Systems seems to be following is continual upgrade of Datagraph with a corresponding increase in price. The best enhancement they could make is to free the user from having to purchase VisiCalc. ■

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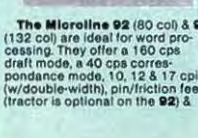

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REVIEW DIGEST

Home Accountant, Continental Software, 11223 Hindry Ave., Los Angeles, CA 90045, Models I and III, $49.95.

"For a reasonable price, this system keeps track of all monthly income and outgo, reconciles bank statements, prints out personal balance sheets and net-worth statements, allows custom search-and-retrieval of any particular transaction, creates professional-looking graphs of your own financial picture and, on some computers, can provide forecasting. It is an accessible, easy-to-learn system that, even on first use, will give anyone a real sense that they are gaining additional knowledge and control of their financial situation." *Personal Software*, November, p. 123.

Electric Webster, Cornucopia Software, P.O. Box 5028, Walnut Creek, CA 94596, Models I and III, $149.95.

"...After looking at nine proofreading programs, I have settled on Webster to keep my final copies accurate...

"...if English 101 is where you caught up on your sleep, then you will appreciate the grammar option.

"Writers...will find the automatic hyphenation a big help; and if your spelling is less than perfect or if you have ever missed a typo, then you will love this fast and accurate dictionary program." *Creative Computing*, November, p. 108.

TRS-80 Model 4, Tandy/Radio Shack, One Tandy Center, Fort Worth, TX 76102, $1,999.

"The design of Radio Shack's new TRS-80 Model 4 computer is proof that large corporations can be responsive to the needs of their customers. An enhanced version of the popular TRS-80 Model III, its new features read like a Model III owner's wish list.

"...Given all the new features in the TRS-80 Model 4 and a price that's lower than its predecessor, the popular Model III, it's safe to say that Radio Shack has a guaranteed winner." *Byte*, October, p. 292.

Disk Trendex Stock Market Trend Analysis, Tandy/Radio Shack, One Tandy Center, Fort Worth, TX 76102, Models I and III, $49.95.

"...This...program provides solidly based statistical analysis of the stock market and of your own portfolio without all the confusion traditionally found in technical analysis software.

"...these programs...are based upon solid statistical methods used every day by stock market professionals to identify market trends." *Personal Computing*, November, p. 196.

6.0 Plus, Micro-Systems Software Inc., 4301-18 Oak Circle, Boca Raton, FL 33431, Model 4, $49.95.

"6.0 PLUS takes TRSDOS 6.0 to new heights of utility and versatility. It may very well become the de facto standard utility package for TRSDOS 6.0, at least until the competition catches up." *Basic Computing*, October, p. 79.

Lynn Video Instruction Series: DB-1 Using Profile III+, Lynn Computer Service, 6831 West 157th St., Tinley Park, IL 60477, VHS or Beta Format, $39.95.

"I found the material to be carefully developed and quite appropriate. They carefully covered all options of the software and even gave some tips that are not in the Profile III+ manual. Much is covered, and more than one viewing is recommended. It does get boring, but a fast-forward button on the VCR will quickly get you to the material that needs a second look." *Basic Computing*, October, p. 83.

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This machine language program contains fast **animation, sound effects, tunes,** and **speech.** The speech has two options: it can be generated by computer or by a VS100 speech synthesizer (speech options described later). The program is easily controlled by a friendly menu-man who points to the options that may be chosen. The main menu contains four sections: • **Learn the Alphabet** • **Learn to Count** • **Learn Shapes** • **Learn Words** Each section contains three subsections which can easily be manipulated, giving twelve games in all. The menu selection is accompanied by a different nursery rhyme tune for each menu.

LETTERS

This option allows the child to select letters at random, match the current letter displayed, or type in the next letter. When a correct response is given, an animation associated with the letter moves across the screen. e.g., Z for Zebra. The computer says the letters also.

NUMBERS

This option allows the child to select the numbers zero to nine at random, match the current number displayed, or type in the next number. Men walk out on the screen equal to the number chosen. This section also contains speech.

SHAPES

This section allows the child to control the menu-man, moving shapes from the left hand of the screen to the right hand of the screen. The first level allows the child to pick up shapes using the spacebar. The second level, in addition, allows the child to control the menu-man with the arrow keys. The third level puts a small 'Bee' on the screen which the child must avoid while manipulating the menu-man and shapes.

WORDS

This final section allows the child to type in letters to form words. The first level asks for a word to be typed in, then to be repeated before another word can be tried. The second level prompts the child with a word which must be matched before an animation will appear on the screen. The last level shows the animation on the screen. Then the child must type in the correct word before the next animation is shown. This section contains speech also.

SPEECH

The program can be bought as a stand-alone program with computer-generated speech, which uses 'your' speaker amplifier. However, we have also made the program compatible with an 'Alpha Products VS100' speech synthesizer for improved speech quality. (This can be purchased from 'Alpha Products' subject to availability). The speech is not available for a 16K machine.

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See List of Advertisers on Page 227

Tandy Makes Its Move

by Eric Maloney

The 16-bit Model 2000, with MS-DOS and hi-res color graphics, is Fort Worth's bid to move into the mainstream and take on the Boys in Blue.

For a year now, the TRS-80 world has nervously watched a convoy of computers swing into the fast lane and pass by in a cloud of dust. When, the faithful asked, would Tandy bring out a machine that could compete with the heavy metal taking over the road?

Well, wait no more—the Model 2000 is here. It is unlike anything Tandy has ever produced. And if it lives up to its advance notices, the 2000 will erase all doubts that Tandy is ready to meet the challenge of its super-charged competitors.

The phrase some Tandy executives are using to describe the machine is "ultra-high performance." The specifications speak for themselves (see Table 1).

The 2000 uses the 16-bit 80186 microprocessor from Intel Corp. and operates under MS-DOS from Microsoft. It comes with 128K RAM, expandable to a whopping 768K. Two disk drives are standard, with 720K storage per drive (that's about 1.4 Mbytes on two floppies). And it runs at a breakneck speed of 8 MHz.

But wait—there's more. The Model 2000 is capable of 640- by 400-pixel high-resolution color graphics. In hi-res mode, you can display up to eight colors, choosing from a palette of 15. You can also create monochrome graphics. With either the color or mono screen, you have an 80- or 40-character by 25-line display.

Then there's the software. Tandy will offer some of the most popular MS-DOS-compatible software available, including Microsoft's Word word processor, Software Systems' MultiMate word processor, dBase II from Ashton-Tate, Microsoft's Multiplan spreadsheet, and the complete PFS business package. In addition, the company will sell a line of MAI/Basic Four accounting software packages, until now available only on the Basic Four minicomputers.

The price? The base unit without the monitor goes for $2,750 ($4,250 with the optional 10 Mbyte hard drive), and $4,197 with the color monitor and graphics capability. Expanding internal memory to the full 768K costs an additional $1,895. So a complete system, minus the TV/joystick option and the monochrome monitor, will go for around $6,500 (see Table 2 for the price list).

Editor's note: This article is not a review, since a review unit was not available at press time. It is based on a demonstration of the Model 2000 and material provided by Tandy.

All photos courtesy of Tandy.

What's So Different About the 2000?

Nearly every step of the way, the Model 2000 offers something new:

The 80186. The 2000 is one of the first micros to use the 80186 microprocessor. It is, unlike the IBM PC's 8088, a true 16-bit microprocessor, with a 16-bit bus. At 8 MHz, it is significantly faster than the IBM (4.7 MHz) or Tandy's other 16-bit machine, the Model 16 (6 MHz). Tandy says that its benchmark tests show the 2000 to be almost three times faster than the IBM. And they say 80186 object code is compatible with the 8086/8088.

User-accessible expansion. Another first for Tandy is the manner in which the 2000 permits expansion: you do it yourself. The main unit comes with four expansion slots in the back. You slide your expansion board into one of the slots like a tray (see Photo 1 and Fig. 1a). Two lock buttons attached to the board hold it in place.

The slots can be used for the following boards:

- Two 128K external memory boards, each expandable to 256K. (The first 128K expansion kit is installed internally.)
- A hi-res monochrome graphics board.
- A TV/joystick board.
- A DigiMouse/clock board (DigiMouse required).

The hi-res color graphics kit includes chips that you or a Computer Center dealer plug in to the hi-res monochrome board.

Mass storage. The drives are double-sided, double-density thin-lines, formatted 96 tracks per inch. The 720K storage per disk is four and one-half times greater than the Model 4's.

Three graphics options. The 2000 supports medium-resolution color graphics, hi-res color graphics, and hi-res monochrome graphics.

The medium-res option requires that you have a color television and the TV/joystick expansion board, and gives you 320- by 200-pixel graphics. You can use four of 15 colors at one time.

The hi-res color option requires the CM-1 color monitor, the monochrome graphics option board, and the color graphics option kit. Resolution is 640 by 400 pixels, and you can use up to eight colors (see Photos 2 and 3).

Available colors are black, blue, green, cyan, red, magenta, brown, gray, light blue, light green, light cyan, light red, light magenta, yellow, and white.

The hi-res monochrome option requires the monochrome graphics option board and either the VM-1 monochrome monitor or the CM-1 color monitor. Resolution is 640 by 400 pixels (see Photo 4). You have two shades of white (normal and high-intensity), and you can create reverse-image, invisible, highlighted, and underscored characters.

The keyboard. The keyboard layout is shown in Photo 5. The 12 function keys are programmable, and the caps and number lock keys have indicator lights. The print key prints each character as displayed, while shift/print prints the current screen. The character keyboard is tiered, while the numeric pad is flat for easier use.

The name. Perhaps one of the most telltale changes is one of the most minor: the name. If you look closely at the front of the main unit, you'll notice that the machine is called the Tandy Model 2000 Personal Computer. "Radio Shack" has been dropped from the label. This is, more than anything else, an indication of how much Tandy wants to alter its image of a company that makes computers for hobbyists instead of serious businessmen.

The Model 2000 in a Nutshell

CPU	16-bit Intel 80186
Internal memory (standard)	128K
Internal memory (maximum)	768K
Disk drives	2
Disk storage per drive	720K
Speed	8 MHz
Operating system	MS-DOS 2.0
Expansion slots	4, user-accessible
Graphics options:	
Medium-res color	320×200
	4 colors
Hi-res color	640×400
	8 colors
Hi-res mono	640×400
Video display (color)	14", 80/40×25
Video display (mono)	12", 80/40×25
External connections	RS-232
	Parallel port
	AC outlet
	Mono monitor connector
Options	Hi-res mono monitor
	Hi-res mono graphics
	Hi-res color monitor
	Hi-res color graphics
	TV/joystick interface
	DigiMouse/clock board
	DigiMouse
	10 Mbyte built-in hard disk
	Monitor pedestal
	CPU floor stand

Table 1. Model 2000 specifications and options.

What's It Look Like?

In keeping with the Models 4, 4P, and 12, the Model 2000 has a textured white case. The main unit includes the CPU, the two drives, and the expansion slots, with the power and reset switches mounted on the unit's front (see Fig. 1 for diagrams).

Tandy has designed the Model 2000 to be set up in a number of ways. Normally, the monitor rests on the main unit while the keyboard sits in front. The keyboard includes extendable legs to give it more tilt. When not in use, the keyboard slides under the main unit.

But if you buy the optional floor stand, you can mount the CPU vertically and set it up to eight feet from the keyboard and monitor. You can also buy a monitor pedestal for the VM-1 that both tilts and swivels. Tandy claims that, with the keyboard in your lap and the CPU on the floor, you reduce the 2000's footprint to about 104 square inches, which is about nine inches more than that of the Model 100 portable.

Photo 1. The Model 2000's expansion boards install easily. The board comes mounted on a tray; you slide the tray into an expansion slot at the back of the CPU case. Two lock buttons on either side of the tray hold the board in place.

Now for the Software

All discussions of the Model 2000's software must start with its operating system—MS-DOS 2.0.

Tandy's reason for choosing MS-DOS is simple: It is the DOS of choice for the IBM PC and has spawned a huge software base for MS-DOS machines. Thus, the Model 2000 user has immediate access to a variety of off-the-shelf packages.

One has only to leaf through the IBM or general-interest magazines to get an idea of the software base for MS-DOS. Current manufacturers include MicroPro (WordStar, MailMerge, SpellStar, CalcStar), Ashton-Tate (dBase II, Friday!), IMSI (Bisybase, Investment Manager, the IMSI Accounting Series), Pearlsoft (Personal Pearl), Sorcim (SuperWriter, SuperCalc), Perfect Software (Perfect Writer, Perfect Calc, Perfect Filer), and, of course, Microsoft. And it's reasonable to expect that, if the Model 2000 takes off, manufacturers of IBM software will adapt their products to the 2000.

Tandy will start users off with several proven software packages. They include:

● Three word processors. At the high end ($375) is Microsoft's new Multi-Tool Word. The mid-priced model ($249.95) is MultiMate from Softword Systems, currently being implemented on the IBM PC. At the low end is PFS's PFS:Write, one of four programs included in an integrated package. (PFS:Write and Word were still under development at press time.)

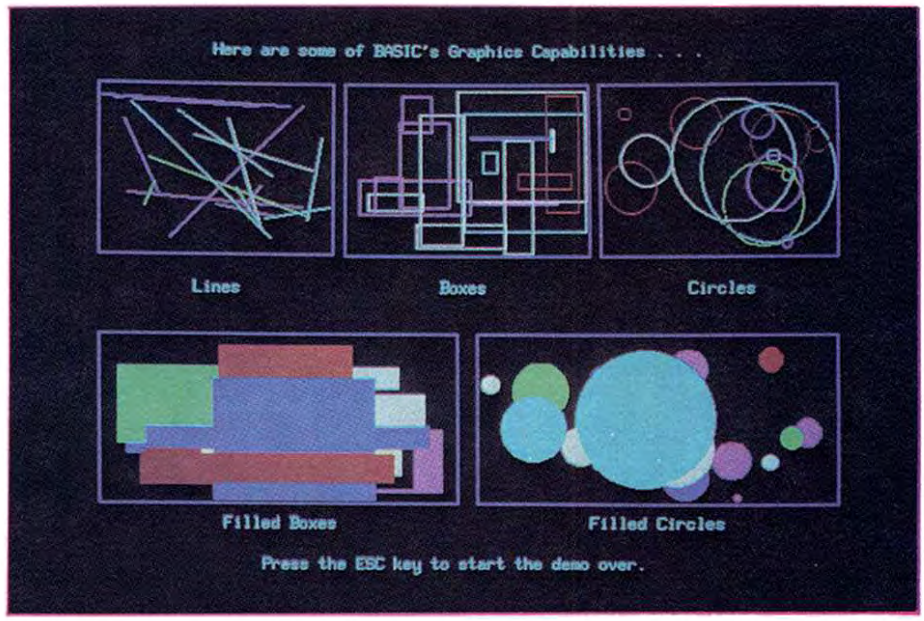


Photo 2. A screen display of the Model 2000's high-resolution color graphics. Shown are geometric patterns developed with GW-Basic.

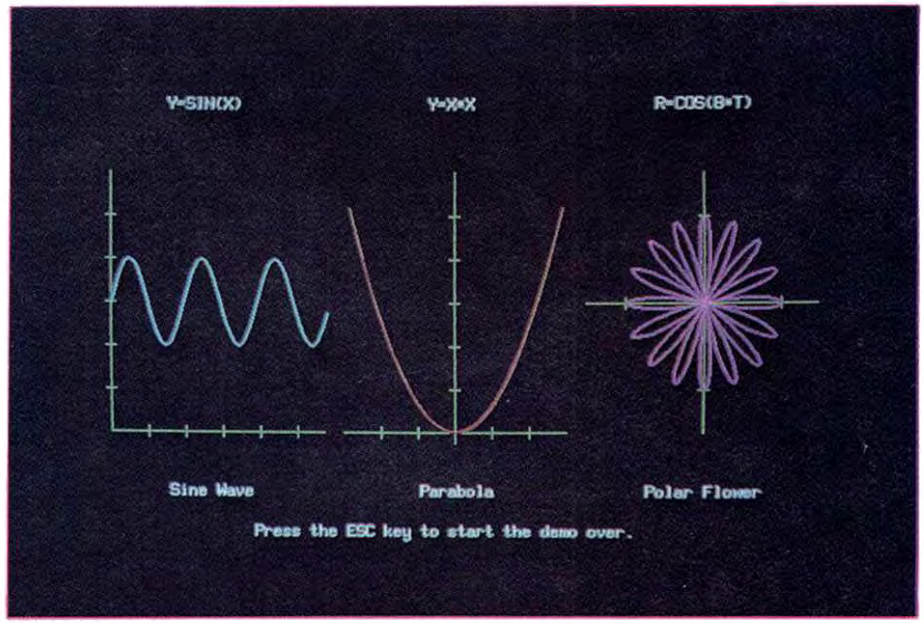
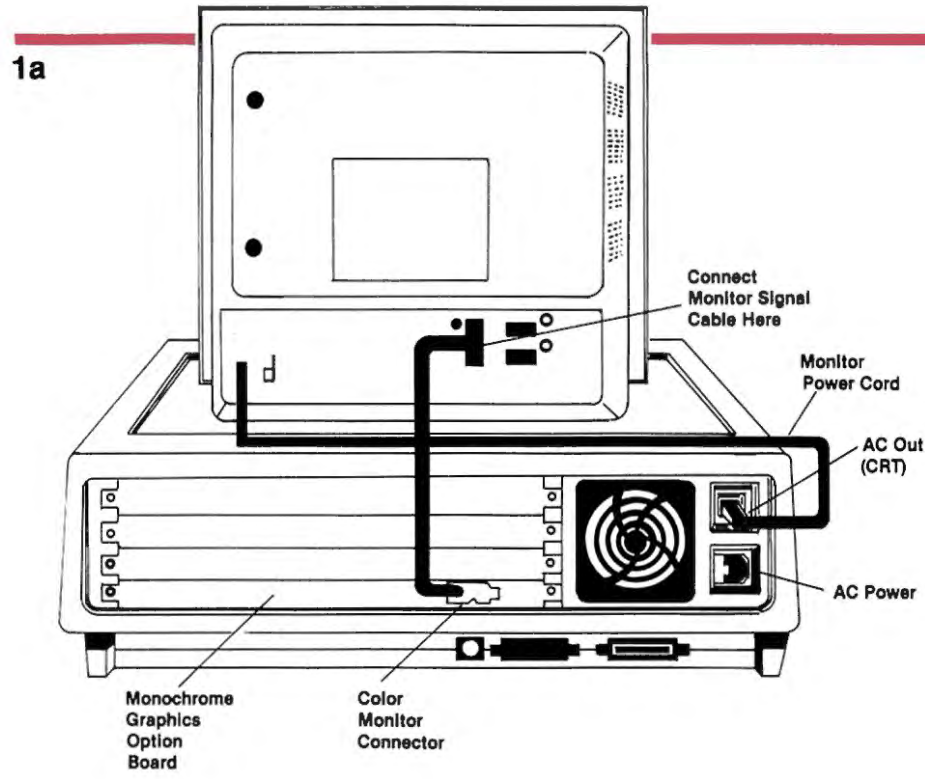
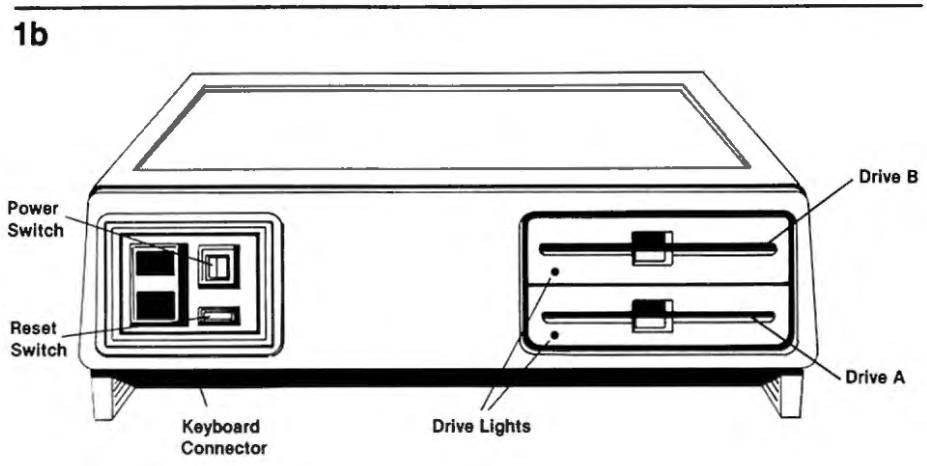


Photo 3. A screen display of mathematical functions.





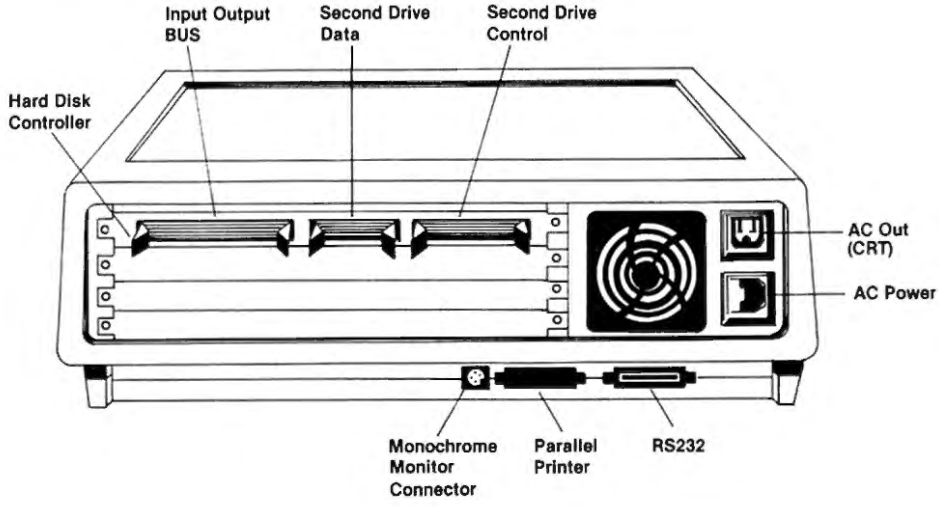


Figure 1. Model 2000 schematics. (1a): The two-drive Model 2000 as seen from the back, with the color monitor option installed on the monochrome graphics board. (1b): Front view of the CPU case. Note the two thin-line disk drives to the right; in accordance with MS-DOS protocol, the drives are labeled A and B. The keyboard connector and the power and reset switches are to the left. (1c): A second rear view of the CPU case. This unit includes the optional built-in hard disk drive with a single floppy disk drive. The input/output board includes an interface for a second, external, floppy disk drive. Note the built-in monochrome monitor interface and the parallel and RS-232C interfaces along the bottom of the case.

- Three electronic filing packages. Leading the pack at $595 is the venerable dBase II from Ashton-Tate. Also available are PFS:File ($140) and PFS: Report ($125), which work together to store data and create tabular reports.
- Microsoft's Multiplan electronic spreadsheet ($249).
- Under development is PFS:Graph ($249), which creates graphs and charts from data stored in PFS:File.
- The MAI/Basic Four small business accounting software. These packages have been converted from Basic Four minicomputers. Included are seven integrated modules: General Ledger ($495), Accounts Payable ($495), Accounts Receivable ($495), Inventory Control ($495), Order Entry ($495), Purchase Orders ($395), and Payroll ($495). The last four were still under development at press time.
- Videotex Plus ($49.95), an enhanced version of Tandy's communications package.
- In languages, Tandy will offer the MS-Pascal Compiler ($299.95), the MS-GW Basic Compiler ($299.95), MS-Fortran ($349.95), the MS-Assembler ($99.95), and Cobol.

How compatible will the Model 2000 be with the IBM PC and MS-DOS? Tandy is quick to emphasize that the 2000 is not an IBM clone. Thus, while it will run some IBM software, those programs that hook into the IBM hardware probably will not be compatible. But the 2000 should run any software written strictly under the conventions of MS-DOS 2.0.

The 2000 comes with GW-Basic, an enhanced version of Microsoft Basic. Its extensive support of color and monochrome graphics includes com-

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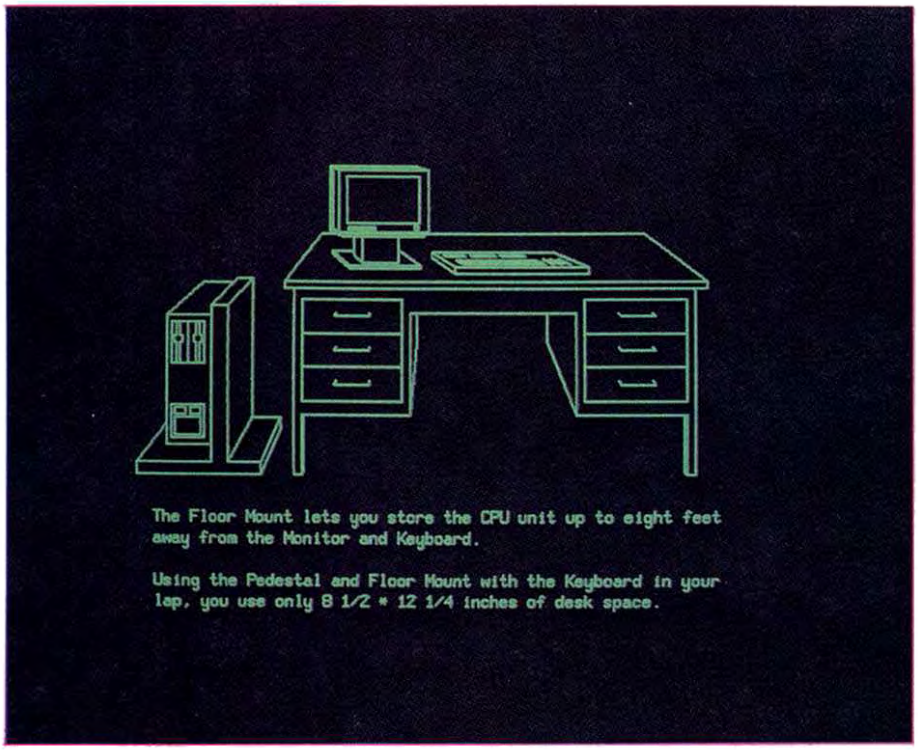

Photo 4. A screen display illustrating the Model 2000's high-resolution monochrome graphics. Shown is an excerpt from Tandy's demonstration program, indicating a possible Model 2000 system setup. The monitor (on its optional pedestal) and keyboard sit on the desk, while the CPU stands on its (optional) floor mount beside the desk.

mands that produce lines, arcs, and circles.

With color graphics, the Paint command tints screen designs, and you can bit-pattern (tile) the design to produce textured graphics. GW-Basic's Get and Put commands insert graphics into dimensioned arrays, which you can put back on the screen to simulate animation.

Other GW-Basic features include screen windowing, music and sound commands, light pen and joystick support, full-screen editing, full RS-232 capability, and a "soft key" utility that lets you define function keys as Basic key words.

(See sidebar for capsules of MultiMate, dBaseII, and MultiPlan.)

The Documentation

The Model 2000 comes with three manuals: an 80-page introduction to the Model 2000, a guide to GW-Basic, and a guide to MS-DOS.

The guides are departures from previous Tandy manuals, coming in 5- by 8½-inch three-ring binders. The Basic manual is 368 pages long, and the MS-DOS manual 296 pages.

Hardware	
Base unit (includes main unit and keyboard, 128K, two drives)	$2750.00
Base unit with 10 Mbyte hard disk	4250.00
VM-1 monochrome monitor	249.00
CM-1 color graphics monitor	799.00
Hi-res monochrome graphics option	399.00
Hi-res color graphics option	199.00
TV/Joystick option (avail. 3/15/84)	249.95
Digi-Mouse/Clock board (avail. 3/15/84)	119.95
Digi-Mouse	99.95
Internal 128K RAM kit	299.00
128K External memory board	499.00
128K RAM upgrade kit	299.00
Monitor pedestal	89.95
Floor stand	145.00

Software	
MultiMate	$249.95
PFS:File	140.00
PFS:Report	125.00
dBase II	595.00
Multiplan	249.00
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MS-GW Basic Compiler	299.95
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*Order Entry	495.00
*Purchase Orders	395.00
*Payroll	495.00
*Multi-Tool Word	375.00
*PFS:Graph	140.00
*PFS:Write	140.00

Table 2. Price list of Model 2000 hardware and software.

*Product still under development at press time.

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Photo 5. The Model 2000 keyboard. The non-number keys are tiered down the keyboard, but the numeric keypad keys lie flat.

Tandy will also offer a *Programmer's Reference Manual* for Assembly-language programmers, and will include hardware information in the *Model 2000 Technical Manual.*

(*80 Micro* will review the manuals in a later issue.)

Finding a Place in the Market

Tandy does not consider the 2000 to be an IBM copy. They are selling it, rather, as a high-performance MS-DOS machine.

"It is not in any way an IBM workalike," says Don White, a product line manager at Tandy. "It is truly a next-generation product.

"In every aspect you could mention, from disk space to graphics, it is superior to anything out there."

Director of Merchandising Ed Juge echoes White's sentiments. "The world doesn't need more IBM copies," he says. "If you want an IBM-like machine and don't want to buy an IBM product, there are plenty of machines just like it."

Juge sums up Tandy's attitude towards IBM thus: "They're a good company. But they're not known for making leading-edge products. I think we got the jump on them this time."

But there is no question that Tandy is aiming the Model 2000 squarely at the IBM PC market. Their benchmark tests compare it to the IBM. Their advertisement includes a Model 2000-IBM PC comparison chart. And IBM naturally comes up in nearly any conversation on the 2000.

Ironically, Tandy will use the software base largely developed by IBM's influence. The strategy, says White, is to go with well-known software that's proven and immediately available.

"The intent is to have the most popular software products available for this machine," he says.

Most of that software, and the software Tandy will offer initially, is obviously aimed at the businessman. But Juge says that Tandy will not sell the 2000 specifically as a business machine. "We won't target it at a specific market," Juge says. "Whether you want a computer for your business or home, if you want MS-DOS with beautiful color graphics and lots of expansion capabilities, this machine is for you."

With the Model 2000, Tandy now covers nearly every corner of the microcomputer market. The Model 4 continues with TRSDOS, the Models 12 and 4 run CP/M, and the Model 16 runs Unix.

"The market is segmented, no question about it," says Juge. "It might stay that way, or it might follow MS-DOS. It doesn't much matter to us."

What remains to be seen is how the TRS-80 computers do against each other. Will the Model 2000 encroach on the Model 4 from one side, while the Model 4P takes away sales on the other? How will the 2000 affect the Model 12? Will it see any penetration outside of business or will the Model 4 and Color Computer maintain the home market?

Again, Juge isn't concerned. "I don't think (the 2000) will have a great effect on the rest of the line," he says. "We feel that each product will stand on its own."

A Final Word

Naturally, no final judgments about the 2000 can be made until people have a chance to see, and the press has a chance to review, the machine. But if the 2000 lives up to its potential, we can expect the company to reestablish itself in the microcomputer marketplace over the next year or so.

And this will be good news to all TRS-80 owners, no matter what system they own. ■

Model 2000 Review Roundup

These three reviews are condensed evaluations of products available for the Model 2000. Although the authors based their judgments on each product's performance with another system, these capsule reviews give you insight into the quality and abilities of MultiMate, dBase II, and Multiplan. Read them for a glimpse of the power available to you now.

MultiMate
Softword Systems Inc.
52 Oakland Ave. North
East Hartford, CT 06027
$495

MultiMate is one of the better designed and organized word processing packages available. It's a scaled-down mainframe system, so until now many of its features have been available only on dedicated word processors.

For the money, MultiMate offers unparalleled features and is more friendly than the competition. It comes with my highest recommendation because of its quality and, just as important, because Softword Systems Inc. seems prepared to fully support it.

The Package

The package includes three disks, one labeled Boot, the actual word processing software; one labeled System, the help files and printer action tables; and the third labeled Utilities, which contains software to convert ASCII files to MultiMate files and vice versa, a recovery program that attempts to rebuild documents that have lost data because of system error, and an edit program for the printer action tables.

Using the Program

While you start MultiMate from a menu, it's misleading to say that MultiMate is a menu-driven program. Many functions are available through ingenious implementation of the function, numeric, and alphabetic keys in conjunction with the shift, ALT, and control keys. More than 50 functions allow almost unlimited flexibility in moving within text and formatting a document.

Twenty-seven other key combinations available on the regular keyboard and numeric keypad let you invoke functions such as print pitch control, subscripts, superscripts, and so on. An excellent online help facility describes which keys do what.

Another impressive feature of MultiMate is the speed with which it moves text around on the screen. Pages don't scroll onto the screen—they appear instantaneously.

MultiMate is a page-oriented word processing system, which means that it stores each page as a separate document on the disk. If the system should crash while you're working on a document, the most damage you'll do is lose the page on which you were working.

Also, page-oriented word processing obviates system memory problems that some packages have because the entire document doesn't have to reside in memory at once.

Another feature of MultiMate is its ability to add and subtract columns of numbers in a text document. MultiMate can also copy, delete, insert, or move columns of numbers or text.

A key feature of MultiMate is the use of highlighting to demarcate the text you've manipulated. By using the cursor control keys or the various function keys (word, line, sentence, or paragraph highlight), you tell the computer what text to copy or move. That text then appears highlighted on the screen.

MultiMate has a sophisticated and comprehensive list of document formatting features. The program supports most printers found in the home and office. Softword Systems will customize MultiMate to match a printer you own if it doesn't currently support your particular model. They provide a toll-free support line to answer questions on printer support or handle problems you might have with the program.

MultiMate lets you insert printer control codes in your documents. The program supports underlining with the Epson dot-matrix printer, five-line headers and footers, alternate page headers and footers, and automatic page numbering. A merge

function creates form letters that automatically insert variables.

Unique to MultiMate is the ability to instruct files to print at a later date or time. Also, you can request that MultiMate print the document in the foreground or background; if you choose the background option, you can work on a new document while the first one prints out in the background mode. You can also specify the start and stop page numbers.

MultiMate offers a unique record-keeping system to track documents as you create them. When you enter the Create New Document mode, you are presented with a header document screen that lets you identify specifics about the text you're creating, such as the author, system operator, identification key words, and comments. The program automatically enters the creation date and update date.

If you later want to find the document, you can search for it using the fields from this same screen. For instance, you can specify a date or a range of dates by which to search and enter information such as author, operator, or subject. The program locates all documents that meet the search criteria.

MultiMate requires a lot of random-access memory because all the programs reside in memory while you're using the package. Additional memory provides little benefit since the program works on one page at a time.

The only practical way to use this program is with two disk drives. While in theory you could use one drive, there would be little room left on a single disk for a document because the system disk is already almost full (on single-sided drives).

The program isn't copy-protected so you can make back-up copies as required. MultiMate's documentation is conveniently tabbed and well-organized, and the instructions are clear and concise.

Drawbacks

Even MultiMate has a few faults. The cursor moves slowly when moving word by word, which seems odd for a program that otherwise runs so fast. When renumbering a document after making many changes, end-of-paragraph markers sometimes appear in the text at the end of lines. Also, it is a bit of a nuisance to have to use a third disk for the utilities; given the size of MultiMate, I do not see any alternatives. ■

This condensed review of MultiMate is based on the review by Shawn W. Bryan that appeared in the November 1983 issue of Desktop Computing. *Bryan evaluated the MS-DOS version for the IBM PC with 128K of RAM.*

---

dBase II
Ashton-Tate
9929 Jefferson
Los Angeles, CA 90230
$700

dBase II is a relational data base, which means it is a data base structured like a table. As with any data base, you can categorize and store data in table format and later recall that data according to category or combination of categories.

The program is written entirely in Assembly language and so operates very quickly. It's written in the style of a command-line interpreter so you don't have to wade through a series of menus to get to the desired operation. This feature also lets you write programs in the dBase II data-manipulation language so you can easily set up custom applications or automate a frequently used sequence of commands.

dBase II works with up to 65,535 records in one file. Each record contains up to 32 fields and up to 1,000 characters. However, by employing a Link option, you can treat two files as one for a total of 64 fields and 2,000 characters per record. This translates into a 130-Mbyte file that dBase II can manipulate.

Obviously, you aren't software limited with dBase II, but hardware limited with most microcomputers. Any given field of a record can have a maximum of 254 characters.

You can use two data files simultaneously, and by entering Use followed by a file name, you can substitute a new file for one of the current files. Several commands involve a third file in their operation, providing even more versatility and convenience.

dBase II provides over 50 major commands, most of which allow several options. You can use the majority of these commands interactively, and you can use all of them in the command files to form a structured programming language. However, the casual user can effectively use dBase II interactively with only 11 commands: Create, Use, Append, Locate, Display, Delete, Recall, Edit, Sort, Report, and Quit.

You enter data into dBase II from the keyboard or from other data files by using the Append command. These files can be either dBase II formatted files or in a delimiter-type format.

Similarly, you can write data out in dBase II format or a delimiter-type format with the Copy command. This ability, in combination with chaining capability, lets you conveniently interface dBase II command files to other programs.

A general Report command is available for generating quick table-type reports. There are also cursor positioning commands for special printing needs or custom displays.

You can use data files to update other files, either adding to or replacing data in certain fields if certain conditions (which you specify) are met.

Calculational commands total a given data base's numerical data to another data file or transfer the sums of a designated field to in-memory variables. In both cases, you can embed conditional instructions in the commands to limit their effect.

dBase II also contains a full-screen editor that you can use to edit records and build command files.

You can organize dBase II data bases in either of two ways. Sorting a data base rearranges the records on the file according to any field you specify, which takes time on a large file. You can use successive sorts if you require different levels of organization. If you use this method regularly on a given file, you can set up a simple command file to do successive sorts automatically.

You can also index any given data file on any combination of fields totaling fewer than 100 characters. Indexing a file is considerably faster than sorting it. You only need to index once, since subsequent appends,

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edits, replaces, or deletes automatically update the Index file. You can maintain up to seven indexes simultaneously on one file.

Once you index a file, you can use a Find command to locate a specific record. Typical search times on a floppy disk system take under two seconds. Also, a Locate command searches out data whether or not you've indexed a data file, although not as quickly.

If you have two data files with different structures but with at least one common field to serve as a key, you can use the Join command to form a new data file from a combination of the two.

dBase II is well documented with over 350 pages split between a tutorial and a reference manual. It's also well supported and is continually being improved. Several other programs are available to support dBase II, including program generators for quickly building command files, and programs that interface dBase II to other established software packages. All in all, dBase II is an exciting alternative and a program worthy of serious consideration. ■

This review is a condensed version of one by Clyde Lightfoot that appeared in Microcomputing, *October 1982. Lightfoot evaluated dBase II for CP/M systems.*

Multiplan
Microsoft Corp.
10700 Northup Way
Bellevue, WA 98004
$275

Microsoft's Multiplan spreadsheet program performs superbly. It's a two-disk package that provides impressive versatility in what-if calculations.

Multiplan's disks are called Boot and System. I found out quickly that the System disk doesn't boot up unless you first load the Boot disk. Afterward, you're asked to insert the System disk and type RETURN. A spreadsheet then appears on your screen.

The spreadsheet consists of 25 rows by 63 columns, for a total of more than 16,000 locations or cells. Cells can contain values, formulas, or labels, and sometimes a combination of these.

Features

You can perform any kind of arithmetic calculation in single cells or by interaction of cells. You can also name individual cells, rows, and columns, and then continue to construct your spreadsheet. For instance, you could ask the program to arrive at costs by adding the columns "Material" and "Labor" and "Overhead," instead of using a much more complicated formula.

All standard statistical functions, such as minimum, maximum, look-up, sum, and others, are available. You will find built-in logical and transcendental functions, such as True, False, Not, Or, If...Then... Else, trigonometric functions, log, and so forth. Multiplan also supports dollar and percent formats not found in other spreadsheets. Additionally, you can sort either alphabetically or numerically.

If you're working with a large spreadsheet, you can divide it into "windows." It's possible to maintain eight active windows at one time, allowing you to keep track of many critical areas simultaneously.

Internal rate of return (of an investment) is one of the more complicated, and sometimes controversial, calculations Multiplan performs. It can solve most internal rate of return problems by iteration. It also calculates standard deviations and net present values.

Multiplan offers various features not available with VisiCalc. Multiplan's scrolling is faster and more versatile, and you can move the cursor in any direction. Cells can contain values plus letters, a dollar, or a percent format. Variable column widths are available.

You can name columns, rows, or whole blocks of data for future reference in calculations. You can lock individual cells or blocks of cells to avoid losing formulas or data accidentally. If you have made changes in your model since you loaded it, the program recalculates when you ask to save a file.

You can tell the program where to print your model by specifying right and top margins. And you can save print parameters in your model file so you don't have to remember a print format every time you use the program.

The program displays the main menu at the bottom of the screen at all times. This makes it possible, most of the time, to give commands in plain English. A special help menu is available to explain commands further. The menu can be distracting once you learn the commands, and there's no way to get it off the screen, a disadvantage.

Documentation

The Multiplan package includes a handy Quick Reference Guide and a 421-page manual. It's certainly one of the better software manuals—detailed and well-written. But, because of the complexity of the subject matter, many intricate features aren't fully explained. You'll still need hours of experience before you fully master Multiplan.

One of the first things you learn from the documentation is how to make one back-up copy of the software. It's highly recommended that you do this right away. With careless handling, it is possible to lose this one-time ability on the original disk. The System disk is not copy-protected.

If you get stuck, Microsoft operates one of the better telephone support systems in the industry. I had occasion to call the hot line and received prompt, courteous, professional answers to my questions every time.

Multiplan has so many features that it is impossible to describe them all here. As a matter of fact, I have only scratched the surface. It's unlikely that you will come across a legitimate problem in the framework of spreadsheets that Multiplan will be unable to solve. ■

This condensed review of Multiplan 1.06 is taken from the review by G.R. Brieger that appeared in Desktop Computing, *July 1983. Brieger evaluated the version for the Apple IIe with 128K of RAM.*

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MS-DOS Overview

by Jim Heid

MS-DOS is the disk operating system (DOS) used by Tandy's new Model 2000 and the IBM Personal Computer and its many clones. The technical differences between MS-DOS and other TRS-80 operating systems are too extensive to adequately cover in a single article; therefore, I'll consider only the major differences you'd encounter.

The two versions of MS-DOS in wide use are MS-DOS 1.X and MS-DOS 2.X. The MS-DOS 2.X series is generally compatible with its predecessors. The Model 2000, like the IBM PC, runs under MS-DOS 2.0.

Commands and File Names

The Table lists the MS-DOS commands and their functions. MS-DOS has two types of commands: external and internal. The code that executes internal commands always resides in memory, while you must load the code that handles external commands from a system disk.

MS-DOS file names can be one to eight characters long, with an optional three-character extension separated from the file name by a period (for example, PINBALL.BAS). MS-DOS lets you use certain special characters ($, #, %, <, and so on) in file names; non-2000 TRS-80 operating systems allow letters and numbers only.

Another difference found with MS-DOS is that its drives aren't numbered; they're lettered A, B, C, and so on. And the drive letter must appear before the file name, not after it (for example, A:PAYROLL.DAT).

When you use a lot of MS-DOS commands, you can use wildcard characters in your file name. The command DIR *.COM, for example, displays a directory of all files with the .COM extension. Similarly, the command ERASE T?T.BAS erases files named TOT.BAS, TAT .BAS, and TXT.BAS.

One annoying difference between MS-DOS and all non-2000 TRS-80 DOSes is that MS-DOS deals only with one disk drive at a time. When you boot up MS-DOS, drive A is active, or logged. If you need a file on drive B, you must specify B: in the file name. MS-DOS won't automatically search other drives when it doesn't find a file on the logged drive. (MS-DOS shares this limitation with CP/M.)

MS-DOS also lacks disk names and password protection. Anyone can see, update, and erase your files.

Command	Purpose	TRS-80 Equivalent
CHKDSK	Reads a directory, reports free space, number of files, free memory.	DIR (A)
COMP	Compares two files for differences.	none
Copy	Copies files (supports wildcards). Also appends files and copy to or from a device.	Copy
Date	Changes system date.	Date
DEL	Identical to Erase (below).	Kill
DIR	Displays directory of files (supports wildcards).	DIR
DISKCOMP	Compares two disks for differences.	none
DISKCOPY	Copies an entire disk.	Backup
Erase	Deletes a file from a disk.	Kill
EXE2BIN	Converts files produced by Link program to .COM (command) format.	none
Format	Initializes a disk.	Format
Mode	Sets mode of operation of a printer for a display connected to color graphics adapter or for serial communications port.	Forms
Pause	Pauses system during batch-file execution.	Pause
REM	Displays remarks from within batch files.	period (.)
REN	Identical to Rename.	Rename
Rename	Changes the name of a disk file (supports wildcards).	Rename
SYS	Transfers operating system files.	none
Time	Changes system time.	Time
Type	Displays contents of a file on the display.	List

Table. Summary of MS-DOS commands. The TRS-80 equivalents column lists similar commands found in some TRS-80 DOSes. Some equivalents do not function exactly like the MS-DOS command, but are similar enough for comparison purposes.

Utility Programs

MS-DOS comes with a debugging utility (Debug), a linking program (Link), and an archaic, line-oriented editor (EDLIN).

The Debug program has the usual commands to display and modify memory and register contents, and it lets you execute a machine-language program with up to 10 breakpoints. When Debug encounters a breakpoint, it stops execution and displays the registers, flags, and the next instruction you want executed. The program doesn't support single-stepping.

Debug also edits the contents of a disk file, compares two blocks of memory, fills a block of memory with a given value or values, searches memory for a specific string or value, performs disassemblies, performs hexadecimal arithmetic, and inputs or outputs a byte to or from a given port. Debug is a fairly powerful utility, but no more so than the LDOS or TRSDOS 6.0 debugging programs.

The Link program produces relocatable modules and combines separately produced object modules. It is most valuable to Assembly-language programmers. Its closest relative in the TRS-80 world is LDOS's CMD-FILE and, more distantly, NEWDOS80's LMOFFSET.

EDLIN is a text editing program most often used to create batch files (do-files or JCL files to the TRS-80 user) and small Assembly-language source code files. EDLIN has limited search and replace capabilities, and not a whole lot more.

Since it's a line-oriented editor, you press the enter key at the end of each line, and you edit lines one at a time. Conversely, a full-screen editor lets you move a cursor around the screen and reformats a block of text if you make deletions or insertions.

MS-DOS

Introduced in the spring of 1983, MS-DOS 2.0 was originally written for the IBM PC-XT, a PC with built-in hard disk drive. MS-DOS 2.0 uses the same commands as its predecessors, and adds a special directory structure that makes it easier to manage the megabytes.

The directory structure is most similar to that of the Unix operating system. It lets you group any related files in their own directories, making file management much easier.

You could, for example, put all your word processing files in one directory, all your payroll files in another, and all your data-base management files in a third. Instead of seeing hundreds of file names scroll by when you display a directory, you see only the file names of the category in which you're interested.

In the pre-Model 2000 TRS-80 world, only TRS-Xenix (available for the Model 16) offered this kind of convenience. (For more information about this type of directory structure, see the "Using Unix-Xenix" series in *80 Micro* (Part I, November 1983, p. 212).)

MS-DOS 2.0 also lets you redirect program input and output. You could tell a sorting program, for instance, to use the output of the directory command as its input. You could instruct a data-base manager to send its output (which would normally go to the screen) to a mailing list program to be used for input (which would normally come from the keyboard). This technique is called piping, because you can redirect data as if it were going through pipes.

In general, MS-DOS 2.0 seems to be a stepping stone toward what might some day be a multi-user, multi-tasking operating system.

Conclusion

MS-DOS is not the ultimate DOS. Like the computer that first made it famous, it's actually quite conventional. Also like the IBM PC, it's incredibly popular. More software is written for MS-DOS than for any other 16-bit operating system, and that's something to think about for the consumer who's buying a new machine, and for the programmer who's writing a new program. MS-DOS is where it's at.

Moreover, MS-DOS is going somewhere. Version 2.0, with its Unix-like directory structure and flexible device handling, is only a glimpse at the power and flexibility that tomorrow's—or, in the case of the 2000—today's microcomputers offer.

Look for a menu-driven command processor that makes using the system easier for noncomputerists. Look for file and record locking, as well as password protection. MS-DOS will change and evolve as the hardware it runs on changes and evolves, and each new generation will make computers more powerful and easier to use. ■

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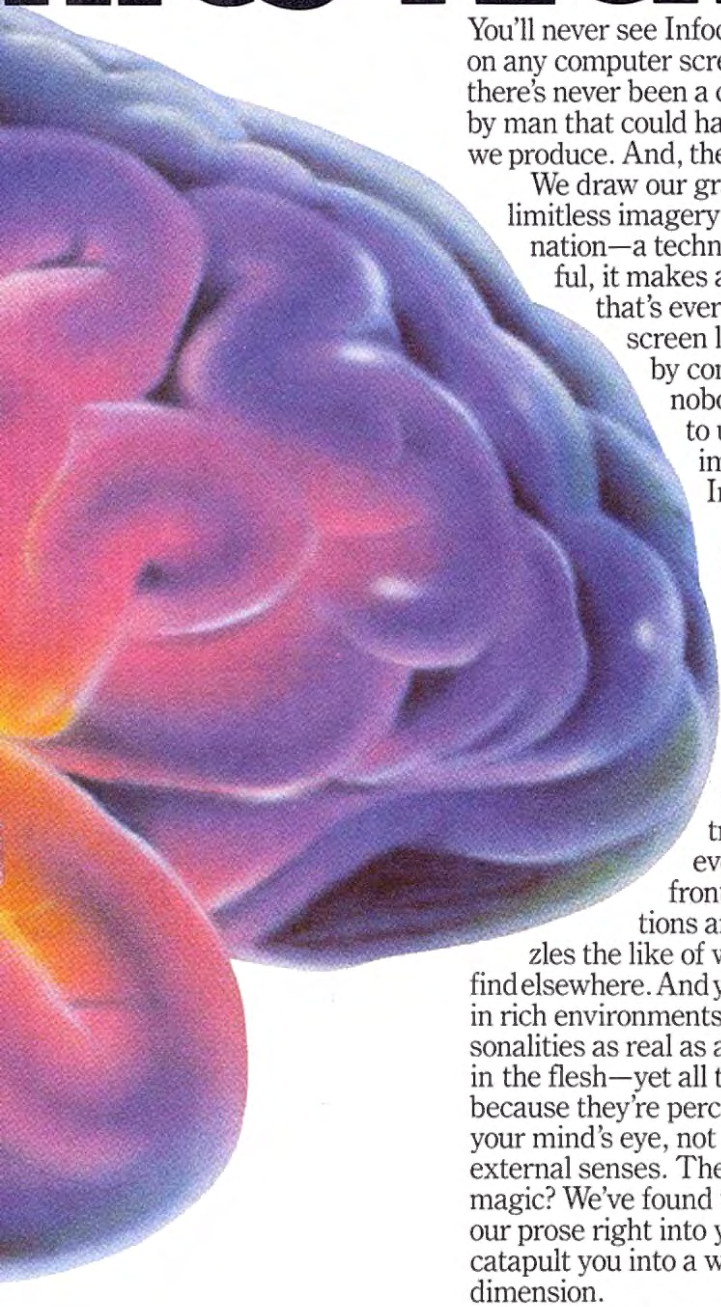

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Touch or Sound Typer

by A.J. Barnard Jr. and David Barnard

This touch- or sound-actuated typing program allows physically handicapped persons to communicate using a Model I/III and a printer.

Producing typewritten text is a simple and useful means of communication and documentation. But for many physically handicapped persons, using a typewriter is virtually impossible.

This article presents a revised Model I/III Basic program called TOSTYPER that turns your computer into a sound- or touch-actuated typewriter (see "Voice-Controlled Typewriter," *80 Micro*, December 1982, p. 72). It allows persons with little or no muscular control, but with normal intelligence, to manipulate the screen cursor to type characters through a printer.

The program's two options let you use a computer to communicate by uttering a sound or touching any key or the space bar. Once someone boots up the program, the handicapped user can operate independently and gain the satisfaction of composing and communicating through written text.

Sound vs. Touch Control

In the original program, you select the character or command you want by making a sound as the cursor moves through a screen display of the alphabet, some punctuation, and commands. The program picks up the sound through the microphone of a cassette

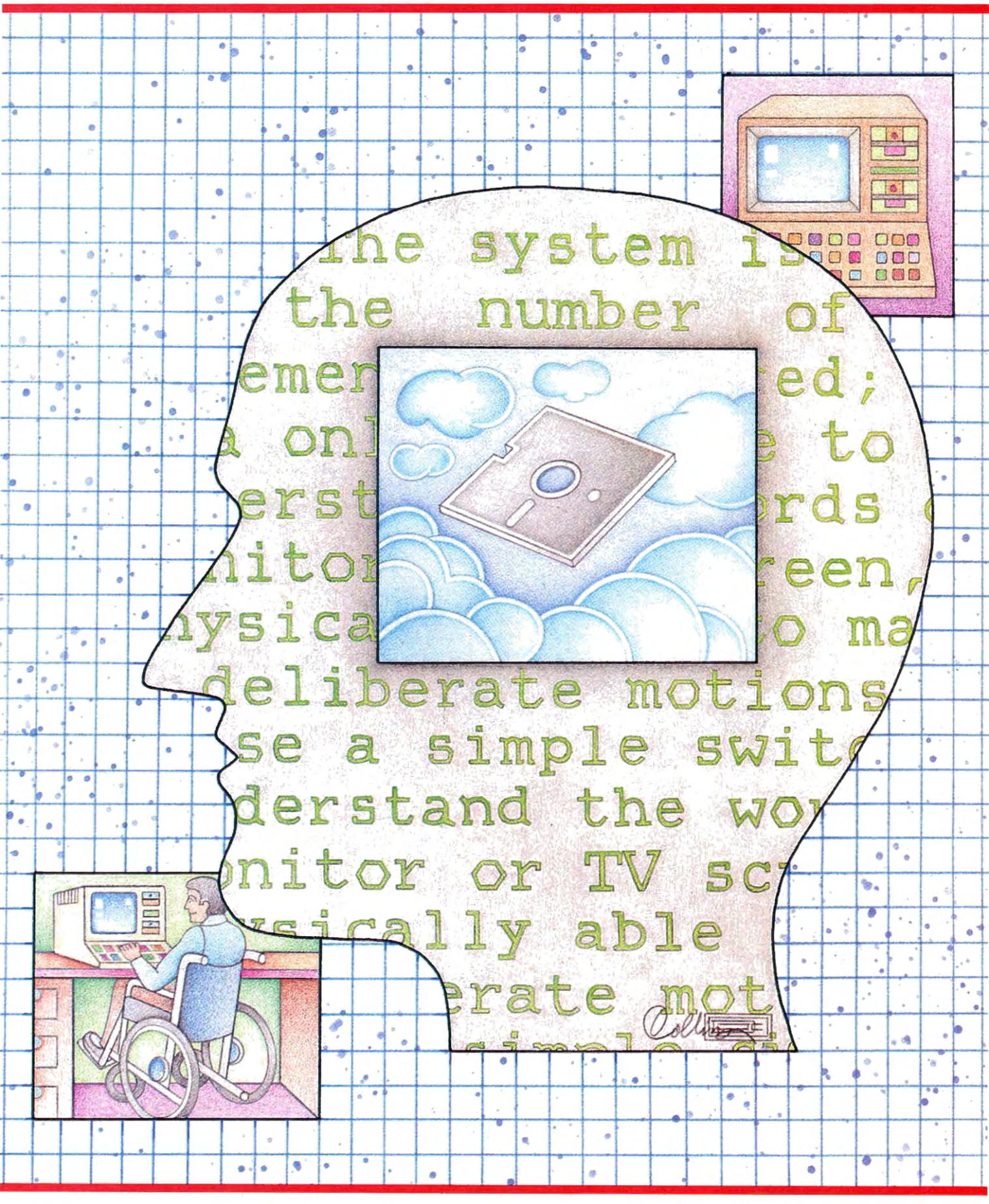

Illustration by Daniel J. Collins

recorder operating in the play/record mode. The signal goes to the computer through the earphone jack. An INP (255) command polls the cassette port before the cursor moves from one character to another.

We reduced this sound-actuated control to the subroutine in line 60 of the Program Listing. When it receives a response, the program sets the F flag.

Some handicapped persons, regardless of their ability to utter a sound, have sufficient muscular activity and control to tap with a pencil, press a button, and so on. Our revision allows optional selection of characters by a key press through the routine in line 50; PEEK(15359)>0 corresponds to an INKEY$ command.

TOSTYPER (touch or sound typer) is more compact than the original program, placing the character set in an array, using numeric offsets for screen positions, and introducing subroutines and For...Next loops. The program prompts you (or an aide) to select sound or touch control.

Character Sets

To make characters or commands as easy as possible to enter, we arranged the screen display of the character set so that the most frequently used text characters are closest to the home position of the cursor. Since you use the blank space most frequently, it appears in the home position.

We include two character sets with TOSTYPER. The first, a simple character set, consists of the alphabet (in uppercase), the 10 digits, and some punctuation marks. The second, a full character set, incorporates the simple set and all of the Model I's other printable characters. The full set is shown in Fig. 1.

Both the simple and full character sets are in array E$ (lines 700–720). Each set is arranged in an eight-column format.

When you first run the program, it installs the simple character set. Select C-SET with the cursor to change back and forth between the simple and full sets. Offset CH has a value of 8 for the simple set and zero for the full set. The program controls screen arrangement (lines 100, 110, and 200) from CH and the H and L arrays, which include the sequence number of the first and last character in each column (line 730).

The Enhanced Mode

To enhance the character set further, you can add some frequently used, two-letter combinations (digrams) to the program. A more effective enhancement involves placing frequently used digrams, trigrams, and common words in an array that you call from the main character set display.

On the main display, each letter that has an enhanced mode appears with a plus sign appended. To get into the enhanced mode (flag EN set) or back to the regular mode, use the cursor to select the XTRA? option. Fig. 1 shows the enhanced mode we developed for the letter E. If you select E+, 15 options beginning with E appear at the bottom of the screen and you select one of these words as the cursor moves through the display. Select Return and only the E registers.

```
■       ■       ■       ■       ■       ■       ■       ■
SPACE   N+      T+      R+      L+      .       ,       ERASE
E+      I+      S+      M+      H+      9       8       7
A+      O+      P+      G+      0       6       5       4
C+      U+      B+      K       1       2       3       ;
D+      Y+      V+      ?       !       '       "       :
F+      Q       X       J       (       )       <       >
W+      Z       /       -       *       +       =
PRINT   #       %       ↑       &       $
ADJST   C-SET   XTRA?   @
        RETURN  EA      ED      EN      ER      ES      ENT
ERE     ERS     EVE     EAT/    END/    EACH/   EASY/   EARLY/
EVERY/
EVERY GOOD BOY ==========================987654321
```

Figure 1. Regular character set in enhanced mode with secondary display for letter E.

Line Number(s)	Module Description
30	Go: title/initialize/instruct/start
50	Touch control subroutine
60	Sound control subroutine
70	Delay subroutine
100–120	Set display and mark print line
150–160	Move cursor and select column
200–210	Move cursor down column and select character or control
250–320	Process selected character or control
350–390	Display and allow selection of multi-letter combinations
400–460	Allow adjustment of cursor speed and print line length and spacing
500–510	Define variables
550–640	Read multi-letter combinations to array
700–720	Read character sets to array
730	Put sequence numbers of first and last characters in columns in arrays
740	Put legend for adjusts in array
750–760	Title; verify printer ready
800–820	Select touch or sound control
850–880	Give instructions for sound control
900–950	Show general instructions

Table 1. TOSTYPER Modules.

The Key Box

Models I and III
16K RAM Cassette Basic
32K RAM Disk Basic
Printer
External Microphone Optional

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5-¼" DS	34.90		34.90		29.90		41.90	
8" SS	24.90		—		19.90		—	
8" DS	39.90		—		29.90		—	
Sub Totals	$_____		$_____		$_____		$_____	

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430

Program Listing. TOSTYPER.

```
0 'STATUS 5/20/83
2 '       -=-  T  O  S  T  Y  P  E  R  -=-
        TOUCH- OR SOUND-CONTROLLED PRINTING
              FOR TRS-80 MOD I & III
        A. J. BARNARD, JR. & DAVID BARNARD
3 '
4 '    BASED ON M. RIGSBY, 80 MICRO 12/82, 72-7
5 ' OPTIMIZED BY SUBR.'S/LOOPS & CHAR.-FREQ. BASED
    DISPLAY, ALLOWING CHANGE IN PRINT LINE LENGTH
      & SPACING, & USE OF ENHANCED CHAR. MODE.
6 '
30 CLEAR1400:GOSUB750:GOSUB500:GOSUB800:GOSUB400:GOTO100
50 F=0:CS=120-Q*10:IFFSTHEN60ELSEFORX=1TOCS
 :IFPEEK(15359)THENF=1:X=CS:NEXT:RETURNELSENEXT:RETURN
60 FORX=1TOCS:OUT255,00:IFINP(255)>200:F=1:X=CS:NEXT:RETURN
 ELSENEXT:RETURN
70 FORX=1TO75+50/Q:NEXT:RETURN
80 GOSUB70:GOTO50
100 CLS:FORI=0TO7:PRINT@(3+I*8),CHR$(160):NEXT
 :FORK=1+CHTO8+CH:FORI=H(K)TOL(K):ET$=""
 :IFEN=0ANDLEN(E$(I))=2THENET$=LEFT$(E$(I),1)ELSEET$=E$(I)
110 PRINT@131+(K-CH-1)*8+(I-H(K))*64,ET$;:NEXTI,K
120 FORI=0TOP-10:PRINT@PL+I,S$;:NEXT:PRINT"987654321";
 :IFB>0THENPRINT@PL,A$;
150 K=0
160 GOSUB70:GOSUB70:POKECC+8*K,U:K=K+1:GOSUB80:IFFTHEN200
 ELSEPOKECC+8*(K-1),V:IFK<8THEN160ELSE150
200 GOSUB70:C=R-9+K*8:POKEC-128,V:POKEC.U:GOSUB70
 :K=K+CH:FORI=H(K)TOL(K):GOSUB80:IFFTHENB$=E$(I):I=L(K)
 ELSEIFI<L(K)THENZ=C+64:POKEZ,U:POKEC,V:GOSUB70:C=Z
210 NEXTI:POKEC,V:IFF<1THEN150
250 N=LEN(B$):IFN>2THEN260ELSEIFN<2THEN270
 ELSEB$=LEFT$(B$,1):IFENTHEN350ELSE270
260 IFB$="ADJST"THENGOSUB400:GOTO100ELSEIFB$="ERASE"THEN300
 ELSEIFB$="PRINT"THEN290ELSEIFB$="XTRA?"THEN310
 ELSEIFB$="C-SET"THEN320ELSEIFB$="SPACE"THENB$=" "
270 A$=A$+B$:B=LEN(A$):IFB<PTHENPRINT@PL,A$;ELSE290
280 IFLEN(B$)>1THEN150ELSEGOSUB50:IFFTHENB=B+1:GOTO270ELSE150
290 LPRINTA$:A$="":B=0:GOTO120
300 IFBTHENB=B-1:A$=LEFT$(A$,B):PRINT@PL+B,S$:GOSUB50
 :IFFTHEN300ELSE150ELSE150
310 IFENTHENEN=0:GOTO100ELSEEN=1:GOTO100
320 IFCHTHENCH=0:GOTO100ELSECH=8:GOTO100
350 A=ASC(B$)-65:PRINT@PR,"RETURN";:N=0
 :FORJ=0TONW:IFT$(A,J)=""THENJ=NW:NEXTJ
 ELSEPRINT@PR+(J+1)*8,T$(A,J);:N=N+1:NEXTJ
360 FORJ=0TON:GOSUB70:POKESP+J*8,U
 :IFJ>0THENPOKESP+(J-1)*8,VELSEPOKESP+N*8,V
370 GOSUB80:IFF<1THENNEXTJ:GOTO360
380 IFJ>0THENB$=T$(A,J-1)
 :IFRIGHT$(B$,1)="/"THENB$=LEFT$(B$,LEN(B$)-1)+" "
390 J=N:NEXTJ:FORI=0TO2:PRINT@PR-9+I*64,ST$;:NEXT:GOTO270
400 CLS:W=15360:ZX=0:I=0:G=Q:GOSUB460:CI=1:CL=1:CM=10
 :GOSUB410:Q=G:G=P:GOSUB460:CI=5:CL=15:CM=80:GOSUB410:P=G
 :G=LL:GOSUB460:CI=1:CL=0:CM=66:GOSUB410:LL=G:RETURN
410 FORE=1TO3:POKEW+(E-1)*20,U
 :IFE=1THENPOKEW+40,VELSEPOKEW+(E-2)*20,V
420 GOSUB80:IFFTHENZ=E:E=3:NEXTE:ONZGOTO430,440:RETURN
 ELSENEXTE:GOTO410
430 G=G-CI:IFG>CLTHEN450ELSEG=CL:GOTO450
440 G=G+CI:IFG>CMTHENG=CM
450 POKEW+(Z-1)*20,V:PRINT@PY,G:GOTO410
460 POKEW+40,V:Z=1+(I+ZX)*2:A=19+I*256:PY=15+A:C=114+A
 :PRINT@A,D$(I+9+ZX);:PRINT@PY,G;:PRINT@C,D$(Z);
 :PRINT@C+20,D$(Z+1);:PRINT@C+40,R$;:W=R+I*256:I=I+1:RETURN
500 PRINT@666,29:POKE16553,255:DEFINTA-Z:NW=15:DIM E$(117),
 H(17),L(16),D$(12),T$(24,NW):U=191:V=128:Q=6:CH=8:B=0:P=30
 :EN=0:PL=896:S$=CHR$(140):CC=15362:PR=713:SP=16072:LL=1
 :R=15491:PC=666
510 PRINT@PC,28:ST$=STRING$(64,128):W1$="PRESS ANY KEY"
 :W$="-> MAKE A SOUND TO GO ON <-":R$="CONTINUE"
550 FORI=0TO24:FORJ=0TONW:READTT$:IFTT$="*"
 THENJ=NW:NEXTJ,IELSET$(I,J)=TT$:PRINT@PC,27-I;:NEXTJ,I
560 DATA AL,AN,AR,AS,AND,ARE,ATE,ATI,ALL/,ANY/,ABLE/,ABOUT/,
 ABOVE/,AFTER/,ALONG/,*,BE/,BY/,BIG/,BUT/,BACK/,BEAT/,BEEN/,
 BEST/,BOTH/,BEGIN/,BEING/,BRING/,BEFORE/,*
570 DATA CE,CO,COM,CON,CAN/,CUT/,CALL/,CAUSE/,COUNT/,COULD/,
 CROWD/,CHANGE/,*,DE,DO/,DAY/,DRY/,DEAR/,DEEP/,DOES/,DONE/,
 DOWN/,DAILY/,DOING/,DRIVE/,*
```

Listing continued

On initialization, the program places the combinations and words in array T$ (lines 550–640), and dimensions it (line 500) for the letters A–Y and up to 16 combinations per letter (NW = 15).

Note the trick in line 550 to avoid including a lot of null elements in the data statements. As the program reads data, it checks for an asterisk. If it finds one, it leaves that element and the remaining elements for that letter empty.

The data we installed in the enhanced mode includes about 40 common digrams that you can't enter more efficiently as single letters, the 21 most frequently used trigrams, the 100 most common words of general English text, and a few additional words useful in personal writing.

As seen in Fig. 1, Return is the first item in a secondary display. If you select it the single letter enters. The secondary display is further arranged by the number of characters and alphabetically. We added wordspace to words that are not also often-used digrams or trigrams—a slash indicates a word space.

In either mode, by holding down a key, or longer sound utterance, you can create a repeating action, thus typing double letters and spaces faster.

Program Operation

When you run the program (printer must be ready), the title page appears as the program counts down from 29 while it loads the arrays. At the end of the countdown, the program displays directions on how you select sound or touch control.

At this point the screen presents three options: Touch, Sound, and Continue. The cursor momentarily stops at each option. Press the spacebar (or any key) to select the option when the cursor is adjacent to it. Then do the same with Continue. From this point on, a handicapped user can operate the program independently.

The program presents you with more directions and allows you to make adjustments. You can adjust cursor speed from slow (1) to fast (10), select a line length of from 15 to 80 characters, and set line spacing. Do this by stopping the moving cursor at the appropriate position.

When you continue, the program starts in the simple character set, dis-

playing characters and commands. The cursor flashes across the top of the eight columns. Respond (in the touch mode) by pressing a key to make the cursor travel down a column with the letter or command you want to execute.

The commands are Adjust, C-Set, XTRA?, Print, and Erase. Adjust brings you back to the adjustment options, and C-Set sends you back and forth between the simple and full character sets. XTRA? displays the enhanced character set with words, digrams, and trigrams for each letter with a plus sign. These commands don't wipe out partial print lines.

The Print command prints out the line of text that you put together. The Erase mode wipes out any errors starting at the back of the line, one character at a time (unless you respond continuously by holding down a key or by making a continuous sound).

Additional Remarks

Refer to Table 1 for the program modules. It is a handy reference if you want to alter or specialize the program.

You can add sound control with an external microphone connected to a tape recorder, thereby placing the recorder farther from the user and reducing concern over room noise. The inexpensive Radio Shack replacement microphone 33-103A is appropriate. It lets you turn the recorder on and off with the slide switch on the mike throat if you plug the two line jacks into the auxiliary and microphone ports.

When you have 32K RAM or more in your system, you can increase the CLEAR 1400 in line 30 (i.e., CLEAR-MEM/3). If you want more words available in the enhanced mode, add them in the data statements of line 560–640. A word should be fewer than seven letters long. For a seven-letter word, there is no wordspace (no slash). You can increase the number of combinations and words allowed for a single letter, from 16 to 22, by changing the value of NW in line 500 because the dimensioning of T$, reading data to it, and operation of the secondary display all tie to NW. ■

For correspondence concerning TOSTYPER, contact A.J. Barnard Jr., J.T. Baker Chemical Co., Phillipsburg, NJ 08875.

Listing continued

```
580 DATA EA.ED,EN,ER,ES,ENT,ERE,ERS,EVE.EAT/,END/,EACH/,EASY/,
 EARLY/,EVERY/,*,FAR,FOR,FEW/.FALL/.FELL/.FIND/,FROM/,FIRST/,
 FOUND/,*
590 DATA GO/,GET/,GAVE/,GIVE/,GOES/,GONE/,GOOD/,GROW/,GOING/,
 GREAT/,GUESS/,GIVING/.*,HA,HE,HAD.HAS,HAT,HER,HIS,HIM/,HEAR/,
 *,I/,IC,IN,IO,IS,IT,IF/.ILL,ING,ION,ITH,ITS/,INTO/,INSIDE/,*
600 DATA *,*,LE,LAY/.LIE/.LET/,LAST/,LATE/,LIKE/,LIVE/,LOOK/,
 LIGHT/,LITTLE/,*,ME,MY/.MAN/,MAY/.MADE/,MANY/,MORE/,MOST/,
 MUCH/,MUST/,MIGHT/,*
610 DATA ND,NG,NT,NO/,NEW/,NEAR/,NEED/,NONE/,NOTE/,*,OF,ON,OR,
 OU,OFF/,OLD/,ONE/,OUR/,OUT/,OWN/,OURS/,OVER/,*,PR,PAY/,PUT/,
 PAIR/,PART/,PASS/,PICK/,PLAN/,PIECE/,PLAIN/,PRINT/,*,*
620 DATA RA.RE,RI.RES,RAN/,RUN/,READ/,REAL/,REST/,RIDE/,RISE/,
 RESULT/,*,SE,ST,SO/,SEE/,SET/,SHE/,SHOW/,SLOW/,SOME/,SUCH/,
 SHALL/,SINCE/,SHOULD/,*
630 DATA TE.TH,TI,TO,TER,THA.THE,TIO,THAT/,THEM/.THEN/.THIS/,
 THEY/,THEIR/,THERE/,THESE/,UP/,US/.USE/.UPON/.UNDER/,UNTIL/,
 UP TO/,USEFUL/,*,VE,VER,VERY/.VIEW/.VISIT/.VALUE/,*
640 DATA WE/,WAS/,WHO/,WHY/,WANT/,WENT/,WILL/,WITH/,WHOM/,
 WORK/,WHERE/,WOULD/,WRITE/,*,*,YES/,YET/,YOU/,YEAR/,YOUR/,
 YOUNG/,YOURS/,*
700 PRINT@PC,2:FORI=0TO116:READE$(I):IFE$(I)="XX"THEN
 E$(I)=CHR$(34)ELSEIFE$(I)="YY"THENE$(I)=CHR$(91)
710 NEXTI:PRINT@PC,1:DATA SPACE,E+,A+,C+,D+,F+,W+,PRINT,ADJST,
 N+,I+,O+,U+,Y+,Q,Z,#,C-SET,T+,S+,P+,B+,V+,X,/,%,"XTRA?",
 R+,M+,G+,K,?,J,-,YY,@,L+,H+,0,1,!,(,*,&,
 ".",9,6,2,"'",),+,$,",",8,5,3,XX,<,=,ERASE,7,4,";",":",>
720 DATA SPACE,E+,A+,C+,D+,F+,W+,PRINT,ADJST,
 N+,I+,O+,U+,Y+,Q,Z,C-SET,T+,S+,P+,B+,V+,X,/,"XTRA?",
 R+,M+,G+,K,?,J,-,L+,H+,0,1,!,".",9,6,2,"'",",",8,5,3,XX,
 ERASE,7,4,";",":"
730 H(1)=0:FORI=1TO16:READL(I):H(I+1)=L(I)+1:NEXTI
 :DATA 8,17,26,35,43,51,58,64,73,81,89,96,101,106,111,116
740 FORI=1TO12:READD$(I):NEXTI:RETURN:DATA SLOWER,FASTER,
 SHORTER,LONGER,LESS,MORE,TOUCH (0),SOUND (1),"SPEED SETTING:",
 "  LINE LENGTH:"," LINE SPACING:","TOUCH VS SOUND:"
750 CLS:PRINTCHR$(23):PRINT@8,"-=- T O S T Y P E R -=-";
 :PRINT@128,"TOUCH- OR SOUND-ACTUATED PRINTER";
 :PRINT@196,"WITH ENTRY OF KEY WORDS AND";
 :PRINT@260,"MULTI-LETTER UNITS ALLOWED.";
760 IF(PEEK(14312)AND240)<>48THENPRINT@530,
 "READY PRINTER!";:GOSUB70:PRINT@530,STRING$(18,32);:GOTO760
770 PRINT@588,"==> INITIALIZING <==";:RETURN
800 CLS:PRINT
 "  NOW SELECT TOUCH OR SOUND CONTROL (0 OR 1 SETTING)."
810 PRINT:PRINTTAB(8)W1$;" WHEN THE CURSOR (WHITE BLOCK) IS"
 :PRINTTAB(5)"NEXT TO 'TOUCH' OR 'SOUND'.":PRINT
 :PRINTTAB(9)"TO GO ON, ";W1$;" WHEN THE CURSOR IS"
 :PRINTTAB(6)"NEXT TO 'CONTINUE'."
820 I=2:ZX=1:G=0:GOSUB460:CI=1:CL=0:CM=1:GOSUB410:FS=G
850 IFFS<1THEN900ELSECLS:PRINT"TO ACHIEVE SOUND CONTROL:
 1. REMOVE THE 'AUX' AND 'MIC' PLUGS FROM THE RECORDER.
 2. PLUG AN EXTERNAL MICROPHONE INTO THE 'MIC' PORT OR
    FOR THE BUILT-IN ONE HAVE THE ROOM QUIET AND PUT"
860 S=15955:T=S+64:Y=T+64:Z=Y+65:PRINT
"    THE RECORDER ON A HARD SURFACE.
 3. AS PICTURED , DEPRESS 'RECORD' & 'PLAY' AND THE
    SMALL PIN AT THE COMPARTMENT REAR."
870 POKES,151:POKES+1,143:FORI=2TO13:POKES+I,131:NEXT
 :POKES+14,171:POKET,149:POKET+14,170:POKEY,181:POKEY+14,186
 :FORI=1TO13:POKEY+I,176:NEXT:POKEZ,U:POKEZ+2,U
880 PRINT@908,W$;:GOSUB50:IFFTHENCLS:PRINT:GOTO910
 ELSEPOKES+1,131:POKES+2,131:POKEZ,V:GOSUB70:POKEZ+2,V:GOTO870
900 CLS:PRINT
"  TO SELECT A CHARACTER (OR A CONTROL), PRESS THE SPACEBAR OR
ANY KEY ON THE KEYBOARD, EXCEPT 'BREAK'.":PRINT
910 PRINT
"   THERE ARE 2 CHARACTER SETS: SIMPLE & FULL. TO CHANGE SETS,
SELECT 'C-SET'. EACH SET HAS 2 MODES: REGULAR & ENHANCED. TO
CHANGE MODES, SELECT 'XTRA?'."
920 PRINT:PRINT
"   IN THE ENHANCED MODE, IF THE SELECTED LETTER HAS '+' ADDED,
YOU SELECT A MULTI-LETTER COMBINATION OR WORD,  OR BY 'RETURN'
ENTER THAT LETTER."
930 PRINT:PRINT
"   INITIALLY, YOU ADJUST THE SPEED FROM 1 (SLOW) TO 10 (FAST),
LINE LENGTH FROM 15 TO 80 CHARACTERS, AND THE SPACING OF PRINT
LINES FROM NONE UP. TO ALTER THESE SETTINGS, SELECT 'ADJST'."
940 IFFSTHENPRINT@972,W$;:GOSUB50:IFFTHENRETURNELSE940
950 PRINT@992,"-> ";W1$;" <-";:GOSUB50:IFFTHENRETURNELSE950
```

Dot Talk

by Mike Rigsby

Braille is a writing system for the blind that uses raised dots in place of letters and characters. Dedicated, commercially available braille character generators are expensive, so I wrote a Model I/III Basic program called Braille that translates conventional text into braille and prints it on a letter-quality or dot-matrix printer (see the Program Listing).

Braille prints braille text on paper using the impact of the print head to produce the dots. To read the generated text, you have to turn the paper over.

This program translates conventional text into braille characters using a standard printer.

The Program

This program produces Grade I braille only, a simple letter-by-letter translation of text to braille (Grade II braille uses a compacted dot pattern and increases the rate at which you can read material).

Braille supports only lowercase letters, spaces, and periods (see the Figure). The program lets you store and print braille code to and from tape. You can thus produce multiple copies of the same text.

Printers

The ideal printer for this braille system is a converted IBM selectric or daisy-wheel printer. Set the impact force to maximum and use a low-quality bond paper. You get the best results when you insert four sheets of paper into the printer together.

If you have a dot-matrix printer, don't despair. Use a 9-inch strip of ½-inch wide double-stick cellophane tape and latex rubber from household dishwashing gloves. Tape the latex side of the glove rubber and expose the flock-lined side. Tape this to the platen behind the computer paper. This system uses a letter O to produce the impact on the paper.

Program Operation

Braille uses the INKEY$ function to determine when you've pressed a key. It converts the character you enter to ASCII code and produces the proper dot combination. I programmed Braille to produce only lowercase letters, so the ASCII code for an uppercase letter gets converted.

After you type in 15 characters, the program scans the entered text for a space, at which point it begins printing or recording. More than 20 characters makes the printer overshoot the edge of conventional 8- by 10-inch paper.

The dot pattern produced by this program is readable, but it's slightly larger than the standard size for braille documents. A printer capable of advancing in increments of half-spaces produces nearly perfect braille text. ■

Write to Mike Rigsby at 5164 Sunburst Drive, Norcross, GA 30092.

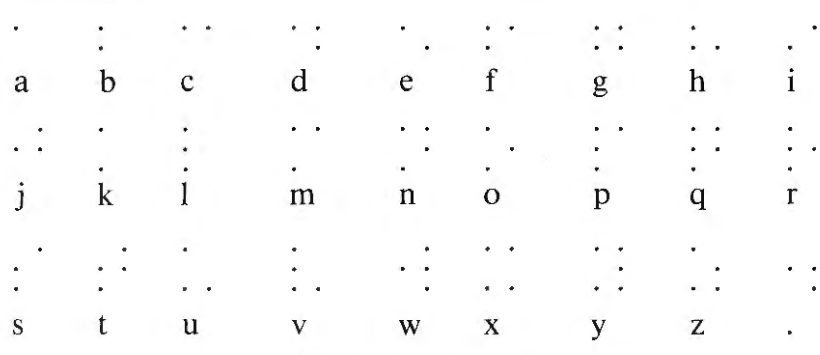

Figure. Braille alphabet.

Program Listing. Braille printer.

```
5 CLEAR 500
6 S=80
7 Z5$=" "
10 CLS
13 INPUT"IF YOU WISH TO PRINT BRAILLE FROM A TAPE, TYPE 'Y'";N$
14 IF N$="Y" THEN 1100
```

Listing continued

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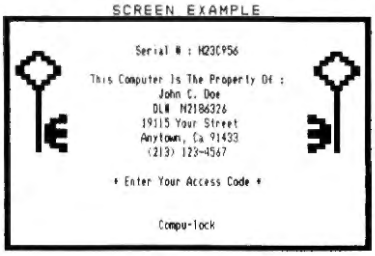
INTRODUCING...

THE COMPU-LOCK

SCREEN EXAMPLE



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Listing continued

```
 15 INPUT"IF YOU WISH TO OUTPUT TO TAPE RATHER THAN PRINTER, TYPE '
 Y'";M$
 20 A=0:B=0:C=0:D$="":E$="":F$="":G$=""
 30 A$="":B$="":C$=""
 40 A$=INKEY$
 50 IF A$=""THEN40
 55 GOTO 400
 70 B=ASC(A$)
 80 B=B-64
 90 ON B GOTO 100,100,200,200,100,200,200,100,300,300,100,100,200,2
 00,100,200,200,100,300,300,100,100,300,200,200,100
100 C$="   ."
110 GOTO 500
200 C$=" . ."
210 GOTO 500
300 C$=" .  "
310 GOTO 500
400 IF A$=" "THEN 420
405 IF A$="."THEN 450
410 GOTO 70
420 C$="    ":D$="    ":F$="    "
430 GOTO 500
450 C$="    ":D$=" . .":F$=" .  "
460 GOTO 500
500 B$=C$+B$
550 IF A$=" "GOTO 900
555 IF A$="." GOTO 900
600 ON B GOTO 650,700,650,800,800,700,750,750,700,750,650,700,650,
800,800,700,750,750,700,750,650,700,750,650,800,800
650 D$="    "
660 GOTO 900
700 D$="   ."
710 GOTO 900
750 D$=" . ."
760 GOTO 900
800 D$=" .  "
810 GOTO 900
900 E$=D$+E$
920 IF A$=" "GOTO 1000
930 IF A$="."GOTO 1000
950 ON B GOTO 960,960,960,960,960,960,960,960,960,960,970,970,970,
970,970,970,970,970,970,970,980,980,990,980,980,980
960 F$="    ":GOTO1000
970 F$="   .":GOTO 1000
980 F$=" . .":GOTO1000
990 F$=" .  ":GOTO1000
1000  G$=F$+G$
1010 A=A+1:IFA>15 THEN 1040
1015 PRINTA$
1020 GOTO 40
1040 IF A$=" "THEN 1060
1045 PRINTA$
1050 GOTO 40
1055 IF M$="Y"THEN 1095
1060 IF M$="Y" THEN 1095
1061 R=LEN(B$):R1=LEN(E$):R2=LEN(G$)
1062 IF R<S THEN GOSUB 1200
1063 IF R1<S THEN GOSUB 1300
1064 IF R2<S THEN GOSUB 1400
1065 LPRINTB$
1070 LPRINT E$
1080 LPRINT G$
1090 LPRINT
1092 GOTO 20
1095 PRINT#-1,B$,E$,G$
1097 GOTO 20
1100 INPUT#-1,B$,E$,G$
1102 R=LEN(B$):R1=LEN(E$):R2=LEN(G$)
1107 IF R<S THEN GOSUB 1200
1108 IF R1<S THEN GOSUB 1300
1109 IF R2<S THEN GOSUB 1400
1110 LPRINTB$
1120 LPRINTE$
1130 LPRINTG$
1140 LPRINT
1150 GOTO 1100
1200 B$=Z5$+B$
1210 R=LEN(B$)
1220 IF R<S THEN GOTO 1200
1230 RETURN
1300 E$=Z5$+E$
1310 R1=LEN(E$)
1320 IF R1<S THEN GOTO 1300
1330 RETURN
1400 G$=Z5$+G$
1410 R2=LEN(G$)
1420 IF R2<S THEN GOTO 1400
1430 RETURN
```

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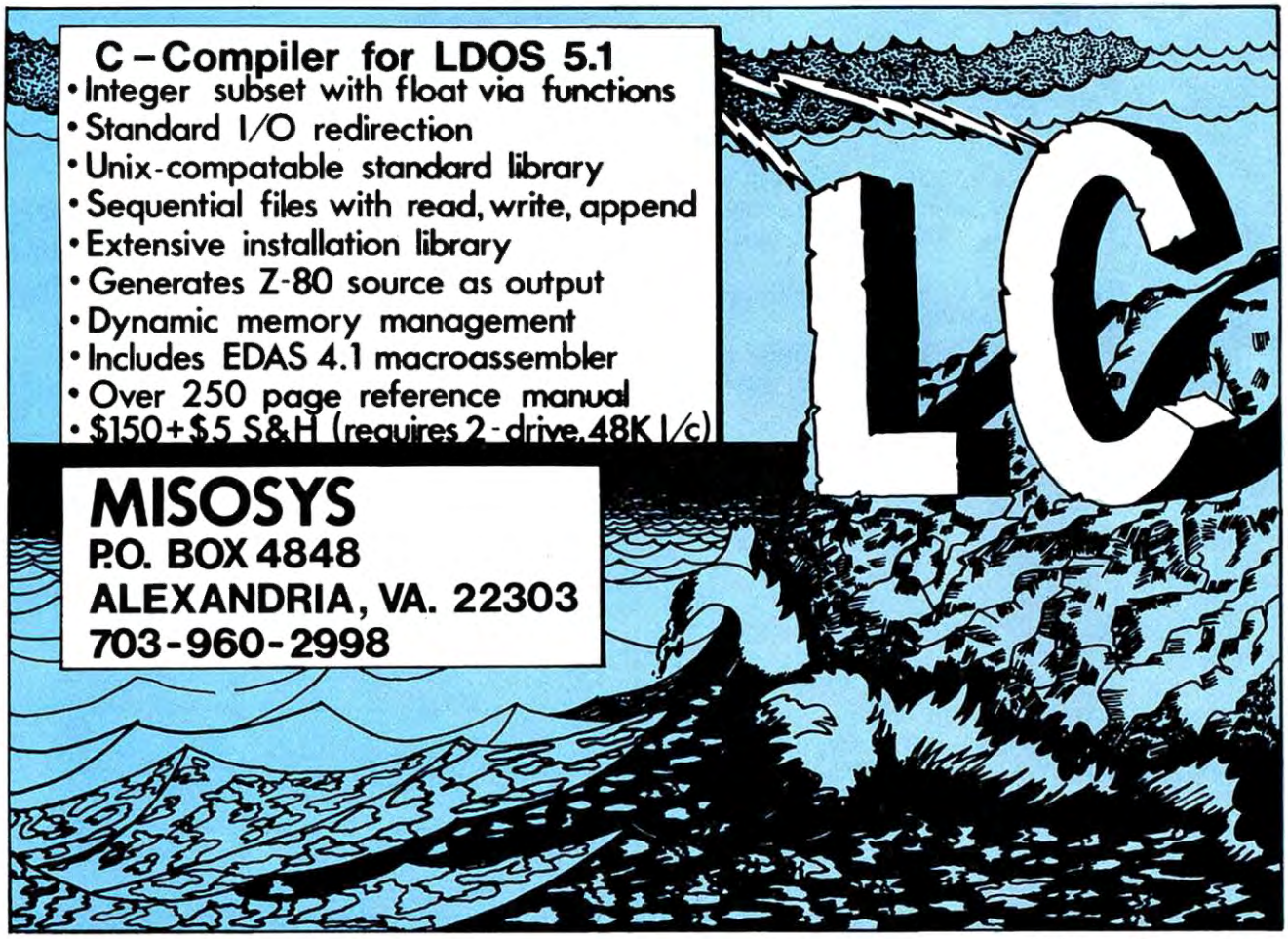

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SCH A	SCH G	Form 1116	Form 4255	PG I 4972	RENTAL STATEMT	SCH D 1120	K1 1041
SCH B	SCH R&RP	Form 2119	Form 4562	Form 5695	I.R.A.	Form 2220	SCH D 1041
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The Taxman Cometh

by Robert Athanasiou

The chance of being audited by the Internal Revenue Service is about the same as that of being hit by a bus. The odds of surviving are also about the same if you can't prove that your deductions are legitimate.

You need good records to protect your cash from the tax collector.

So you think you'll never be audited? Why not be on the safe side with Taxman, just in case?

```
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F = Fed w/held, E = FICA(Soc.Sec), B = Bus/Prof, I = Interest,
D = Dvdnd, C = Contrib, T = Taxes, M = Medical, O = Other

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   DS      STATE TAX                              $ 1234.56
   DE      FICA                                   $ 2019.95
   IW      ____________________________________   $_____.__

ENTER THE SOURCE OF INCOME OR DEDUCTION
  ** press <up-arrow> to go BACK one column
```

Figure 1. Data-entry screen.

```
ENTER ITEMS USING THESE CATEGORIES: W = Wages, S = State w/held
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>  DO      SUBSCRIPTION TO 80-MICROCOMPUTING      $   19.23

<P>PRINT FILE    <L>LOAD FROM DISK    <R>RESUME    <Q>QUIT
<D>DELETE    <I>INSERT    <S>SAVE ON DISK    <Y>YTD SUMMARY
```

Figure 2. Command-mode screen.

Taxman can help. The Model I/III program lets you record income and deductions as they come along, and handles the computations. At the end of the year, all you do is push the Y key, and you have a full summary of your form 1040 information.

Even if you don't get audited, Taxman will make your life easier at tax time.

How It Works

Figure 1 shows the screen when you enter data. The program is self-prompting. It records up to 200 entries and lets you scroll them for review. Each data entry column is prompted by a set of underline characters [CHR$(95)] and directions at the bottom of the screen.

You can backspace to correct wrong entries at any time, as well as delete or insert lines. You enter the amount of your deduction as you would on a calculator, with the decimal point and dollar sign already in place.

When you're in the command mode (see Fig. 2), the arrow keys control screen scroll. You can scroll continuously by holding the up-arrow key; if you press both the shift and up-arrow keys simultaneously, you'll scroll until you press another key. The down-arrow key works the same.

The Key Box

Models I and III
32K RAM
Disk Basic
Printer

I inserts a line, and D deletes the line indicated by the cursor. L loads data previously saved and S saves the data under the file name TAXFILE/DAT. P prints the file, without categorizing or summing, for archival or review purposes. Q returns you to Basic while R resumes the program where you left off. Y prints the summary and can be used at any time to let you see how you're doing.

The summarized data for the year to date appears in Fig. 3. (The example is entirely fictitious.)

```
**********************************************************************************
INCOME FROM WAGES:
     ANYWHERE GENERAL HOSPITAL  1982 YTD    $65432.10
                                                SUBTOTAL =    $65,432.10
----------------------------------------------------------------------------------

BUSINESS OR PROFESSIONAL INCOME:
     SOFTWARE SOLD TO 80-MICROCOMPUTING     $12345.60
     CONSULTING: UNIV OF FLORIDA            $  500.00
                                                SUBTOTAL =    $12,845.60
----------------------------------------------------------------------------------

DIVIDEND INCOME FROM INVESTMENTS:
     TANDY CORP STOCK  CK#12245             $  876.00
     EMPLOYEES CREDIT UNION #12345          $   56.21
                                                SUBTOTAL =       $932.21
----------------------------------------------------------------------------------

INTEREST INCOME (FROM SAVINGS):
     FIRST NATIONAL BANK OF ANYWHERE        $ 1234.50
     2ND NATIONAL BANK ACCT # 456789        $   98.78
                                                SUBTOTAL =     $1,333.28
----------------------------------------------------------------------------------

OTHER AND MISCELLANEOUS INCOME:
                                                SUBTOTAL =         $0.00
----------------------------------------------------------------------------------

                    ***    TAX WITHELD SUMMARY    ***

FEDERAL TAX WITHELD:
     FEDERAL TAX                            $12345.67
                                                SUBTOTAL =    $12,345.70
----------------------------------------------------------------------------------

STATE TAX WITHELD:
     STATE TAX                              $ 1234.56
                                                SUBTOTAL =     $1,234.56
----------------------------------------------------------------------------------

FICA (SOCIAL SECURITY) WITHELD:
     FICA                                   $ 2019.95
                                                SUBTOTAL =     $2,019.95
----------------------------------------------------------------------------------

                  ***    SUMMARY OF DEDUCTIONS    ***

BUSINESS OR PROFESSIONAL DEDUCTIONS:
     TRS-80 MOD 3 TAX CALCULATING DEVICE    $ 2295.00
                                                SUBTOTAL =     $2,295.00
----------------------------------------------------------------------------------

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     CREDIT CARD REVOLVING CREDIT ACCT      $    1.23
                                                SUBTOTAL =     $1,231.23
----------------------------------------------------------------------------------

CHARITABLE CONTRIBUTIONS:
     THE CHARITY OF MY CHOICE               $  123.45
     SIGMA ALPHA EPSILON, INC               $  100.00
     ARRL DEVELOPMENT FUND                  $  100.00
                                                SUBTOTAL =       $323.45
----------------------------------------------------------------------------------

DEDUCTABLE TAXES (real estate, sales, etc.):
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     SALES TAX ON 1982 MERCEDES-BENZ        $ 1234.56
                                                SUBTOTAL =     $1,690.68
----------------------------------------------------------------------------------

MEDICAL EXPENSES:
     DR. CUTTER: CHOLECYSTECTOMY            $  456.12
                                                SUBTOTAL =       $456.12
----------------------------------------------------------------------------------

OTHER MISCELLANEOUS DEDUCTIONS:
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     OIL LEASING/DRILLING DEPLETION AL.     $  789.45
                                                SUBTOTAL =       $808.68
----------------------------------------------------------------------------------
```

Figure 3. Fictitious summarized data for year to date.

Inside Taxman

I wrote this program with the help of subroutines from Lewis Rosenfelder's book *Basic Faster and Better*. They cut my programming and debugging time considerably. The book has line-by-line descriptions of the subroutines and machine-language programs used here.

In the Program Listing line 10 speeds up the program by assigning memory locations to the variables in order of frequency of use. Line 10 also specifies that each data line is 63 bytes long, that there is a limit of 200 lines, and that memory above −12600 is saved for storing the data. If you wanted to use a limit of 300 lines, LM should equal 300 and MB should equal −18900. The start of the search routine in line 180 would then change from CEC8 hexadecimal (hex) to B634 hex.

The program uses two machine-language routines. The first is Move Data, which is loaded in line 40 and called in line 7020. In line 7020 the From address is placed in array position US(1), the To address in US(3), the number of bytes to move in US(5), and the method—LDIR—in US(6). A move using the Z80 code LDDR would be represented by −18195 in US(6). The Move Data routine is also called in lines 8130, 8180, 8200, 8220, 8390, and 8410. In each case you need only specify the From and To addresses, the number of bytes, and the method used to move them. Like all of Rosenfelder's routines, it is fast.

The second machine-language program is a Search routine that loads into array SS in line 140. Taxman uses the array C to pass information to the Search routine; that is, the starting position of the search (CEC8 hex), the number of bytes per string (63), and the offset position in the string (3), as shown in line 180. The Search routine finds the search key string, SK$, specified in lines 1000–1170.

The Search subroutine called in 2010 uses the information in line 2000 to search for the first occurrence of SK$, place the string in which it is found in temporary reserve in RE$, and keep track of how many strings it is to search (LN). This useful Search routine rapidly accumulates the items and subtotals by category.

Lines 500–570 control the data input for each segment of the data line. This input technique is virtually foolproof since you can only enter an I or a D for the first data item and a member of the set defined by AX$ for other columns. You can enter only numeric data in the amount column.

Just about the only way you can bug this program is to start entering data without first loading the data already saved on disk. If you trust yourself to remember to load data each time you

Continued on p. 104

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✓ 308

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✓ 297

Program Listing. TAXMAN.BAS.

```
10  CLEAR2000:DEFINTA-Z:DIMA$,A,PO,AN$,LZ,PL,A1,LV,LT,LI,AX$,LE,LN
,J,X,MB,TT!,RE$,SK$,S,M$,LM,CN$,SG$,DS,AD$,AH$,US(7),SS(84),C(9):L
E=63:LM=200:MB=-12600:J=0:LI=384:LV=7:LZ=0:LN=0
40 SG$=STRING$(63,131):DEFFNCN$(A$,A)=STRING$(A/2-LEN(A$)/2-.5," "
)+A$:M$="$$###,###.##":US(0)=8448:US(2)=4352:US(4)=256:US(7)=201:
DATA32717,-6902,-7715,20189,-8948,94,22237,6913,33,-13568,12345,64
01,1320,10731,6379,-5132
120 DATA28381,-8956,1382,-8935,4725,29917,-8941,4206,26333,17937,9
032,9054,-10922,-8763,94,22237:DATA-8959,2158,26333,-18679,21229,2
1560,28381,-8942,4966,24285,5646,6400,-11839,-14891,-16870,1568
140 DATA8979,-2032,8472,28381,-8960,358,-8925,117,29917,-8959,4718
,26333,-8941,3166,22,-8935:DATA4725,29917,6163,-8780,2670,26333,17
931,24285,-8942,4950,29475,29219,28381,-8960,358,1048:DATA46,38,-1
5935,-25917,10:FORX=0TO84:READSS(X):NEXT
180 C(2)=&HCEC8:C(6)=63:C(7)=3
200 CLS:POKE16420,1:PRINTFNCN$("TAXMAN",64):PRINTFNCN$(CHR$(239)+"
 1982  by Robert Athanasiou, PhD, MD",64):PRINT:PRINT
210 PRINT"This program was built with the help of subroutines and
data handlers developed by Lewis Rosenfelder in his fascinating
book BASIC FASTER AND BETTER & OTHER MYSTERIES.";
220 PRINT" published by IJG Inc. 1981, Upland CA.":PRINT:PRINTFNCN
$("PRESS ANY KEY TO CONTINUE",64):GOSUB6200
230 CLS:PRINT"To use the program follow the directions at the top
of the
screen and the prompts at the bottom.  The <up-arrow> will send yo
u back a column to correct an error or move you to the commandmode
.";
235 PRINT"  In the COMMAND MODE, the <arrow>";
240 PRINT" keys will scroll the
data up or down the screen.  Other commands are listed at the
bottom of the screen.  When entering data, use the 2 letter codest
arting with an I for an INCOME item or a D for a ";
250 PRINT" Deduction.  Witholding and FICA are considered deductio
ns.
  Press the <ENTER> key after each of the two letter codes then
you'll be ready to enter the source then the amount for the item"
260 PRINT:PRINT"A MAXIMUM OF 200 ITEMS MAY BE SAVED IN THE MEMORY
ALLOTTED":PRINT:PRINTFNCN$("PRESS ANY KEY TO CONTINUE...",64):GOSU
B6200:CLS:PRINTFNCN$("In the COMMAND mode:",64):PRINT
290 PRINT"<UP-ARROW> scrolls data up; <SHIFT><UP-ARROW> scrolls un
til
     another key is pressed.  <DOWN-ARROW> is similar.":PRINT
300 PRINT"<D> deletes a line, <I> inserts a line":PRINT:PRINT
"<L> and <S> load and save data to disk.":PRINT
310 PRINT"<R> resumes program, <Q> ends program and returns to BAS
IC":PRINT:PRINT"<P> prints the data for hard copy storage or check
ing.":PRINT
320 PRINT"<Y> invokes the subroutine that sums the tax categories
and
     prints a copy for your accountant or form 1040.":PRINTFNCN$("
PRESS ANY KEY TO BEGIN PROGRAM",64);:GOSUB6200
400 CLS:PRINT"ENTER ITEMS USING THESE CATEGORIES: W = Wages, S = S
tate w/held":PRINT"F = Fed w/held, E = FICA(Soc.Sec), B = Bus/Prof
, I = Interest,":PRINT"D = Dvdnd, C = Contrib, T = Taxes, M = Medi
cal, O = Other":PRINTSG$:PRINT@832,SG$
410 PRINT@256,"CODE/CAT";TAB(16)"DATE & SOURCE OF INC OR DED";TAB(
48)"AMOUNT":PRINT@320,SG$:GOSUB8000:GOTO200
500 PRINT@896,CHR$(31);"<ENTER> CODE then  <ENTER> CATEGORY... I =
 INCOME, D = DEDUCTION  ** press <up-arrow> to go to COMMAND mode.
..";:IFDS=0GOTO8240
510 LT=3:A1=1:GOSUB7000:AX$="ID":PRINTCHR$(30);:GOSUB6000:LT=4:A1=
1:GOSUB7000:AX$="WSEFBIDCTMO":PRINTCHR$(30);:GOSUB6000:IFA$=CHR$(9
1)THENRETURN
520 PRINT@896,CHR$(31);"ENTER THE SOURCE OF INCOME OR DEDUCTION
  ** press <up-arrow> to go BACK one column";:LT=10:A1=36:GOSUB700
0:AX$=" !#$%&'()*+=-,./;:@<>?ABCDEFGHIJKLMNOPQRSTUVWXYZ1234567890"
:GOSUB6000:IFA$=CHR$(91)THEN500
540 PRINT@896,CHR$(31);"ENTER AMOUNT without using the dollar sign
  ** press <up-arrow> to go BACK one column";:LT=48:A1=8:GOSUB7000
:GOSUB6100:IFA$=CHR$(91)THEN520
560 IFVAL(AN$)>99999THEN540
570 RETURN
1000 CLS:LINEINPUT"ENTER DATE OF THIS SUMMARY  ";AD$:LINEINPUT"ENT
ER HEADING FOR THIS SUMMARY  ";AH$:LPRINTFNCN$(AH$,80):LPRINTFNCN$
(AD$,80):LPRINT:LPRINTSTRING$(79,"*"):LPRINT"INCOME FROM WAGES:":S
K$="IW":GOSUB2000
1040 LPRINT"BUSINESS OR PROFESSIONAL INCOME:":SK$="IB":GOSUB2000:L
PRINT"DIVIDEND INCOME FROM INVESTMENTS:":SK$="ID":GOSUB2000:LPRINT
"INTEREST INCOME (FROM SAVINGS):":SK$="II":GOSUB2000
1070 LPRINT"OTHER AND MISCELLANEOUS INCOME:":SK$="IO":GOSUB2000:LP
RINTFNCN$("***    TAX WITHELD SUMMARY    ***",80):LPRINT:LPRINT"FE
DERAL TAX WITHELD:":SK$="DF":GOSUB2000:LPRINT"STATE TAX WITHELD:":
SK$="DS":GOSUB2000
1110 LPRINT"FICA (SOCIAL SECURITY) WITHELD:":SK$="DE":GOSUB2000:LP
RINTFNCN$("***    SUMMARY OF DEDUCTIONS    ***",80):LPRINT:LPRINT"
```

Listing continued

Listing continued

```
BUSINESS OR PROFESSIONAL DEDUCTIONS:":SK$="DB":GOSUB2000
1140 LPRINT"INTEREST (e.g. loan or mortgage) DEDUCTIONS:":SK$="DI"
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RINT"DEDUCTABLE TAXES (real estate, sales, etc.):":SK$="DT":GOSUB2
000
1170 LPRINT"MEDICAL EXPENSES:":SK$="DM":GOSUB2000:LPRINT"OTHER MIS
CELLANEOUS DEDUCTIONS:":SK$="DO":GOSUB2000:GOTO400
2000 C(0)=1:TT!=0:RE$=STRING$(63," "):C(4)=LN:C(5)=VARPTR(RE$):C(8
)=VARPTR(SK$)
2010 DEFUSR1=VARPTR(SS(0)):J=USR1(VARPTR(C(0))):IFJ=0GOTO2050
2030 LPRINTTAB(5)RIGHT$(RE$,53):TT!=TT!+VAL(RIGHT$(RE$,14)):IFC(0)
<LNTHENC(0)=C(0)+1:GOTO2010
2050 LPRINTTAB(50)"SUBTOTAL = ";:LPRINTUSINGM$;TT!:LPRINTSTRING$(7
9,"-"):LPRINT:RETURN
3000 IFDS=0THENEND
3010 CLS:PRINT@64,FNCN$("=>  YOU HAVE DATA IN RAM !  <=",64):PRINT
"ENTER <S> TO SAVE THE DATA
ENTER <R> TO RETURN TO THE PROGRAM
ENTER <QUIT> TO END WITHOUT SAVING THE DATA":PRINT:INPUTAQ$
3040 AQ$=LEFT$(AQ$,1):ONINSTR("SRQ",AQ$)GOTO8320,400,3050:GOTO3010
3050 CLS:PRINT@384,FNCN$("OK !",64):END
4000 LZ=0:PRINTLI,CHR$(30);STRING$(LV-1,13);:LT=1:GOSUB7010:GOSUB8
380:A1=63:GOSUB5000:LPRINTAN$:IFLZ=LNTHEN8040ELSELZ=LZ+1:GOTO2030
5000 AN$=" ":POKEVARPTR(AN$),A1:POKEVARPTR(AN$)+2,INT(PO/256)+60:P
OKEVARPTR(AN$)+1,PO-INT(PO/256)*256:RETURN
6000 A=0:PRINT@PO,STRING$(A1,95);
6010 IFA=A1THEN6040ELSEPRINT@PO+A,CHR$(95);
6020 A$=INKEY$:IFA$=""THEN6020ELSEIFINSTR(AX$,A$)THENPRINT@PO+A,A$
;:A=A+1:GOTO6010
6030 ONINSTR(CHR$(8)+CHR$(31)+CHR$(13)+CHR$(91),A$)GOTO6050,6000,6
080,6070:GOTO6010
6040 A$=INKEY$:IFA$=""THEN6040ELSE6030
6050 IFA<A1THENPRINT@PO+A,CHR$(95);
6060 A=A-1:IFA<0THENA=0:GOTO6010ELSE6010
6070 A=0
6080 IFA$=CHR$(91)THENPRINT@PO,STRING$(A1,95);ELSEPRINT@PO+A,STRIN
G$(A1-A," ");
6090 GOSUB5000:RETURN
6100 S=1:AN$="":PRINT@PO,"$";STRING$(A1,95);" ";:PRINT@PO+A1-2,"."
;
6110 A$=INKEY$:IFA$=""THEN6110ELSEIFINSTR("0123456789",A$)THEN6130
ELSEONINSTR("-"+CHR$(8)+CHR$(31)+CHR$(13)+CHR$(91),A$)GOTO6150,610
0,6100,6170,6160
6120 GOTO6110
6130 AN$=AN$+A$:IFLEN(AN$)=1THENAN$=CHR$(95)+AN$ELSEIFLEN(AN$)>A1-
1THENAN$=LEFT$(AN$,A1-1)ELSEIFLEN(AN$)=3ANDLEFT$(AN$,1)=CHR$(95)TH
ENAN$=RIGHT$(AN$,2)
6140 PRINT@PO+A1-LEN(AN$),LEFT$(AN$,LEN(AN$)-2);".";RIGHT$(AN$,2);
:GOTO6110
6150 S=-S:PRINT@PO+A1+1,"";:IFS=-1THENPRINT"-";:GOTO6110ELSEPRINT"
 ";:GOTO6110
6160 IFA$=CHR$(91)THENPRINT@PO+1,STRING$(A1,95);" ";:PRINT@PO+A1-2
,".";:GOTO6190ELSEPRINT@PO,STRING$(A1+2," ");:GOTO6190
6170 IFLEN(AN$)=0THENPRINT@PO,STRING$(A1+2," ");:GOTO6190ELSEPRINT
@PO+1,STRING$(A1-1-LEN(AN$)," ");:IFLEFT$(AN$,1)=CHR$(95)THENPRINT
@PO+A1-1,"0";:MID$(AN$,1,1)="0"
6180 AN$=MID$(AN$,1,LEN(AN$)-2)+"."+RIGHT$(AN$,2):IFS=-1THENAN$="-
"+AN$
6190 RETURN
6200 A$=INKEY$:IFA$=""THEN6200ELSERETURN
7000 IFLZ>LV-1THENPL=LI+(LV-1)*64:PO=PL+LT:PRINT@PO,"";:RETURNELSE
PL=LI+LZ*64:PO=PL+LT:PRINT@PO,"";:RETURN
7010 IFLZ<LVTHENGOSUB7000:RETURNELSEJ=0
7020 US(1)=15424+LI:US(3)=15360+LI:US(5)=(LV-1)*64:US(6)=-20243:DE
FUSR0=VARPTR(US(0)):J=USR0(0):GOSUB7000:PRINT@PL,CHR$(30);:RETURN
8000 GOSUB500
8010 IFA$="["THENPRINT@PL,CHR$(30);:GOSUB8370:GOSUB8040:IFA$="E"TH
ENRETURNELSE8030
8020 GOSUB8370:LZ=LZ+1:LN=LZ:GOSUB7010
8030 IFLN<LMTHEN8000ELSEPRINT@896,CHR$(31);"LIMIT OF";LM;" ENTRIES
 HAS BEEN REACHED.
PRESS <ENTER>...";:GOSUB6200:A$="[":GOTO8010
8040 PRINT@896,CHR$(31);"<P>PRINT FILE    <L>LOAD FROM DISK    <R>
RESUME   <Q>QUIT
<D>DELETE   <I>INSERT   <S>SAVE ON DISK      <Y>YTD SUMMARY";
8050 GOSUB8490:GOSUB6200:GOSUB8500
8060 A=INSTR(CHR$(91)+CHR$(10)+CHR$(27)+CHR$(26)+"RPIDLSYQ",A$):ON
AGOTO8080,8090,8100,8110,8120,4000,8130,8200,8240,8320,1000,3000:G
OTO8050:RETURN
8080 GOSUB8400:IFPEEK(14591)>0THEN8080ELSE8050
8090 GOSUB8500:GOSUB8460:GOSUB8490:IFPEEK(14591)>0THEN8090ELSE8050
8100 GOSUB8500:GOSUB8400:GOSUB8490:A$=INKEY$:IFA$=""THEN8100ELSE80
60
8110 GOSUB8500:GOSUB8460:GOSUB8490:A$=INKEY$:IFA$=""THEN8110ELSE80
60
8120 IFLZ=LNTHENGOSUB8500:RETURNELSEGOSUB8460:GOTO8120
```

Listing continued

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Listing continued

```
8130 IFLN>=LMTHEN8120ELSEGOSUB8500:IFPL<>LI+LV*64-64THENUS(1)=1536
0+LI+LV*64-65:US(3)=US(1)+64:US(5)=(LI+LV*64-64)-PL:US(6)=-18195:J
=USR(0)
8140 PRINT@PL,CHR$(30);:GOSUB500:IFA$<>"["THEN8180ELSEIFPL<>LI+LV*
64-64THENUS(1)=PL+15360+64:US(3)=US(1)-64:US(6)=-20243:J=USR(0)
8160 J=LZ:A1=PL:LZ=LZ+((LI+LV*64-64)-PL)/64:PL=LI+LV*64-64:IFLZ>LN
THENPRINT@PL,CHR$(30);ELSEGOSUB8380
8170 LZ=J:PL=A1:GOTO8040
8180 US(1)=LN*LE+LE+MB:US(3)=US(1)+LE:US(5)=(LN-LZ)*LE+LE:US(6)=-1
8195:J=USR(0):LN=LN+1:GOSUB8370:GOSUB8460:GOTO8040
8200 IFLZ=LNTHEN8050ELSEIFPL<>LI+LV*64-64THENUS(1)=PL+15424:US(3)=
US(1)-64:US(5)=(LI+LV*64-64)-PL:US(6)=-20243:DEFUSR0=VARPTR(US(0))
:J=USR0(0)
8210 J=LZ:A1=PL:LZ=LZ+((LI+LV*64)-PL)/64:PL=LI+LV*64-64:IFLZ>LNTHE
NPRINT@PL,CHR$(30);ELSEGOSUB8380
8220 LZ=J:PL=A1:US(1)=MB+1+LZ*LE+LE:US(3)=US(1)-LE:US(5)=(LN-LZ)*L
E:DEFUSR0=VARPTR(US(0)):J=USR0(0):LN=LN-1:GOTO8050
8240 IFDS=1THENGOTO3010ELSELZ=0:LN=0:DS=1:PRINT@LI,CHR$(30);STRING
$(LV-1,13);:PRINT@896,CHR$(31);"LOADING FROM DISK...";
8250 ONERRORGOTO8300:OPEN"I",1,"TAXFILE/DAT":ONERRORGOTO0
8260 IFEOF(1)THEN8290ELSELINEINPUT#1,AN$
8270 LT=1:GOSUB7000:PRINTAN$;:GOSUB8370:LZ=LZ+1:GOTO8260
8290 CLOSE1:LZ=LZ-1:LN=LZ:GOTO8040
8300 LZ=0:LN=0:RESUME8040
8320 LZ=0:DS=0:PRINT@LI,CHR$(30);STRING$(LV-1,13);:PRINT@896,CHR$(
31);"SAVING ON DISK...";:OPEN"O",1,"TAXFILE/DAT"
8340 LT=1:GOSUB7010:GOSUB8380:A1=LE:GOSUB5000:PRINT#1,AN$:IFLZ=LNT
HENCLOSE1:GOTO8040ELSELZ=LZ+1:GOTO8340
8370 US(1)=PL+15361:US(3)=LZ*LE+MB+1:US(5)=LE:US(6)=-20243:GOTO839
0
8380 US(1)=LZ*LE+MB+1:US(3)=PL+15361:US(5)=LE:US(6)=-20243:GOTO839
0
8390 A=0:DEFUSR0=VARPTR(US(0)):A=USR0(0):RETURN
8400 GOSUB8500:LZ=(LZ-1)*-((LZ-1)>0):IFLZ<LV-1THEN8450
8410 US(1)=15360+LI+LV*64-65:US(3)=US(1)+64:US(5)=(LV-1)*64:US(6)=
-18195:DEFUSR0=VARPTR(US(0)):J=USR0(0):J=LZ:LZ=LZ+1-LV:PL=LI:GOSUB
8380:LZ=J
8450 GOSUB8490:RETURN
8460 LZ=LZ+1:IFLZ>LNTHENLZ=LN:RETURNELSEIFLZ<LVTHEN8480ELSEGOSUB70
20:PL=LI+LV*64-64
8470 GOSUB8380
8480 RETURN
8490 GOSUB7000:PRINT@PL,CHR$(62);:RETURN
8500 GOSUB7000:PRINT@PL," ";:RETURN:END
```

Continued from p. 101

use the program, delete this from line 500:

```
:IF DS=0 GOTO 8240
```

After you load the data, press R and begin adding new data. Lines 3000–3050 try to keep you from exiting the program before saving your data.

After you have the program running, you can save space and speed up the program by removing the blanks and REMs and combining lines.

Rosenfelder's subroutines are available on disk and are a great buy for the serious programmer. His book and the disks are available from IJG Inc., 1260 West Foothill Blvd., Upland, CA 91786 and several mail-order houses. Radio Shack offers the book but not the disks. ■

Contact Robert Athanasiou at 13 Lawnridge Ave., Albany, NY 12208.

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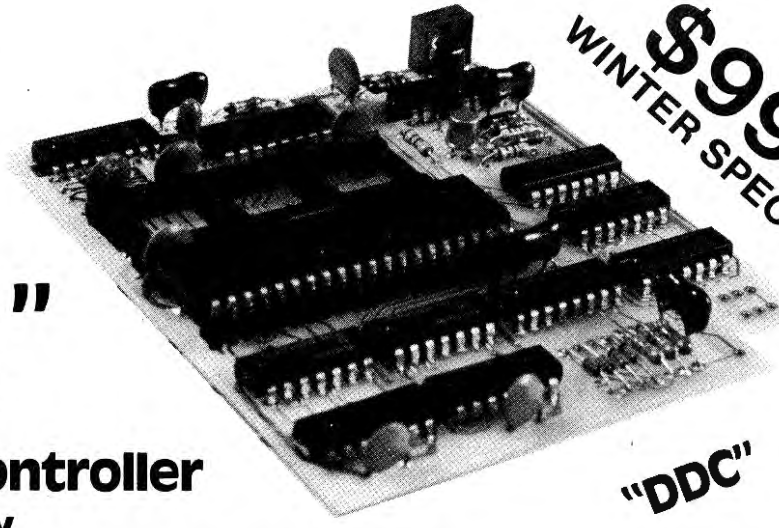

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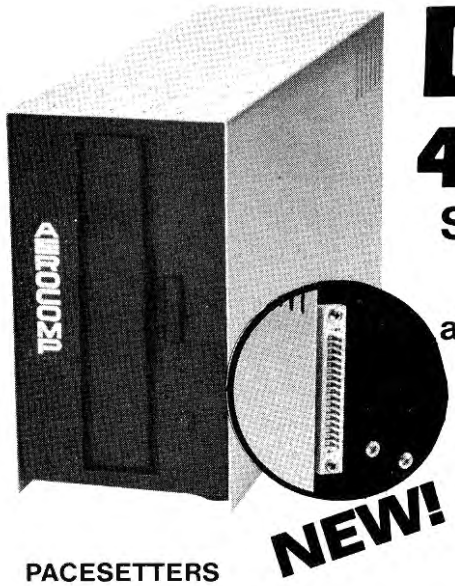

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A New Constellation

by Charles R. Perelman

You want to invest in a comprehensive word processing package for your CP/M system, so take a look at MicroPro's all-star line-up.

★★★★

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MicroPro International has bundled some of its most popular and valuable word processing programs into a multifaceted package. WordStar Professional consists of WordStar 3.30, MailMerge 3.30, SpellStar 3.30, and StarIndex 1.01. It's a reasonably well-integrated package and, despite its high cost, I think it's worthwhile for both the student and the professional writer.

Installation is menu driven and the programs support most printers. You can select WordStar, MailMerge, and SpellStar from the main menu by pressing a single key. StarIndex is an entirely separate program.

WordStar 3.30

The star of this package is still WordStar, one of the top micro word processors. You get a full panoply of features that give you an almost exact screen preview of the way your text prints out.

Cursor movement and scrolling occur in all directions and include single row or column changes, jumps to the beginning or end of a document, and automatic horizontal scrolling of up to 240 characters. Insert, delete, find, replace, and a good range of block functions perform traditional roles.

You can repeat many commands continuously, and you have sophisticated wildcard and global search and replace options. This latest WordStar is noticeably faster than prior releases.

Extensive formatting choices control top, bottom, right, and left margins, tabs, justification, hyphenation, line spacing, single line headers and footers, and page length. If your printer supports bidirectional printing, boldface, double strike, underline, strikeout, strikeover, subscript, superscript, varied character pitch, and line height, WordStar provides these functions through commands you enter in the margins or embed in your document.

Column manipulations and decimal tabs aid your preparation of tables or newsletter-style text.

File commands let you write portions of a file to a new file or insert an entire external file into your current work. Without terminating your edit, you can access the WordStar directory, copy a different file even to another disk, rename, or delete another file.

Theoretically you can print out one file while editing another, but the spooling is partial. Rapidly entering new text interrupts the printer.

Directory displays don't show files with extensions of COM, HEX, SYS, OVR, REL, and $$$; this eases scanning the directory to locate a text file. Since StarIndex doesn't appear in the main menu and all but one of its files have nondisplay extensions, it's disconcerting not to find an indication of its existence in the WordStar directory.

A document file's length is limited only by disk size with virtual memory techniques. Working file requirements, retention of your original file with a BAK extension, and space for program software on the same disk reduce available space but it's more than sufficient under ordinary circumstances.

One major failing of WordStar is its limited recovery procedures for disk full errors. Saving text at regular intervals is good insurance. MicroPro has numerous reminders throughout the documentation about checking disk space.

WordStar contains good Help screens and brief lists of major commands. You can speed program operation by changing help levels and eliminating some displays as you become more proficient.

The technical manual is free to direct dealers or $50 to end users. It includes answers to commonly asked questions about WordStar and other MicroPro products, patches for specialized printer needs and unusual installation configurations, and an explanation of the label patcher.

If you have problems applying the technical manual data, telephone the technical hot line. Try to solve your enigma with the manual first, since MicroPro has a large user base and the hot line is frequently busy.

WordStar 3.30's documentation is awesome. The command card for WordStar is logically organized and easy to use. A similar card for MailMerge, SpellStar, and StarIndex gives pertinent data at a quick glance. The documentation includes adhesive labels imprinted with control characters.

The new WordStar manual is attrac-

tively printed on 6- by 9-inch sheets, and comes in a three-ring binder with a jointed cover. Tabs divide major sections. The text is well illustrated, and examples of screen prompts and document output are clear.

The manual breaks involved procedures into numbered steps and describes each in detail. Cross-referencing for related information, an index, a table of contents, and a flowchart guide further enhance the documentation.

A training guide contains 20 lessons divided into three word processing courses at different levels of proficiency. The lessons are readable, logically ordered and grouped, and easy to follow.

WordStar isn't perfect. If you have heavy continuous word processing demands, consider a hardware spooler; concurrent editing and printing operate at a snail's pace. You cannot move to a particular page by number, but you can place up to 10 markers in a document for quick movement during editing.

If you're not using the defaults, you must reset margins, line spacing, justification, and so on each time you edit. Also, WordStar does not support true proportional printing, although microjustification produces good justified printing.

WordStar doesn't implement glossary features. You can save a single heading or text selection in a separate file and read in as many of these files as you want, but this isn't as effective as a true glossary.

You don't have split screen capability for working on multiple files. Multiple line headers and footers aren't provided. You can't print the file you're editing or any part of it interactively; you must close it first.

In fairness, I don't know of a micro word processor that has all these features as well as those WordStar offers. WordStar remains a premier accomplishment, and I thoroughly enjoy using it.

MailMerge 3.30

MailMerge is a versatile WordStar adjunct. The new ability to match specific sections of a master document to data from a list meeting selected criteria, described as conditional printing, is a very powerful feature.

You prepare your master (e.g., a form letter) with WordStar. Commands preceding the text identify the data file and variables you want merged. In the body of the form, the program delineates generic variable names with ampersands. At run time, actual list data replaces the variables and MailMerge reforms paragraphs to fit the inserts.

Other MailMerge techniques permit individual determination of variables for insertion. For example, you can prompt the operator for variables on each printout (different addresses for a form letter), or, at the beginning of a file, you can quickly set variables that appear repeatedly throughout a document (the names of parties in a contract, for example).

An alternate method uses a command file like those used in editing macros, but this one is easier. You build up each task with commands, directing access to various text and data files as needed. When run, the program extracts text and data from the different files as required.

You design on-screen prompts for entering variables, inserting paper or envelopes, or changing disks. You can chain or nest files to use boilerplate provisions or to join related text for continuous page numbering.

"WordStar remains a premier accomplishment, and I thoroughly enjoy using it."

Run-time print options on the MailMerge menu are similar to those on WordStar, letting you start or stop printing at any page of the document, print continuous or single-sheet documents, and print multiple copies. If you start MailMerge after the first page of a data file, be prepared to wait as it cycles through each data item prior to your starting page.

I've saved the best for last. Conditional printing gives you some facilities of a data-base management system. You can choose different text paragraphs to match to particular elements of your data file.

You can compare any variable from your data file to alphabetic or numeric expressions based on ASCII values by using equal, greater than, less than, And, and Or delimiters. You can use up to 100 characters in a conditional command.

The result of the comparison then branches the program using If...Then or Except...Then construction. The possibilities are practically limitless, especially when you add special variables to your data file as sorting or identifier keys.

Since MailMerge uses dot commands of the same type as WordStar and you use WordStar to edit files you want merged, you need prior exposure to WordStar to feel comfortable with MailMerge. The WordStar nondocument mode used for this purpose might be alien to many users.

The documentation is well-done and packaged similarly to WordStar's. It's nicely printed with plenty of graphics, a table of contents, an index, flowcharts, and an excellent discussion of errors and warning messages.

As a bonus, Appendix C contains details on some worthwhile applications. With the four tutorial lessons on MailMerge procedures contained in the WordStar manual, you get excellent samples of MailMerge's capabilities.

SpellStar 3.30

You call SpellStar from WordStar's main menu. Sufficient disk space can be a problem, since you need work file space equal to your original file. The main 20,800-word SpellStar dictionary takes approximately 96K and the overlay (COM) file takes 18K.

Starting your spelling check is cumbersome. After answering a prompt for file name, you must go through two submenus, choose proofing as opposed to dictionary maintenance, set up a main dictionary, and possibly set up an optional dictionary containing specialized terms.

While processing your text, the program updates various statistics such as number of words in the document, words in dictionaries used, and words not recognized. The original SpellStar dictionary does not recognize some common words, such as *tabs*, *cursor*, and *nicely*. The *ly* suffix seems to generate misspelling indicators.

The next step processes the file by marking all unrecognized words. Finally, you move through the file electing whether to edit a marked word, ignore it, pass it for later review, or add it to one of the dictionaries.

SpellStar retains ignore and add-to-dictionary instructions for about the last 15 words, and handles subsequent appearances of any of these words in the same way. In a long document you might rework the same word many times. You make revisions in context as you skim through the document.

Dictionary maintenance lets you create a main or supplemental dictionary, add or delete words, or format a

purchased dictionary. It's possible to list a dictionary's contents on the screen, but you can't print them. The use of customized supplemental dictionaries is valuable and reduces unrecognized words, particularly in specialty areas.

The SpellStar manual is consistent in format with the other programs and contains an index, table of contents, and flowcharts. Presentation of material is not as cogent, perhaps because this is not as mature a product.

Enumerated steps for functions such as creating a dictionary would be helpful. The last two chapters of the WordStar training guide lead you through SpellStar procedures to give you a working knowledge of the system.

Overall SpellStar is unwieldy and slow. It also requires an inordinate amount of disk space for a main dictionary that doesn't recognize many common words. SpellStar has an abundance of handy features, but it takes too many steps to accomplish normal functions.

StarIndex 1.01

StarIndex is an orphan. Unless you know that Format.FMT is a StarIndex file, no sign of it appears in the WordStar directory display. The training guide doesn't offer any lessons in its use.

To access StarIndex with the Run command from WordStar's main menu, you must remember the COM file name (STARINDX) and the syntax. In spite of its neglect, the software is tremendously useful.

StarIndex produces alphabetical indexes, tables of contents, lists of figures and tables, and outlines, with a minimum of hassle.

Creating an index is an extension of the basic WordStar philosophy using embedded print controls and dot commands. You must prepare the file with WordStar before creating the index.

Using WordStar's Find command, you locate and mark any word in your text that you want to appear in your index. If you use the global Find and Replace command with the word surrounded by print control markers, the program rapidly indexes every repetition. StarIndex recognizes the MailMerge command for calling an external file, letting you create a single index for material in multiple files.

With dot commands you can insert a descriptive index item, such as a synonym or classification that doesn't appear in the text, for any page. You designate references as master (main headings printed in boldface) or general.

You can list subentries or detailed classifications beneath each reference. After running StarIndex, you can edit the output files.

StarIndex has only one print format, a single-column index without any title. Judicious editing with WordStar aligns two index columns to a page, and you can insert titles, such as INDEX, as headers.

"MailMerge's conditional branching opens up new applications and StarIndex adds a helpful dimension."

STARINDX.COM and its related files occupy about 56K of RAM. Check disk space before running StarIndex since the program produces three output files: another text file implementing the StarIndex commands, the table of contents, and the index files. All three combined take up somewhat more space than your unprocessed text file.

You use dot commands to produce a table of contents with a main level, up to three subsidiary levels, and separate lists of figures and tables. The program uses the same numbering system in the body of your document as in the table of contents.

Ignoring the table of contents, you can use this system to create outlines or contracts with sequential subdivision numbering. Headings or captions for figures or tables are limited to one line, but you can edit the resulting text and table of contents files to lengthen the captions.

The real versatility of StarIndex is in the options available for making your own default file and altering formats with dot commands. Style, a menu-driven utility, lets you create new patterns to replace Format.FMT. A format file gives consistency to your documents, but doesn't place directives in the text file.

Inserted dot commands override default settings from format files. If you turn off format file print controls and enter all parameters in the text file, you get a picture of the formatting in the text file, but you increase editing time.

Boldface, double strike, elongation, underlining, and insertion of spaces are print control options.

Numbering choices include combinations of upper- and lowercase Roman numbers, Arabic numbers, upper- and lowercase letters, and no numbering for main headings. You can't use Roman numerals for subsections.

Many other options are available for formatting your index, numbering pages, inserting blank pages, and so on.

Clarity and completeness of the manuals need improvement. The form is the same as that of the other programs in this package.

Appendix B (error messages) is rather terse for a beginner. Other appendixes contain a command list, an explanation of StarIndex work files, and a set of documents for the sample file included on your distribution disk.

Prior experience with WordStar is a must for thoroughly understanding the manual and program. Take MicroPro's advice and experiment with the sample file.

The documentation is good, but not as all-inclusive as that for WordStar. A discussion of the structure of StarIndex output files with TOC (Table of Contents), SI (text with print controls), and IDX (Index) extensions and of editing those files is conspicuously absent.

StarIndex integrates nicely with the balance of the WordStar Professional package. It would be more convenient if it were selectable from the main menu and prompted for input and output files.

Other enhancements I'd appreciate include the ability to enter cross references in an index without page numbers, to eliminate the periods and page numbers in a table of contents, to change the periods to other characters, to put parentheses around second and subsequent subdivision characters, to put descriptive headers preceding numbers, and to have more subdivision levels.

Summary

WordStar Professional offers a broad range of valuable word processing features. Overall, it's a quality package, with SpellStar its weakest link. On the plus side, MailMerge's conditional branching opens up new applications and StarIndex adds a helpful dimension. All in all, I recommend it for anyone who has to do a lot of writing. ■

Write Charles Perelman at 1800 Century Park East 1150, Los Angeles, CA 90067.

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Tape It Easy

by David J. Trapasso

This utility lets you alter machine-language tapes as easily as Basic tapes. Now you can edit, list, and back up system tapes.

When I bought my Model III, it had no disk drives. I felt comfortable with Basic tapes because I could load, list, change, or develop programs. But I was helpless when it came to machine-language tapes; I couldn't alter transfer speeds, list program code, or create, change, or back up machine-language tapes.

To solve this problem, I bought an assembler and wrote a Model I/III utility called Tapetility that not only backs up machine-language tapes, but provides many other features. Tapetility loads machine-language tapes into memory, tests them, writes new ones to tape, verifies the new tape with the code in memory, executes loaded programs, edits tapes, and searches through a tape for a specified program.

Using combinations of these features, you can change tape speed, name, and/or contents, identify program names and their load execution addresses, and generate machine-language tapes of programs you write.

Program Listing 1. Tape16.

```
10 CLS
20 PRINT "TAPE16 MACHINE LANGUAGE POKE ROUTINE- BY DAVE TRAPASSO"
30 POKE 16561,255:POKE 16562,123:CLEAR 10
40 PRINT "MEMORY SIZE IS NOW SET TO PROTECT THE MACHINE LANGUAGE R
OUTINE"
50 PRINT "PROGRAM LOADS AT HEX 7C00-7FEF (31744-32751 DECIMAL)
60 PRINT "CAUTION: MAKE SURE YOU SAVE THE BASIC PROGRAM BEFORE RUN
NING"
70 PRINT "WAIT ABOUT 15 SECONDS FOR THE POKE ROUTINE":S=0
80 FOR I=31744 TO 32751
90 READ A:POKE I,A:S=S+A:NEXT I
95 PRINT "THE SUM OF YOUR DATA STATEMENTS IS: ";S;", IT SHOULD BE
     108701"
96 IF S<> 108701 THEN STOP
100 REM- SET UP THE BREAK KEY VECTOR TO JUMP TO THE START OF THE P
ROGRAM
110 POKE 16396,195: POKE 16397,0: POKE 16398,124
120 INPUT "HIT THE BREAK KEY TO TO RUN";A$
130 PRINT "YOU HIT A KEY OTHER THAN BREAK" :STOP
10000 DATA49,125,64,205,248,1,205,201,1,33
10010 DATA59,127,205,105,125,62,195,50,12,64
10020 DATA33,0,124,34,13,64,33,3,66,54
10030 DATA195,35,54,12,35,54,64,6,64,62
10040 DATA95,205,53,127,16,249,33,98,127,205
10050 DATA105,125,6,1,33,252,127,229,205,64
10060 DATA0,225,126,254,87,202,122,125,254,74
10070 DATA202,46,127,254,69,202,166,126,254,84
10080 DATA40,8,254,86,40,4,254,76,32,203
10090 DATA35,54,170,205,128,126,205,147,2,205
10100 DATA53,2,254,85,32,249,33,249,63,17
```

Listing 1 continued

Running the Program

Since many people are unfamiliar with assemblers, I converted Tapetility's machine code to Basic data statements. This lets anyone who can type a simple Basic program use Tapetility. The Basic listing reads the data and then POKEs it back into memory (see Program Listings 1, 2, and 3). This takes about 15 seconds, after which you're prompted to execute the program by pushing the break key.

After you type in the utility but before you run it, make sure you save it in case you make a mistake. If you do make an error, you'll have to start all over again since there's no way to get back the Basic listing.

Once you boot up the utility, you can discard the Basic listing after you use the utility to make a copy of itself. The

Continued on p. 116

The Key Box

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With **SoftBase,** your allowed the freedom to customize your files to your specific needs using our exclusive full-screen cursor control. This gives you the ability to create client addresses, payment records and custom receipts, just to name a few. Manipulation of text is as easy as 1-2-3, using some 30 function commands.

And when you need to find and retrieve records, **SoftBase** sorts through your records electronically, using fast data access through special indexing. **SoftBase** allows you to be as selective as you like, with a variety of text retrieving methods.

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Listing 1 continued

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10110 DATA246,127,6,6,205,53,2,119,18,19
10120 DATA35,16,247,205,53,2,254,60,32,249
10130 DATA205,53,2,71,205,20,3,34,244,127
10140 DATA24,21,205,157,126,205,53,2,254,120
10150 DATA40,116,254,60,32,242,205,53,2,71
10160 DATA205,20,3,77,124,129,79,205,148,126
10170 DATA205,53,2,95,58,252,127,254,84,40
10180 DATA39,254,86,40,62,213,229,235,33,0
10190 DATA124,237,82,56,4,225,209,24,17,63
10200 DATA235,43,17,255,127,237,82,48,242,62
10210 DATA0,50,253,127,24,235,56,2,123,119
10220 DATA123,129,79,35,16,197,205,53,2,185
10230 DATA40,166,205,248,1,33,216,127,205,105
10240 DATA125,205,118,125,195,37,124,126,187,40
10250 DATA225,34,244,127,205,248,1,33,225,127
10260 DATA17,245,127,205,115,125,24,229,43,34
10270 DATA242,127,205,20,3,34,240,127,205,248
10280 DATA1,33,155,127,17,245,127,205,115,125
10290 DATA33,170,127,17,243,127,205,115,125,33
10300 DATA183,127,17,241,127,205,115,125,58,253
10310 DATA127,254,170,40,185,33,232,127,205,105
10320 DATA125,24,174,213,205,105,125,225,205,80
10330 DATA125,43,205,80,125,201,126,15,15,15
10340 DATA15,205,89,125,126,230,15,198,48,254
10350 DATA58,56,2,198,7,195,53,127,33,148
10360 DATA127,126,254,0,200,205,53,127,35,24
10370 DATA246,205,67,125,62,13,24,233,205,102
10380 DATA125,33,198,127,205,105,125,6,6,33
10390 DATA246,127,229,229,126,8,205,64,0,225
10400 DATA126,254,13,32,4,8,119,24,9,205
10410 DATA35,126,205,27,126,205,43,126,205,128
10420 DATA126,205,132,2,62,85,205,100,2,6
10430 DATA6,225,126,205,100,2,35,16,249,42
10440 DATA242,127,237,91,244,127,237,82,35,36
10450 DATA205,157,126,37,40,12,62,60,205,100
10460 DATA2,62,0,205,1,126,24,238,175,189
10470 DATA40,9,62,60,205,100,2,125,205,1
10480 DATA126,62,120,205,100,2,33,240,127,126
10490 DATA205,100,2,35,126,205,100,2,205,248
10500 DATA1,195,37,124,205,100,2,245,205,148
10510 DATA126,241,201,205,248,125,71,123,205,248
10520 DATA125,122,205,248,125,131,79,26,205,248
10530 DATA125,129,79,19,16,247,121,24,221,33
10540 DATA170,127,17,243,127,24,14,33,155,127
10550 DATA17,245,127,24,6,33,183,127,17,241
10560 DATA127,213,229,205,102,125,225,205,105,125
10570 DATA33,252,127,229,6,4,205,64,0,225
10580 DATA209,205,76,126,205,76,126,201,205,93
10590 DATA126,56,41,205,116,126,205,93,126,56
10600 DATA33,129,18,27,201,126,35,254,71,48
10610 DATA15,254,48,216,254,58,56,5,254,65
10620 DATA216,198,9,230,15,55,63,201,7,7
10630 DATA7,7,79,201,225,225,43,43,43,233
10640 DATA58,147,2,238,205,40,3,205,66,48
10650 DATA243,33,133,127,205,105,125,195,73,0
10660 DATA58,64,56,230,4,194,12,64,201,58
10670 DATA62,60,238,10,50,62,60,201,205,35
10680 DATA126,205,118,125,205,4,127,205,236,126
10690 DATA33,252,127,229,6,2,205,64,0,225
10700 DATA126,254,10,40,49,254,91,40,30,254
10710 DATA13,40,21,5,40,14,205,93,126,56
10720 DATA216,205,116,126,205,93,126,56,208,129
10730 DATA42,244,127,119,205,38,127,24,201,42
10740 DATA244,127,43,34,244,127,24,192,33,145
10750 DATA127,195,105,125,205,4,127,205,43,0
10760 DATA254,0,32,173,205,38,127,205,118,125
10770 DATA24,238,33,245,127,205,72,125,205,236
10780 DATA126,42,244,127,229,126,254,32,56,4
10790 DATA254,128,56,2,62,46,205,53,127,205
10800 DATA236,126,225,195,80,125,42,244,127,35
10810 DATA34,244,127,201,205,43,126,42,240,127
10820 DATA233,205,51,0,201,59,0,84,65,80
10830 DATA69,49,54,32,45,67,79,80,89,82
10840 DATA73,71,72,84,32,49,57,56,50,45
10850 DATA32,68,65,86,69,32,84,82,65,80
10860 DATA65,83,83,79,13,0,76,111,97,100
10870 DATA13,84,101,115,116,13,86,101,114,105
10880 DATA102,121,13,87,114,105,116,101,13,69
10890 DATA100,105,116,13,74,117,109,112,13,62
10900 DATA0,82,69,65,68,89,32,67,65,83
10910 DATA83,13,0,61,32,0,73,78,80,85
10920 DATA84,32,0,83,84,65,82,84,32,65
10930 DATA68,68,82,69,83,83,61,0,69,78
10940 DATA68,32,65,68,68,82,69,83,83,61
10950 DATA0,88,45,70,69,82,32,65,68,68
10960 DATA82,69,83,83,61,0,54,32,67,72
10970 DATA65,82,65,67,84,69,82,32,78,65
10980 DATA77,69,61,0,67,72,69,67,75,83
10990 DATA85,77,32,69,82,82,79,82,32,0
11000 DATA79,86,69,82,76,65,89,0
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23. *Eight disk files may be opened simultaneously; random, sequential or mixed.*
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26. *NEW 60+ PAGE MANUAL WITH DESCRIPTIONS AND EXAMPLE.*
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ZBASIC 2.2 DOES NOT SUPPORT THESE BASIC COMMANDS:

1. ATN, EXP, COS, SIN, LOG, TAN, and exponentiation. (However, subroutines are included in the manual for these functions.)
2. ERROR, ON ERROR GOTO, ERL, ERR RESUME.
3. No direct commands like AUTO, EDIT, LIST, LLIST ETC, although these commands may be used when writing programs.
4. Others NOT supported: CDBL, CINT, CSNG, DEFFN, FIX, FRE.
5. Normal CASSETTE I/O. (ZBASIC supports it's own SPECIAL CASSETTE I/O statements.)
6. SOME BASIC COMMANDS MAY DIFFER IN ZBASIC. For instance, END jumps to DOS READY, STOP jumps to BASIC READY etc.
7. MEMORY REQUIREMENTS: to approximate the largest BASIC program that can be compiled in your machine (at one time), enter BASIC and type: PRINT (MEM-6500)/2. Remember, you can merge compiled programs together to fill memory.

ZBASIC 2.2 SPEED COMPARISON DEMO

To help give you an idea how fast compiled programs are, we have included this demo program:

ZBASIC 2.2 DEMO PROGRAM

Time to compile and run complete program	**: 0 MIN. 2 SEC.**
BASIC Execution speed MOD 1, LEVEL II	**: 7 MIN. 34 SEC.**
ZBASIC Execution speed MOD 1, LEVEL II	**:0 MIN. 18 SEC.**
BASIC Program size (WITHOUT VARIABLES)	**: 895 BYTES**
ZBASIC Program size (WITHOUT VARIABLES)	**: 2733 BYTES**

(Remember that the ZBASIC program includes an 1879 byte subroutine package.) Program shown exactly as compiled and run in BASIC and ZBASIC.

```
10 '========= ZBASIC 2.2 EXAMPLE PROGRAM AND TIME TEST========
20 CLS:CLEAR100:DEFINT A-X:DEFSTR Z:DIM AA(64,24),Z(50):RANDOM
30 AA=100:BB=-1000:CC=3:DD=-3:EE=-9999:ST$="START TIME "+TIME$
40 FOR I=1TO127STEP2 :FOR J=47TO1STEP-3:XX=POINT(I,J):SET(I,J)
50 XX=(I-J)/CC*(7+I+J) :XX=ABS(INT(RND(I*J)-AA)+7) :RESET(I,J)
60 XX=PEEK(I+J) :POKE15360+I+J,J :OUT255,J AND (3*J):XX=INP(I)
70 AB$=STR$(I+J) :BA$=LEFT$(AB$,2) :AA(I/2,J/2)=VAL(BA$)+AA*3
80 BA$=BA$+RIGHT$(BA$,RND(3)) :XX=INSTR(1,BA$,"9"):XX=SQR(I*J)
90 BA$=MID$(BA$,2,2) :MID$(BA$,1,1)=Z :IF XX THEN 100 ELSE CLS
100 IF LEN(BA$)>3 OR SGN(XX)=1 AND ASC(BA$)=32 THEN PRINT"+++";
110 IFPOS(0)>62 THEN TRON:TROFF:PRINT ELSE XX=NOT(RND(99))+100
120 A$=INKEY$:IF A$="Y" OR A$="y" AND I>120 THEN PRINT"TRUE.."
130 RESTORE :READA,C,Z(J),D:GOSUB170:GOSUB170:GOSUB170:GOTO210
140 NEXT :PRINT"*";:NEXTI:CLS:PRINT@512,ST$,"STOP TIME ";TIME$
150 STOP'============= END OF MAIN TEST LOOP ================
160 DATA 12345,-1,"TEST",-9999
170 ON RND(6) GOTO 180,190,200,180,190,200
180 RETURN
190 RETURN
200 RETURN
210 ON RND(9) GOSUB 180,190,200,180,190,200,180,190,200
220 GOTO140
```

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Continued from p. 112

utility only takes about 1½ seconds to load under the System command at Model III high speed.

Tapetility's utilities use the hexadecimal (hex) number system to be more compatible with machine language. Don't panic if you don't know hex; you'll still be able to use the utilities.

Tapetility runs without modification on any Level II Model I/III with at least 16K of memory. I've provided three versions for different size memories. The program checks to see which machine you're using and takes the proper action.

Memory Requirements

All versions use 1K of memory. To create a system tape after you POKE it in from the Basic program, first read the section titled Operator Messages, then use the Write command by entering a W. Use the addresses listed in Table 1 when the program prompts you for them.

You can use any version of the utility that has the same or less memory as your computer. For example, TAPE16 and TAPE32 (Program Listings 1 and 2, respectively) run on a 32K machine, but TAPE32 or TAPE48 (Program Listings 2 and 3) won't run on a 16K machine. The program sets the memory stack area at 407D hex, the same area the ROM boostrap routine uses.

Special Features

You can use the break key to return to Tapetility's main menu, even during cassette input/output. This is handy for correcting while using the utility, or for interrupting cassette operations. You can also load and execute a program from the utility, provided the program you're running doesn't use the break key.

Model I users should note that their ROM won't support the break key during cassette input. However, the utility looks for the break key after it reads each byte. This means you can use the break key during input, provided the asterisk is flashing. If the asterisk isn't flashing, rewind your tape slightly, and press the play button to get it flashing again. Cassette output (record) will break at any time.

If you have a printer turned on while using the utility, all commands and addresses will be logged onto it. Since the program POKEs tape names and commands into video RAM, they don't appear on a printout when the program reads them off the tape.

Tapetility comes with the printer disabled, and you shouldn't enable the printer unless one is connected to your computer. If you do, the screen locks up while the computer waits for you to prepare the printer, and you'll have to reload the tape.

If you want to enable the printer function, use the Edit command to change the data at the addresses listed in Table 2. After making the changes, you can use the utility to make a new version of itself.

Command Descriptions

The Load command reads a tape and stores it in RAM, while Test will read a tape but not store the program in RAM.

The Verify command compares tape contents against memory content byte for byte for the addresses specified on the tape. This ensures that the tape code is exactly the same as that in memory. To generate a machine-language tape from the contents of a specified memory block, use the Write command.

The Edit command performs a variety of functions. You can use it to make changes in RAM contents, and for changing, examining, listing, or entering new programs.

The Jump command transfers control of the computer to the program you specified by the transfer address you stipulate. You can also use it to execute a program you load or to exit the utility by specifying a transfer address of 0000.

Operator Messages

All three commands—Load, Test, and Verify—identify the tape the program reads in the lower right-hand corner of your screen. These same three commands, used after the tape is read, print the following:

START ADDRESS = XXXX
END ADDRESS = XXXX
X-FER ADDRESS = XXXX

where XXXX is a four-digit number indicating the address at which the tape loads and runs in memory. You can then use these addresses to make a back-up tape using the Write command.

Checksum Error indicates a read error. Error XXXX differs from Checksum Error in that it is only generated

Continued on p. 120

Version	Start Address	End Address	Transfer Address
Tape16	7C00 (31744)	7FEF (32751)	7C00 (31744)
Tape32	BC00 (48128)	BFEF (49135)	BC00 (48128)
Tape48	FC00 (64512)	FFEF (65519)	FC00 (64512)

Table 1. Hex load addresses: Decimal in (XXXXX).

Program Listing 2. Tape32.

```
10 CLS
20 PRINT "TAPE32 MACHINE LANGUAGE POKE ROUTINE- BY DAVE TRAPASSO"
30 POKE 16561,255 :POKE 16562,187 :CLEAR 10
40 PRINT "MEMORY SIZE IS NOW SET TO PROTECT THE MACHINE LANGUAGE R
OUTINE"
50 PRINT "PROGRAM LOADS AT HEX BC00-BFEF (48128-49135 DECIMAL)
60 PRINT "CAUTION: MAKE SURE YOU SAVE THE BASIC PROGRAM BEFORE RUN
NING"
70 PRINT "WAIT ABOUT 15 SECONDS FOR THE POKE ROUTINE":S=0
80 FOR I= -17408 TO -16401
90 READ A: POKE I,A:S=S+A:NEXTI
95 PRINT "THE SUM OF YOUR DATA STATEMENTS IS: ";S;", IT SHOULD BE
    115931"
96 IF S<>115931 THEN STOP
100 REM- SET UP THE BREAK KEY VECTOR TO JUMP TO THE START OF THE P
ROGRAM
110 POKE 16396,195: POKE 16397,0: POKE 16398,188
120 INPUT "HIT THE BREAK KEY TO RUN";A$
130 PRINT "YOU HIT A KEY OTHER THAN BREAK" :STOP
10000 DATA49,125,64,205,248,1,205,201,1,33
10010 DATA59,191,205,105,189,62,195,50,12,64
10020 DATA33,0,188,34,13,64,33,3,66,54
10030 DATA195,35,54,12,35,54,64,6,64,62
10040 DATA95,205,53,191,16,249,33,98,191,205
10050 DATA105,189,6,1,33,252,191,229,205,64
10060 DATA0,225,126,254,87,202,122,189,254,74
10070 DATA202,46,191,254,69,202,166,190,254,84
10080 DATA40,8,254,86,40,4,254,76,32,203
10090 DATA35,54,170,205,128,190,205,147,2,205
10100 DATA53,2,254,85,32,249,33,249,63,17
10110 DATA246,191,6,6,205,53,2,119,18,19
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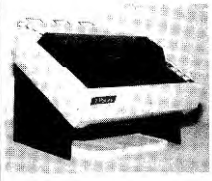

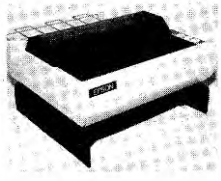

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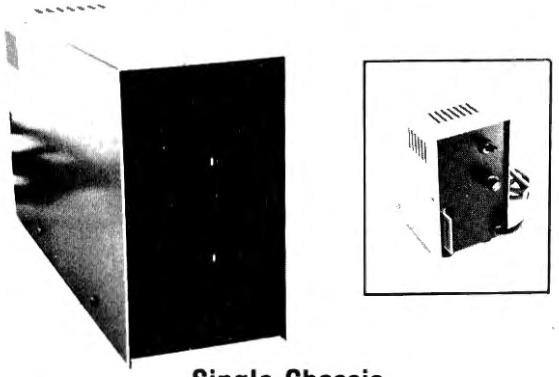

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Listing 2 continued

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10130 DATA205,53,2,71,205,20,3,34,244,191
10140 DATA24,21,205,157,190,205,53,2,254,120
10150 DATA40,116,254,60,32,242,205,53,2,#1
10160 DATA205,20,3,77,124,129,79,205,148,190
10170 DATA205,53,2,95,58,252,191,254,84,40
10180 DATA39,254,86,40,62,213,229,235,33,0
10190 DATA188,237,82,56,4,225,209,24,17,63
10200 DATA235,43,17,255,191,237,82,48,242,62
10210 DATA0,50,253,191,24,235,56,2,123,119
10220 DATA123,129,79,35,16,197,205,53,2,185
10230 DATA40,166,205,248,1,33,216,191,205,105
10240 DATA189,205,118,189,195,37,188,126,187,40
10250 DATA225,34,244,191,205,248,1,33,225,191
10260 DATA17,245,191,205,115,189,24,229,43,34
10270 DATA242,191,205,20,3,34,240,191,205,248
10280 DATA1,33,155,191,17,245,191,205,115,189
10290 DATA33,170,191,17,243,191,205,115,189,33
10300 DATA183,191,17,241,191,205,115,189,58,253
10310 DATA191,254,170,40,185,33,232,191,205,105
10320 DATA189,24,174,213,205,105,189,225,205,80
10330 DATA189,43,205,80,189,201,126,15,15,15
10340 DATA15,205,89,189,126,230,15,198,48,254
10350 DATA58,56,2,198,7,195,53,191,33,148
10360 DATA191,126,254,0,200,205,53,191,35,24
10370 DATA246,205,67,189,62,13,24,233,205,102
10380 DATA189,33,198,191,205,105,189,6,6,33
10390 DATA246,191,229,229,126,8,205,64,0,225
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10410 DATA35,190,205,27,190,205,43,190,205,128
10420 DATA190,205,132,2,62,85,205,100,2,6
10430 DATA6,225,126,205,100,2,35,16,249,42
10440 DATA242,191,237,91,244,191,237,82,35,36
10450 DATA205,157,190,37,40,12,62,60,205,100
10460 DATA2,62,0,205,1,190,24,238,175,189
10470 DATA40,9,62,60,205,100,2,125,205,1
10480 DATA190,62,120,205,100,2,33,240,191,126
10490 DATA205,100,2,35,126,205,100,2,205,248
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10530 DATA189,129,79,19,16,247,121,24,221,33
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10610 DATA15,254,48,216,254,58,56,5,254,65
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10630 DATA7,7,79,201,225,225,43,43,43,233
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10720 DATA216,205,116,190,205,93,190,56,208,129
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10910 DATA83,13,0,61,32,0,73,78,80,85
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10930 DATA68,68,82,69,83,83,61,0,69,78
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10960 DATA82,69,83,83,61,0,54,32,67,72
10970 DATA65,82,65,67,84,69,82,32,78,65
10980 DATA77,69,61,0,67,72,69,67,75,83
10990 DATA85,77,32,69,82,82,79,82,32,0
11000 DATA79,86,69,82,76,65,89,0
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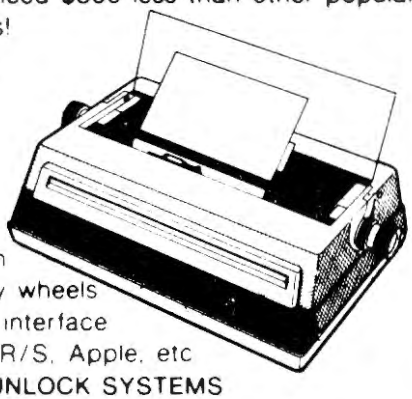

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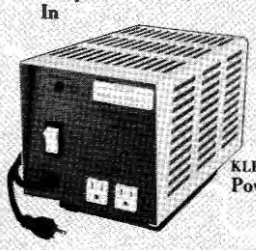

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Continued from p. 116

from the Verify command. Here, XXXX represents the hex address where the mis-compare was found. The program then returns to the main menu.

A return to the menu with no error message and a listing of addresses as stated above means the tape code is identical to that in memory.

When the READY CASS prompt appears, prepare your recorder to play or record a tape and hit any key to start.

Tapetility only generates an overlay error message from the Load command and means that the program just loaded requires an area of memory occupied by the utility. This normally wipes out the utility since you'd be altering its instructions. Tapetility checks for this condition and loads all memory locations specified by the addresses on the tape except those used by the utility. When this occurs, the overlay message appears after the computer finishes reading the tape. The Test command won't generate the message, and the Verify command gives you an Error XXXX message. Use a different version of the utility to solve the problem.

Version	Address	Enable Printer	Disable Printer
Tape16	7F38	C3	C9
Tape32	BF38	C3	C9
Tape48	FF38	C3	C9

Table 2. Data addresses for printer function.

The CASS? prompt is the same as the Model III Basic prompt, and Tapetility requests it before every cassette input or output command. The utility determines which machine you're using and bypasses the prompt on the Model I. Respond by typing an L for low speed or an H for high speed. By reading a tape at low speed and recording at high speed, you can change the speed of your existing tapes for a faster load.

The first prompt for the Write command, Input 6 Character Name=, represents the name you want recorded. Always use a six-character name. For example, if the name of your program is Yours, hit the space bar once after typing the five letters. If you press the enter key before entering any name, the utility uses the name and address read from the previous tape, and bypasses all the following input address prompts:

```
INPUT START ADDRESS=
INPUT END ADDRESS=
INPUT X-FER ADDRESS=
```

Calling All Machine-Language Programs

by David J. Trapasso

Until now, calling machine-language programs from a Basic program was difficult. You either had to load the machine-language program, protect the memory size, then load the Basic program every time you wanted to use it, or convert the binary code of the machine-language program into decimal numbers so they could be POKEd into memory from Basic.

The second method was easier since it involved loading only one tape, but both methods were prone to mistakes.

I decided to write a utility in machine language to solve this problem (see Program Listing 4). This program runs on Level II Models I and III, with at least 16K of memory. It takes the data in any block of memory entered by the user and generates a tape of data statements that Basic can read.

Once you load the Basic data tape, you can write a short POKE routine in the body of the program to read the data, and POKE the machine code back in.

The utility makes a Basic data tape starting with line 10000. Each line holds 10 pieces of data, and lines are numbered in increments of 10. You can see in Listing 4 that I used the utility on its own machine code to make a Basic program out of itself.

The utility loads at about 4K from the top of the first 16K block of memory. This is useful for those with only 16K of memory available. Any machine-language program larger than 4K won't leave enough room in a Basic program for the data statements needed to represent the machine-language program.

Once you make the data tape, the utility doesn't have to be resident in memory with the Basic program.

Notice line 30 in Listing 4. It shows one way to reserve memory without having to set the memory size every time you run the program.

When you run the Basic listing, it takes a few seconds to POKE in the machine code. After you POKE the program in, it prompts you to execute it by pressing the break key. You could also use the USR function in your program to execute it.

To use the utility, protect the memory so the machine-language program you want to copy is protected. If your code resides below the utility (7000 hex), you'll have to change line 30 of Listing 4 to protect it. You can then load the utility in the form of the Basic listing and run it.

When you run the utility, it prompts you for the starting address in hex. Enter the four-digit address, using leading zeroes is necessary. If you make a mistake, use the left arrow to correct it or the break key to reenter the entire number.

The utility then prompts you for the end address. After entering it, the READY CASSETTE prompt appears. Set your tape recorder to record and press any key. When the recorder stops, the utility will start again. It's best to make more than one copy to increase the chances that at least one copy will be good.

Make sure you load the data tape in Basic before writing the body of your program. If you don't, you'll have to find some way to merge the two sections of your program. Model III users should make sure they set the cassette speed before they run the utility to know the correct speed at which to run the data.

A good way to practice using the utility is to make a data tape of your first ROM locations. Load the generated tape in Basic, then PEEK the same locations. It's all easier than you think! ■

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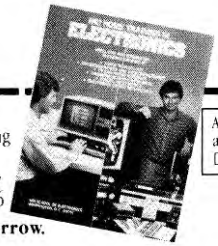

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The program then prompts for these addresses with the Write command. Enter the addresses for the block of memory you want to copy to tape and the address where program execution begins. If you're making a copy of another tape, simply hit the enter key when prompted to enter the six-character name. If you're creating a tape, such as a copy of this utility after you POKE it in from Basic, you have to enter the name and all the addresses.

To change only the tape name, type in the new name and, when prompted for the addresses, enter the addresses shown on the display after the Load or Verify command.

You must enter all addresses as four digits, and you need to include leading zeroes. Note that the program requests the transfer address during the Jump command and the start address during the Edit command.

To enter a command, enter its first letter. For example, enter a V to use the Verify command or an L to use the Load command. The > symbol that appears after the program displays the menu is the request for command entry. Terminate all user entries by hitting the enter key.

Editing

In the Edit mode, the program first prompts you for the start address of the area of RAM you want to edit. After you enter the four-character number, the utility displays the following: XXXX = A = BB = CC, where XXXX is the address at which you're currently editing and A is the ASCII representation of the data in that address. The program displays nonprintable data as a period. (Tapetility displays only ASCII characters in the range of hex 20 to 7F hex.)

BB is the actual data in the hex address, and CC is your input, up to two characters long. You have one of the following six options:

- Pressing only the enter key bumps you up to the next RAM address and displays it without changing the contents of the prior address.
- Typing one character then hitting the enter key enters the ASCII character for the key pushed into memory location. You have to enter control ASCII characters such as enter (0D hex) as hex data. The program automatically displays the next location of memory after the enter key is pushed.
- Typing two characters then pressing the enter key changes the contents of the location to the hex number typed in. Again, the program automatically displays the next address. If you type a non-hex character, however, the contents of the location won't change, and Tapetility will print out the same address again. Make sure you look at the address as you edit to see if it increases by one to the next location. If you don't, you could start putting your en-

Program Listing 3. Tape48.

```
10 CLS
20 PRINT "TAPE48 MACHINE LANGUAGE POKE ROUTINE- BY DAVE TRAPASSO"
30 POKE 16561,255: POKE 16562,251 :CLEAR10
40 PRINT "MEM SIZE IS NOW SET TO PROTECT THE MACHINE LANGUAGE ROUT
INE"
50 PRINT "PROGRAM LOADS AT HEX FC00-FFEF (64512-65519 DECIMAL)
60 PRINT "CAUTION: MAKE SURE YOU SAVE THE BASIC PROGRAM BEFORE RUN
NING"
70 PRINT "WAIT ABOUT 15 SECONDS FOR THE POKE ROUTINE":S=0
80 FOR I=-1024 TO -17
90 READ A: POKE I,A:S=S+A: NEXT I
95 PRINT "THE SUM OF YOUR DATA STATEMENTS IS: ";S;", IT SHOULD BE
    123170"
96 IF S<>123170 THEN STOP
100 REM- SET UP THE BREAK KEY VECTOR TO JUMP TO THE START OF THE P
ROGRAM
110 POKE 16396,195: POKE 16397,0 :POKE 16398,252
120 INPUT "HIT THE BREAK KEY TO RUN";A$
130 PRINT "YOU HIT A KEY OTHER THAN BREAK": STOP
10000 DATA49,125,64,205,248,1,205,201,1,33
10010 DATA59,255,205,105,253,62,195,50,12,64
10020 DATA33,0,252,34,13,64,33,3,66,54
10030 DATA195,35,54,12,35,54,64,6,64,62
10040 DATA95,205,53,255,16,249,33,98,255,205
10050 DATA105,253,6,1,33,252,255,229,205,64
10060 DATA0,225,126,254,87,202,122,253,254,74
10070 DATA202,46,255,254,69,202,166,254,254,84
10080 DATA40,8,254,86,40,4,254,76,32,203
10090 DATA35,54,170,205,128,254,205,147,2,205
10100 DATA53,2,254,85,32,249,33,249,63,17
10110 DATA246,255,6,6,205,53,2,119,18,19
```

Listing 3 continued

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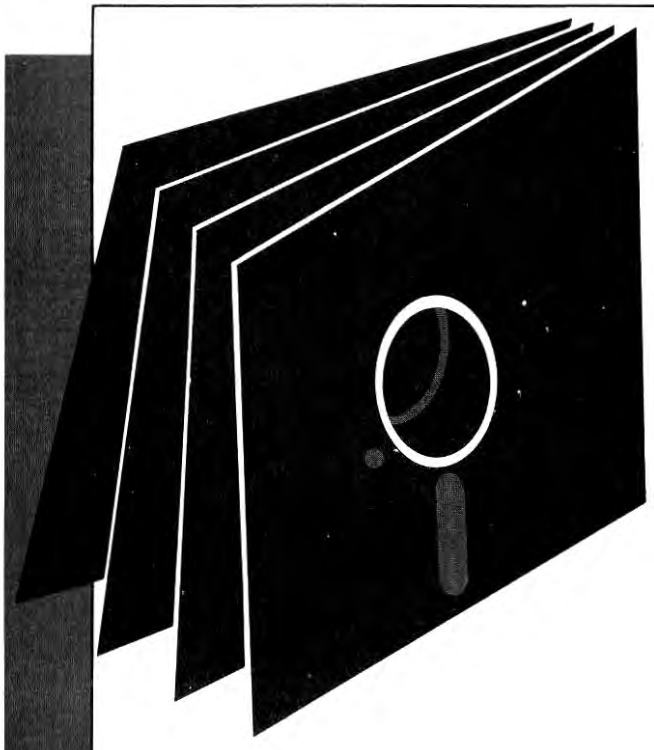

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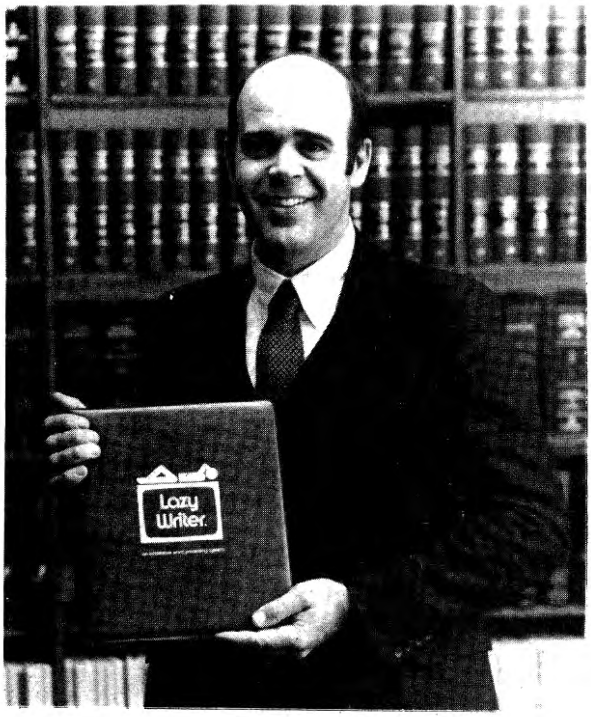

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10130 DATA205,53,2,71,205,20,3,34,244,255
10140 DATA24,21,205,157,254,205,53,2,254,120
10150 DATA40,116,254,60,32,242,205,53,2,71
10160 DATA205,20,3,77,124,129,79,205,148,254
10170 DATA205,53,2,95,58,252,255,254,84,40
10180 DATA39,254,86,40,62,213,229,235,33,0
10190 DATA252,237,82,56,4,225,209,24,17,63
10200 DATA235,43,17,255,255,237,82,48,242,62
10210 DATA0,50,253,255,24,235,56,2,123,119
10220 DATA123,129,79,35,16,197,205,53,2,185
10230 DATA40,166,205,248,1,33,216,255,205,105
10240 DATA253,205,118,253,195,37,252,126,187,40
10250 DATA225,34,244,255,205,248,1,33,225,255
10260 DATA17,245,255,205,115,253,24,229,43,34
10270 DATA242,255,205,20,3,34,240,255,205,248
10280 DATA1,33,155,255,17,245,255,205,115,253
10290 DATA33,170,255,17,243,255,205,115,253,33
10300 DATA183,255,17,241,255,205,115,253,58,253
10310 DATA255,254,170,40,185,33,232,255,205,105
10320 DATA253,24,174,213,205,105,253,225,205,80
10330 DATA253,43,205,80,253,201,126,15,15,15
10340 DATA15,205,89,253,126,230,15,198,48,254
10350 DATA58,56,2,198,7,195,53,255,33,148
10360 DATA255,126,254,0,200,205,53,255,35,24
10370 DATA246,205,67,253,62,13,24,233,205,102
10380 DATA253,33,198,255,205,105,253,6,6,33
10390 DATA246,255,229,229,126,8,205,64,0,225
10400 DATA126,254,13,32,4,8,119,24,9,205
10410 DATA35,254,205,27,254,205,43,254,205,128
10420 DATA254,205,132,2,62,85,205,100,2,6
10430 DATA6,225,126,205,100,2,35,16,249,42
10440 DATA242,255,237,91,244,255,237,82,35,36
10450 DATA205,157,254,37,40,12,62,60,205,100
10460 DATA2,62,0,205,1,254,24,238,175,189
10470 DATA40,9,62,60,205,100,2,125,205,1
10480 DATA254,62,120,205,100,2,33,240,255,126
10490 DATA205,100,2,35,126,205,100,2,205,248
10500 DATA1,195,37,252,205,100,2,245,205,148
10510 DATA254,241,201,205,248,253,71,123,205,248
10520 DATA253,122,205,248,253,131,79,26,205,248
10530 DATA253,129,79,19,16,247,121,24,221,33
10540 DATA170,255,17,243,255,24,14,33,155,255
10550 DATA17,245,255,24,6,33,183,255,17,241
10560 DATA255,213,229,205,102,253,225,205,105,253
10570 DATA33,252,255,229,6,4,205,64,0,225
10580 DATA209,205,76,254,205,76,254,201,205,93
10590 DATA254,56,41,205,116,254,205,93,254,56
10600 DATA33,129,18,27,201,126,35,254,71,48
10610 DATA15,254,48,216,254,58,56,5,254,65
10620 DATA216,198,9,230,15,55,63,201,7,7
10630 DATA7,7,79,201,225,225,43,43,43,233
10640 DATA58,147,2,238,205,40,3,205,66,48
10650 DATA243,33,133,255,205,105,253,195,73,0
10660 DATA58,64,56,230,4,194,12,64,201,58
10670 DATA62,60,238,10,50,62,60,201,205,35
10680 DATA254,205,118,253,205,4,255,205,236,254
10690 DATA33,252,255,229,6,2,205,64,0,225
10700 DATA126,254,10,40,49,254,91,40,30,254
10710 DATA13,40,21,5,40,14,205,93,254,56
10720 DATA216,205,116,254,205,93,254,56,208,129
10730 DATA42,244,255,119,205,38,255,24,201,42
10740 DATA244,255,43,34,244,255,24,192,33,145
10750 DATA255,195,105,253,205,4,255,205,43,0
10760 DATA254,0,32,173,205,38,255,205,118,253
10770 DATA24,238,33,245,255,205,72,253,205,236
10780 DATA254,42,244,255,229,126,254,32,56,4
10790 DATA254,128,56,2,62,46,205,53,255,205
10800 DATA236,254,225,195,80,253,42,244,255,35
10810 DATA34,244,255,201,205,43,254,42,240,255
10820 DATA233,205,51,0,201,59,0,84,65,80
10830 DATA69,52,56,32,45,67,79,80,89,82
10840 DATA73,71,72,84,32,49,57,56,50,45
10850 DATA32,68,65,86,69,32,84,82,65,80
10860 DATA65,83,83,79,13,0,76,111,97,100
10870 DATA13,84,101,115,116,13,86,101,114,105
10880 DATA102,121,13,87,114,105,116,101,13,69
10890 DATA100,105,116,13,74,117,109,112,13,62
10900 DATA0,82,69,65,68,89,32,67,65,83
10910 DATA83,13,0,61,32,0,73,78,80,85
10920 DATA84,32,0,83,84,65,82,84,32,65
10930 DATA68,68,82,69,83,83,61,0,69,78
10940 DATA68,32,65,68,68,82,69,83,83,61
10950 DATA0,88,45,70,69,82,32,65,68,68
10960 DATA82,69,83,83,61,0,54,32,67,72
10970 DATA65,82,65,67,84,69,82,32,78,65
10980 DATA77,69,61,0,67,72,69,67,75,83
10990 DATA85,77,32,69,82,82,79,82,32,0
11000 DATA79,86,69,82,76,65,89,0
```

tries in out of sequence at this point.

- Pressing the down-arrow key then hitting the enter key lists and displays the addresses continuously until you hit any other key. You can continue editing at the point which you stop the listing without having to reenter the address. If you have a printer turned on, you can get a printout of the program.
- Pressing the up-arrow key, then the enter key, takes you to the next lowest RAM address. This doesn't change memory contents.
- Pressing the break key takes you out of the Edit mode and returns you to the menu. After making changes, or entering a program of your own, you can use Tapetility to make a permanent copy.

Making a Back-up Copy

First, load the original copy of the tape and check for the overlay message. Use a different version of Tapetility if an overlay error occurs and try again.

Then verify the original tape. While not mandatory, it is highly recommended to ensure that the original code is identical to that in memory. If you get an Error XXXX message, load and verify the original tape again.

You can now invoke the Write command to record the program on tape. At this point the back-up tape is complete, but you should verify the back-up to ensure you made a good copy.

You can also use the utilities to make back-up copies of themselves. After creating a machine-language tape of the utility, see the Memory Requirements section on creating a tape after you POKE it in from Basic and Table 1. Read the tape as you would any back up, then hit the enter key when prompted for the name.

DOS users should be aware that Tapetility will run directly from disk without alteration if transferred to disk using the Tape command. You can use this utility to find the start, end, and transfer addresses of CMD files by transferring the files to tape, then using the utility to load the tape.

Problems

The most common problem with Tapetility is that the tape won't stop. If you're returned to the menu, the problem is a sticky relay. Turning the recorder off solves this problem; if you're not returned to the menu and the asterisks flash, you aren't done yet.

If you are reading a tape and the asterisks aren't flashing, check your volume and/or tone control. Another possibility is that you're reading the tape at the wrong speed.

If you checked this and the asterisks stop flashing but the tape doesn't stop, you might have a bad tape. Apparently, the utility searched for the transfer address at the end of the file and never found it. Try loading the tape under the System command. If it doesn't load there, the utility won't load it. To avoid this problem, hit the break key to return to the menu.

Checksum errors are also a common problem. They can be caused by dirty, magnetized, or misaligned tape heads, incorrect tone or volume setting, a bad copy of the tape, or an incorrect speed setting.

If the tape won't stop after recording, check the asterisk; if it's still flashing, make sure you didn't type in addresses that would send a huge block of memory to tape. This could take a long time, especially at low speed. Use the break key to return to the menu. If you are returned to the menu, the relay is stuck again.

If you suspect a problem with your ROM, use Tapetility to make a tape of the ROM. Use the Verify command to check it with a tape from another CPU.

If you type an incorrect character, use the left-arrow key to correct it. If you already entered the information, use the break key, but you will have to reenter the information again.

If you type a non-hex character, such as the letter O instead of a zero, the utility prompts you for the same information again. ■

David J. Trapasso can be reached at 29 Boulevard Parkway, Rochester, NY 14612.

```
10 CLS
20 PRINT"MACHINE LANGUAGE TO DATA TAPE ROUTINE- BY DAVE TRAPASSO"
30 A=28671:POKE16561,A-INT(A/256)*256:POKE16562,INT(A/256):CLEAR 1
0
40 PRINT"MEMORY SIZE IS NOW SET TO PROTECT THE MACHINE LANGUAGE PR
OGRAM":PRINT"PROGRAM LOADS AT HEX 7000-7189 (28672 TO 29065 DECIMA
L)"
50 FOR I=28672 TO 29065
60 READ A:POKE I,A:NEXT I
70 REM- SET UP THE BREAK KEY VECTOR TO JUMP TO THE START OF THE PR
OGRAM
80 POKE 16396,195:POKE16397,0:POKE16398,112
90 INPUT "HIT THE BREAK KEY TO RUN";A$
100 PRINT "YOU HIT A KEY OTHER THAN THE BREAK KEY"
110 STOP
10000 DATA49,125,64,205,248,1,205,201,1,33
10010 DATA26,113,205,182,112,33,98,113,17,139
10020 DATA113,205,223,112,56,245,33,119,113,17
10030 DATA141,113,205,223,112,56,245,33,69,113
10040 DATA205,182,112,205,73,0,243,205,132,2
10050 DATA6,3,62,211,205,100,2,16,249,62
10060 DATA68,205,100,2,42,140,113,237,91,138
10070 DATA113,237,82,35,34,146,113,33,16,39
10080 DATA6,10,62,5,205,100,2,62,68,205
10090 DATA100,2,125,205,100,2,124,205,100,2
10100 DATA62,136,205,100,2,35,26,19,205,197
10110 DATA112,245,124,254,48,40,6,124,205,100
10120 DATA2,24,3,189,40,4,125,205,100,2
10130 DATA241,205,100,2,221,33,146,113,221,53
10140 DATA0,32,6,221,53,1,250,170,112,217
10150 DATA120,254,1,40,5,62,44,205,100,2
10160 DATA16,199,62,0,205,100,2,195,80,112
10170 DATA6,7,62,0,205,100,2,16,249,195
10180 DATA0,112,126,254,0,200,205,51,0,35
10190 DATA24,246,62,13,195,51,0,217,14,100
10200 DATA22,10,6,48,145,4,48,252,5,129
10210 DATA96,6,48,146,4,48,252,5,130,104
10220 DATA198,48,201,213,205,182,112,33,142,113
10230 DATA229,6,4,205,64,0,225,209,205,242
10240 DATA112,216,205,3,113,216,7,7,7,7
10250 DATA79,205,3,113,216,129,18,27,201,126
10260 DATA35,254,71,48,15,254,48,216,254,58
10270 DATA56,5,254,65,216,198,9,230,15,55
10280 DATA63,201,66,65,83,73,67,32,68,65
10290 DATA84,65,32,84,65,80,69,32,66,85
10300 DATA73,76,68,69,82,45,32,66,89,32
10310 DATA68,65,86,69,32,84,82,65,80,65
10320 DATA83,83,79,13,0,82,69,65,68,89
10330 DATA32,67,65,83,83,69,84,84,69,44
10340 DATA32,72,73,84,32,65,78,89,32,75
10350 DATA69,89,13,0,73,78,80,85,84,32
10360 DATA83,84,65,82,84,32,65,68,68,82
10370 DATA69,83,83,61,0,73,78,80,85,84
10380 DATA32,69,78,68,32,65,68,68,82,69
10390 DATA83,83,61,0
```

Program Listing 4. Machine Language to Data Tape.

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Assembly Language Made Simple—Part II

by Hardin Brothers

The lesson continues. Increase your Assembly-language vocabulary while learning to produce sounds and create borders for your screen.

Assembly language frightens a lot of people. I've seen writers apologize for using it in microcomputing magazines. But after last month's dose of programming ("Assembly Language Made Simple—Part I," p. 74), I hope you're becoming comfortable with Assembly language.

This month, I'll introduce some new opcodes and programming techniques, as well as an easy method of adding machine-language routines to your Basic programs.

Getting Started

The first program draws a border around the screen (see Program Listing 1). It starts by equating the label Video to 3C00H, the hexadecimal (hex) address of the first screen location (line 170). Next, the EQU pseudo-op in line 180 defines the character that creates the border. I use CHR$(191), a full graphics block, for this demonstration, but you can easily change it to some other character by changing the EQU instruction.

Line 200 establishes the ORG of the program at 7000 hex, just as in last month's programs. The program starts on line 220.

The HL register pair points to (holds the address of) the current screen print position. Line 220 loads HL with the value VIDEO − 1. Note that the assembler can perform simple arithmetic. Most assemblers support addition (+) and subtraction (−), as well as logical AND (&) and shift (<).

Operands for assembler arithmetic include direct numbers and label values. Line 220 asks the assembler to look up the value for Video, subtract 1 from that value, and write the machine code to load the result into the HL register pair.

Line 220 points HL to the first memory location below the screen in order to allow a loop that first increments HL and then prints information on the screen. It may seem more natural to reverse the order of events—print, then increment—but by incrementing HL first, HL always points to the current, instead of the next, print position at the end of the instruction loop. This makes the logic that prints the sides of the screen simpler.

Line 230 loads the B register with

```
00100 ;*********************************
00110 ;*                               *
00120 ;*   Screen Border Program       *
00130 ;*                               *
00140 ;*********************************
00150 ;
00160 ;
00170 VIDEO   EQU     3C00H           ;TOP OF SCREEN
00180 CHAR    EQU     191D            ;FULL GRAPHICS BLOCK
00190 ;
00200         ORG     7000H
00210 ;
00220         LD      HL,VIDEO-1      ;HL==>TOP OF SCREEN
00230         LD      B,65            ;TOP POSITIONS + 1
00240 TOP     INC     HL              ;POINT TO NEXT SPACE
00250         LD      (HL),CHAR       ;FILL SPACE
00260         DJNZ    TOP             ;REPEAT FOR TOP LINE
00270 ;
00280         LD      B,14            ;B = # OF LINES
00290         LD      DE,63           ;SPACES IN EACH LINE
00300 MIDDLE  ADD     HL,DE           ;SKIP MIDDLE OF SCREEN
00310         LD      (HL),CHAR       ;FILL A SPACE
00320         INC     HL              ;POINT TO NEXT SPACE
00330         LD      (HL),CHAR       ;FILL ANOTHER SPACE
00340         DJNZ    MIDDLE          ;LOOP UNTIL SIDES DONE
00350 ;
00360         LD      B,63            ;SPACES LEFT AT BOTTOM
00370 BOTTOM  INC     HL              ;POINT TO NEXT SPACE
00380         LD      (HL),CHAR       ;FILL SPACE
00390         DJNZ    BOTTOM          ;FILL BOTTOM ROW
00400 ;
00410 LOOP    JR      LOOP            ;ENDLESS LOOP TO END
00420 ;
00430         END     7000H           ;INCLUDE STARTING ADDR.
```

Program Listing 1. Creates a screen border.

The Key Box

Models I and III
16K RAM
Assembly Language
Editor/Assembler

65—the number of print positions across the top of the screen plus the first position in the second row. The B register acts as a counter for the program's first loop, which starts in line 240, with the label Top. First, the program increments HL to point to the next position, then line 250 loads the value of CHAR to that position.

Line 260 demonstrates the first new opcode for this month: DJNZ. Written in full, this instruction is "Decrement B then perform a relative Jump if B is not zero." This is a common and powerful opcode, but you must understand several important implications to use it correctly.

You can use DJNZ only if the B register is set up as a loop counter. There is no equivalent instruction for any other register or register pair. The B register is 8 bits wide. It can hold any value from zero to 255 (binary values from 00000000 to 11111111). When the Z80 chip finds a DJNZ instruction, it first decrements the B register; if the value in B is zero before the decrement, it is 255 afterwards. Therefore, DJNZ can operate a loop one to 256 times.

Relative Jumps

After a DJNZ instruction decrements B the program tests the result to see if it's zero. If so, the loop ends and control passes to the next instruction in memory. If not, the program performs a relative jump (usually backwards) to run a loop.

In last month's programs, all jumps are to an immediate, specific address. A relative jump operates differently. Instead of including a specific address, a relative jump includes a 1-byte offset from the current address. If the offset byte is less than 128 decimal (80 hex), the computer adds the value to the current address in the PC (program counter) register and jumps forward in memory. If the offset byte is 128 decimal or greater, the program subtracts the complement of the offset from the PC register and the value jumps backwards.

In other words, the offset can be between −128 and +127. However, because the PC updates to point to the next instruction before the program performs the current instruction, the effective offset is −126 to +129.

The last few paragraphs are difficult; make sure you understand them, then examine line 260 in Listing 1. Because B was set to 65 decimal before the loop began, the loop from lines 240 to 260 repeats 65 times. When the loop is completed, it fills all of the top video row and the first position of the second video row. HL still points to the first position in the second row.

The video screen shows 16 rows of 64 characters each. Our program fills the top row and bottom row completely, but only the outside edges of the middle 14 rows. Therefore, in each of the middle 14 rows, we want to print the first and sixty-fourth positions. In line 280, B is set to 14 again as a loop counter. DE is set to 63, the offset from the first to last print position in each row.

The loop for printing the middle of the screen begins on line 300 with the label Middle, and here you meet the second new opcode for this month, ADD. The Z80 chip supports an 8-bit and 16-bit addition instruction. If it adds two 8-bit values, it places one of the values in the A register and, after the addition, the result is set in the A register. If adding two 16-bit values, it places one in the HL register, which holds the result after the addition.

Line 300 adds the present value in the DE register, 63 decimal, to the current value in the HL register. The HL register contains the sum after the addition. The HL register then points to the last print position in the current row after the addition. Starting in line 310, the print character appears at the end of the row, HL increments to point to the first position of the next row, placing the print character there, and the loop repeats. By the end of the middle loop, the entire top row, the entire left side, and all of the right side except the last row are printed.

The last section of the program, starting in line 360, is similar to the first. It loads the B register with 63 decimal, the number of print positions remaining in the last row (remember that the first position in that row is already printed). Then HL increments and the print character appears 63 times. Finally, in line 410, an endless loop keeps the program from wandering off unattended, and in line 430, the End pseudo-op signals both the program's end and its starting address.

Possible Problems

Assemble Listing 1 (keep the source code) and run it. You should see a white border around your screen. One warning is necessary: If you try to run the program while your computer is in the 32-character mode, the result is unpredictable. On a Model I, the top, bottom, and left sides of the screen print, but not the right side. This is because the 32-character mode only displays characters in even-numbered print positions. With a Model III, the results are even less clear.

```
00100 ;*********************************
00110 ;*                               *
00120 ;*   Screen Border Program       *
00130 ;*    modified to be run         *
00140 ;*    as a Basic subroutine      *
00150 ;*                               *
00160 ;*********************************
00170 ;
00180 ;
00190 VIDEO   EQU     3C00H           ;Top of Screen
00200 ;
00210         ORG     7FE1H           ;PUTS THE PROGRAM AT
00220 ;                               THE TOP OF 16K MEMORY
00230 ;                       USE 0BFE1H FOR 32K
00240 ;                       USE 0FFE1H FOR 48K
00250 ;                       (see text)
00260 ;
00270         CALL    0A7FH           ;GET PARAMETER IN HL
00280         LD      A,L             ;A HOLDS PRINT CHAR.
00290 ;
00300         LD      HL,VIDEO-1      ;HL==>TOP OF SCREEN-1
00310         LD      B,65D           ;B=# OF TOP POSN.S + 1
00320 TOP     INC     HL              ;POINT TO NEXT SPACE
00330         LD      (HL),A          ;PRINT CHARACTER
00340         DJNZ    TOP             ;REPEAT FOR TOP LINE
00350 ;
00360         LD      B,14D           ;B=# OF ROWS - 2
00370         LD      DE,63D          ;DE= SPACES TO SKIP
00380 MIDDLE  ADD     HL,DE           ;SKIP MIDDLE OF SCREEN
00390         LD      (HL),A          ;PRINT AT END OF ROW
00400         INC     HL              ;HL==> BEG. OF NEXT ROW
00410         LD      (HL),A          ;PRINT AT BEG. OF ROW
00420         DJNZ    MIDDLE          ;LOOP UNTIL SIDES DONE
00430 ;
00440         LD      B,63D           ;SPACES LEFT AT BOTTOM
00450 BOTTOM  INC     HL              ;POINT TO NEXT SPACE
00460         LD      (HL),A          ;PRINT CHARACTER
00470         DJNZ    BOTTOM          ;FILL BOTTOM ROW
00480 ;
00490         RET                     ;RETURN TO BASIC
00500 ;
00510         END                     ;NO START VALUE NEEDED.
00520 ;
```

Program Listing 2. Screen border as Basic subroutine.

The Model III contains a hardware defect that makes the 32-character mode occasionally malfunction. Any time a program accesses the screen directly in 32-character mode, the results are unpredictable because of a timing problem within the computer.

To avoid the problem, you must include an NOP (no operation) instruction immediately after all instructions that load to or from the screen. NOP forces the computer to do nothing for a short period of time. By putting this short delay into your programs, you can work around the Model III peculiarities. (The Model III timing fault doesn't seem to exist on the Model 4 running in either Model III or Model 4 mode.)

The border around the screen looks nice, but you're probably thinking that the endless loop at the end of the program makes it useless. Yet you can use the program as a subroutine for a Basic program by changing it only slightly. You might want to have the Basic program print something on the screen, and then have the machine-language routine draw the frame to create, for instance, a title screen for a program.

Program Listing 2 is the same as Listing 1 except that the program is now in a form that Basic can use. There are only a few changes. First, change the origin (ORG) value to place the routine as high as possible in 16K memory. If you have more memory available, use one of the alternate ORGs given in the program's comments.

Second, the program starts with a call to 0A7F hex. When Basic invokes a machine-language routine (I explain that process below), it can pass a single value or parameter to the machine-language program. If your machine-language program is expecting a value, it must start with CALL 0A7FH, which places that value in the HL register pair. Listing 2 allows Basic to specify which print character to use. Line 280 of Listing 2 transfers the least-significant byte (LSB) of the parameter from register L to register A.

Ignore the most-significant byte (MSB) here because a display value can be only 1 byte long. If Basic mistakenly sends a value larger than 255, the program uses only the LSB, and reports no error message.

From line 300 to line 470, Listing 2 is the same as Listing 1 except that the value in the A register prints on the screen instead of the value of the label CHAR. However, line 490 has a return (RET) instruction that needs explanation.

"You can use the program as a subroutine for a Basic program by changing it only slightly."

Learning Returns

Basic treats machine-language programs as subroutines. All subroutines must end with some form of a return to pass control back to the original program. Therefore, whenever you write a machine-language program to use with Basic, you should include a RET command at the end of the program. To send a single parameter back to Basic, load the parameter into the HL register pair and return to Basic with the instruction JP 0A9AH. If there is no RET command at the end of Listing 2, Basic can't resume control of your computer.

After you enter and assemble Listing 2 (or modify Listing 1 to look like Listing 2), you need to link it into a Basic program. There are several techniques for doing this. I'll concentrate on the most direct one for now.

Save the source code first, then assemble the program to tape or disk. If you use a disk system, you may want to give the program's filespec an extension other than /CMD since this program won't run from the DOS READY prompt. The most commonly used extension for routines of this type is /CIM (core image file), which indicates that you should load the program into memory but you can't run it directly.

When you're ready to use the program, load it into memory without running it. If the assembled program is on tape, use the System command to load the program, but hit the break key at the following SYSTEM prompt to return to Basic. If the assembled program is on disk, use the Load command from DOS READY before entering Basic.

In either case, you also have to set memory size to protect the program. To calculate the correct answer to the Memory Size? prompt, subtract one from the ORG value in the machine-language program and convert the answer to decimal. You may want to record that value in your program notes.

Your next job is to tell the computer where the program resides in memory, so that Basic can call it with a USR command. If you use Disk Basic, your program must contain the command

DEFUSR = &Hnnnn

where nnnn is the hexadecimal address of the first machine instruction you want to execute.

Setting the address for tape Basic is more complicated, and is best illustrated with a concrete example. Your goal is to store the address of the routine

Tape Systems:

System Memory	Program 2 ORG	Memory Size Prompt	Line 100, Listing 3 POKE 16526	POKE 16527
16K	7FE1H	32736	225	127
32K	0BFE1H	49120	225	191
48K	0FFE1H	65504	225	225

Disk Systems:

System Memory	Program 2 ORG	Memory Size Prompt	Line 100, Listing 3 DEFUSR =
16K	7FE1H	32736	&H7FE1
32K	0BFE1H	49120	&HBFE1
48K	0FFE1H	65504	&HFFE1

Table 1. Set-up values for Listings 2 and 3.

```
10 '*****************************
20 '*                           *
30 '*   Marquee Demonstration   *
40 '*         Program           *
50 '*                           *
60 '*****************************
70 '
80 '
90 CLS
100 DEFUSR = &H7F74     'See Table 2
110 PRINT @ 281,"Press Any Key";
120 PRINT @ 410,"To Continue";
130 A = USR(0)
140 CLS
150 PRINT CHR$(23);
160 PRINT @ 274,"THANK YOU!"
170 PRINT : PRINT : PRINT : PRINT
180 END
```

Program Listing 3. Makes a running border.

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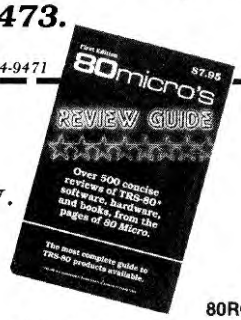

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in memory locations 16526 and 16527. Assuming you assembled the program to load starting at 7FE1 hex, take the second byte (last two digits) of that address, 0E1 hex, and translate that value into decimal 225. (There is a handy table at the back of your computer manual where you can look up the values.) Your program needs to POKE that value into memory location 16526. Then take the first byte, 7F hex, translate it into decimal 127, and POKE that value into 16527.

Now include a statement in your Basic program similar to

```
A = USR(X)
```

X contains the value sent to the machine-language program. After control passes back to Basic, A contains the value passed back from your machine-language program.

Program Listing 3 is a short Basic program that demonstrates how a Basic program can use the Listing 2 version of the border routine. Table 1 helps you find the correct memory size and POKE values to use with your particular system.

I've introduced many new details this month: The rest of the article will be easier. Be sure you have a good grasp on the concepts to this point. Experiment with Listings 1 and 2 to see how you might modify them. For example, you might try printing the border around only the top part of the screen, or add a second border inside the first.

"A pattern looks as if it's moving if it is continually offset and reprinted on the screen."

A Marquee Border

Program Listing 4 contains this month's second program, which sets up a running marquee border around the screen, keeps it moving until you press any key, and then returns control to the Basic program that calls it.

The underlying concept of this program is that a pattern looks as if it's moving if it is continually offset and reprinted on the screen. The program defines three patterns in lines 1010–1140. A graphics block and two spaces compose each, but the order changes in each. Printing the first pattern around the edge of the screen, then the second, then the third, and repeating this process indefinitely, creates the illusion of a moving series of blocks.

Lines 100–250 should be familiar and need no further explanation. The main loop of the program is in lines 260–380, with a routine known as a driver. Subroutines perform all of the real work in this program—the driver is responsible for calling the subroutines in the correct order with a pointer set correctly. The use of such a driver provides structure and clarity to a program, and simplifies debugging.

```
00100 ;*********************************
00110 ;*                               *
00120 ;*   Marquee Border Program      *
00130 ;*   (to be called from Basic)   *
00140 ;*                               *
00150 ;*********************************
00160 ;
00170 ;
00180 VIDEO   EQU     3C00H           ;TOP OF SCREEN
00190 ;
00200 ;
00210         ORG     7F74H           ;PUTS PROGRAM AT TOP
00220                                 ;OF 16K MEMORY
00230                         ;USE 0BF74H FOR 32K MEMORY
00240                         ;USE 0FF74H FOR 48K MEMORY
00250 ;
00260 START   LD      IX,PATRN1       ;IX==>1ST PATTERN
00270         CALL    FRAME           ;PRINT IT
00280         CALL    DELAY           ;DELAY A WHILE
00290         CALL    GETKEY          ;LOOK FOR KEYSTROKE
00300         LD      IX,PATRN2       ;IX==>2ND PATTERN
00310         CALL    FRAME           ;PRINT IT
00320         CALL    DELAY           ;WAIT A WHILE
00330         CALL    GETKEY          ;CHECK KEYSTROKE AGAIN
00340         LD      IX,PATRN3       ;IX==>3RD PATTERN
00350         CALL    FRAME           ;PRINT IT
00360         CALL    DELAY           ;WAIT A WHILE
00370         CALL    GETKEY          ;CHECK KEYBOARD AGAIN
00380         JR      START           ;LOOP BACK FOREVER
00390 ;
00400 GETKEY  EQU     $               ;CHECK KEYBOARD --
00410                         ;RETURN TO PROGRAM IF NO KEY
00420                         ;ELSE CLEAR STACK AND RETURN
00430                         ;TO BASIC
00440         LD      A,(3BFFH)       ;CHECK IF ANY KEY
00450         OR      A               ;SET FLAGS
00460         RET     Z               ;IF NONE, RETURN
00470         POP     HL              ;ELSE CLEAR STACK
00480         RET                     ;AND RETURN TO BASIC
00490 ;
00500 FRAME   LD      HL,VIDEO-1      ;HL==>SCREEN TOP - 1
00510         LD      B,64D           ;B = SPACES TO FILL
00520 TOP     INC     HL              ;HL==> NEXT POSITION
00530         LD      A,(IX)          ;GET CHARACTER
00540         LD      (HL),A          ;PRINT IT
00550         CALL    INCPTR          ;INCREMENT PATTERN
00560         DJNZ    TOP             ;REPEAT FOR TOP LINE
00570 ;
00580         LD      DE,64D          ;SPACE BETWEEN LINES
00590         LD      B,15D           ;LINES TO PRINT
00600 RIGHT   ADD     HL,DE           ;MOVE DOWN ONE LINE
00610         LD      A,(IX)          ;GET CHARACTER
00620         LD      (HL),A          ;PRINT IT
00630         CALL    INCPTR          ;INCREMENT PATTERN
00640         DJNZ    RIGHT           ;FILL RIGHT SIDE
00650 ;
00660         LD      B,63D           ;SPACES LEFT ON BOTTOM
00670 BOTTOM  DEC     HL              ;MOVE LEFT ONE SPACE
00680         LD      A,(IX)          ;GET CHARACTER
00690         LD      (HL),A          ;PRINT IT
00700         CALL    INCPTR          ;INCREMENT PATTERN
00710         DJNZ    BOTTOM          ;FILL BOTTOM ROW
00720 ;
00730 ; Note -- DE is still equal to 64D
00740 ;
00750         LD      B,14D           ;LINES UP SIDE
00760 LEFT    XOR     A               ;RESET CARRY FLAG
00770         SBC     HL,DE           ;MOVE UP ONE LINE
00780         LD      A,(IX)          ;GET CHARACTER
00790         LD      (HL),A          ;PRINT IT
00800         CALL    INCPTR          ;INCREMENT PATTERN
00810         DJNZ    LEFT            ;FILL LEFT SIDE
00820 ;
00830         RET                     ;END OF ROUTINE
00840 ;
00850 INCPTR  INC     IX              ;POINT TO NEXT CHAR.
00860         LD      A,(IX)          ;GET CHARACTER
00870         OR      A               ;SET STATUS FLAGS
00880         RET     NZ              ;RETURN IF NOT ZERO
00890         DEC     IX              ;ELSE POINT BACK TO
00900         DEC     IX              ;  BEG. OF PATTERN BY
00910         DEC     IX              ;  DEC. 3 TIMES
00920         RET                     ;RETURN TO CALLER
00930 ;
00940 DELAY   LD      BC,1800H        ;DELAY VALUE
00950 D10     DEC     BC              ;BC = BC-1
00960         LD      A,B             ;GET MSB OF VALUE
00970         OR      C               ;MERGE WITH LSB
00980         JR      NZ,D10          ;GO BACK UNTIL BC=0
00990         RET                     ;THEN RETURN
01000 ;
01010 PATRN1  DEFB    191D            ;1ST PATTERN IS BLOCK
01020         DEFB    32D             ;  FOLLOWED BY TWO
01030         DEFB    32D             ;  SPACES
01040         DEFB    0               ;MARK END OF PATTERN
01050 ;
01060 PATRN2  DEFB    32D             ;2ND PATTERN IS SPACE
01070         DEFB    191D            ;  BLOCK AND
01080         DEFB    32D             ;  SPACE
01090         DEFB    0               ;MARK END OF PATTERN
01100 ;
01110 PATRN3  DEFB    32D             ;3RD PATTERN IS TWO
01120         DEFB    32D             ;  SPACES AND THEN
01130         DEFB    191D            ;  A BLOCK
01140         DEFB    0               ;MARK END OF PATTERN
01150 ;
01160         END                     ;END OF PROGRAM
```

Program Listing 4. Running border called from Basic.

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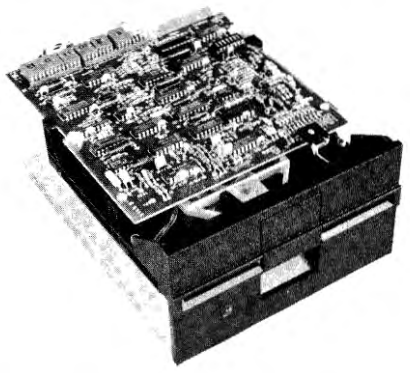

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In this program, the IX register points to the current print character, the HL register pair points to the current print position, DE holds line offset values, B counts loops, BC holds delay values, and the A register transfers values from the print patterns to the screen.

```
10 '*****************************
20 '*                           *
30 '*   Border Demonstration    *
40 '*         Program           *
50 '*                           *
60 '*****************************
70 '
80 '
90 CLS
100 DEFUSR = &H7FE1     'See Table 1
110 PRINT @ 280,"Border Character";
120 FOR I = 0 TO 255
130   PRINT @ 350,I;
140   A = USR(I)
145  FOR J = 1 TO 150 : NEXT J
150 NEXT I
151 PRINT @ 350,"    ";
160 PRINT @ 350,"32";
170 A = USR(32)
180 END
```

Program Listing 5. Border demonstration.

Starting with line 260, IX points to the first print pattern. The Frame routine then prints that pattern around the screen. The program calls the short Delay routine, and calls GETKEY to check for a keystroke. The computer returns control to Basic if you press a key. The program repeats the same sequence of commands twice, with IX pointing to a new pattern each time.

You see a new opcode in line 380. JR performs a relative (as opposed to an absolute) jump to another part of a program. Like DJNZ, JR can only jump a short distance forward or backward. It requires 1 less byte of memory than JP, and it allows relocatable, or position-independent, programs, but JR operates slightly slower than an absolute jump.

The first subroutine shown is GETKEY. It is similar to the Key routine in last month's third program. Line 400 shows a new pseudo-op, $, which means "at this location." The $ can indicate the value of a label, and the value of relative jumps (for example, JR $-4 means jump back 4 bytes).

In lines 440 and 450, GETKEY first checks to see if you pressed a key. If you haven't, the Z flag is set and the conditional return, RET Z, sends control back to the driver loop. If you have pressed a key, the program returns to Basic.

A simple return instruction doesn't work because it only returns to the driver loop. Whenever the program executes a call, the Z80 saves the address of the next regular instruction onto the stack before transferring control to the subroutine. The stack is simply a first-in first-out data structure contained somewhere in memory (Basic sets it immediately below the cleared string space).

The classic analogy that describes a stack is a cafeteria plate-holder. Pushing a value (always a 2-byte value) onto the stack is like placing another plate on the pile. POPing a value off the stack is similar to removing the top plate. The SP register keeps track of the current address of the top value on the stack automatically.

Each call instruction pushes the return address on the stack and jumps to the subroutine. If you press a key, GETKEY ignores the first return address—the one leading to the driver—and instead returns to the second address, leading back to Basic. Therefore, the first value is POPed off the stack into the HL register. A RET command then transfers control back to the original Basic program.

The second subroutine, Frame, begins on line 500. It is similar to Listing 1, except it fills the two sides of the screen separately. It first loads each print value into the A register with an LD A,(IX) command, then transfers the values to the screen with LD (HL),A. After each character prints, the program calls INCPTR (line 850) to increment and test the IX pointer. If IX reaches the end-of-pattern marker (a zero byte), IX decrements three times to point back to the beginning of the pattern.

The last section of Frame is the Left routine, where you meet another new opcode, SBC (subtract with carry). The

```
00100 ;*******************************
00110 ;*                             *
00120 ;*   Machine-Language Sound    *
00130 ;*     Receives values for     *
00140 ;*    Tone and Duration from   *
00150 ;*    calling Basic program    *
00160 ;*                             *
00170 ;*******************************
00180 ;
00190 ;  Connect an amplifier to the cassette Aux plug
00200 ;  before running this program.
00210 ;
00220 PORT    EQU     0FFH            ;Cassette Port
00230 ;
00240         ORG     7FE8H           ;FOR TOP OF 16K MEMORY
00241                                 ;USE 0BFE8H FOR 32K MEMORY
00242                                 ;USE 0FFE8H FOR 48K MEMORY
00250         CALL    0A7FH           ;GET VALUE FROM BASIC
00260                                 ;L WILL HAVE TONE VALUE
00270                                 ;H WILL HAVE DURATION
00280         DI                      ;DISABLE INTERRUPTS
00290         LD      C,H             ;PUT DURATION IN C
00300 LOOP1   LD      B,L             ;GET FREQ. VALUE
00310         LD      A,1             ;OUTPUT VALUE
00320         OUT     (PORT),A        ;SEND IT OUT
00330 LOOP2   DJNZ    LOOP2           ;DELAY FOR 1/2 CYCLE
00340         LD      B,L             ;GET FREQ. VALUE AGAIN
00350         LD      A,2             ;OUTPUT VALUE
00360         OUT     (PORT),A        ;SEND IT OUT
00370 LOOP3   DJNZ    LOOP3           ;DELAY FOR 1/2 CYCLE
00380         DEC     C               ;DEC. DURATION COUNT
00390         JR      NZ,LOOP1        ;REPEAT UNTIL C=0
00400         EI                      ;ENABLE INTERRUPTS
00410         RET                     ;THEN RETURN TO BASIC
00420 ;
00430         END                     ;END OF PROGRAM
```

Program Listing 6. Sound tone and duration values.

Tape Systems:

System Memory	Program 4 ORG	Memory Size Prompt	Line 100, Listing 5 POKE 16526	POKE 16527
16K	7F74H	32627	116	127
32K	0BF74H	49011	116	191
48K	0FF74H	65395	116	255

Disk Systems:

System Memory	Program 4 ORG	Memory Size Prompt	Line 100, Listing 5 DEFUSR =
16K	7F74H	32627	&H7F74
32K	0BF74H	49011	&HBF74
48K	0FF74H	65395	&HFF74

Table 2. Set-up values for Listings 4 and 5.

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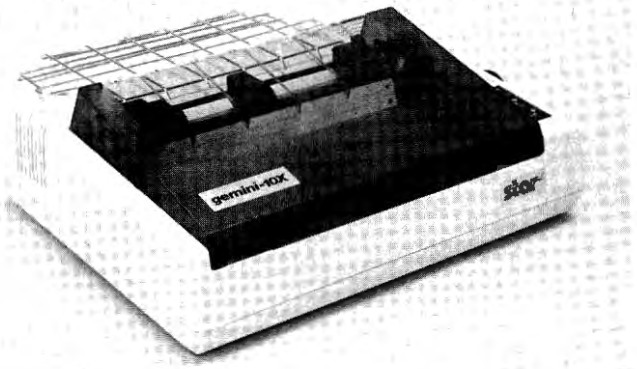

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16K	7FE8H	32743	232	127
32K	0BFE8H	49127	232	191
48K	0FFE8H	65511	232	255

Disk Systems:

System Memory	Program 6 ORG	Memory Size Prompt	Line 100, Listing 7 DEFUSR =
16K	7FE8H	32743	&H7FE8
32K	0BFE8H	49127	&HBFE8
48K	0FFE8H	65511	&HFFE8

Table 3. Set-up values for Listings 6 and 7.

Z80 instruction set doesn't include a straight 16-bit Subtract command, so use SBC here. SBC HL,DE subtracts the value in DE from HL, loads the result in HL, and decrements HL by one if the program sets the carry flag. To be sure that line 770 produces the correct result, you must be sure the program hasn't set the carry flag.

The Z80 has two commands that directly affect the carry flag: SCF (set carry flag) and CCF (complement carry flag, which changes it to the opposite of its current status). You can use the two together to reset the carry flag so it doesn't alter the results of the subtraction. However, XOR A does the same thing faster. An exclusive OR (XOR) of the A register always sets the A register to zero, sets the zero flag, and resets the carry flag. This instruction is often a shorthand method of establishing known values for the A register and both flags.

DELAY, the last subroutine of the program, begins in line 940. It slows down program execution to produce an attractive display. The Z80 operates so quickly that without a delay routine, you lose the marquee effect. Try removing lines 280, 320, and 360 to see how fast the program can operate.

Line 940 loads the BC register pair with a delay value of 1800 hex. If you want to change the delay time, change that value. Then, in a loop from line 950 to line 980, BC decrements one step at a time until it equals zero, when the program returns control to the driver.

The mechanics of checking BC for zero should be familiar from last month. By using the timing codes in your editor/assembler manual you can calculate how long each instruction takes. The Delay subroutine, as written, takes about .08 seconds on a Model III and slightly longer on a Model I.

Since I wrote Listing 4 for use with a Basic program, you have to follow the same procedure you use with Listing 2. The correct values for memory size and setting the USR addresses are in Table 2, and Listing 5 is a short program that

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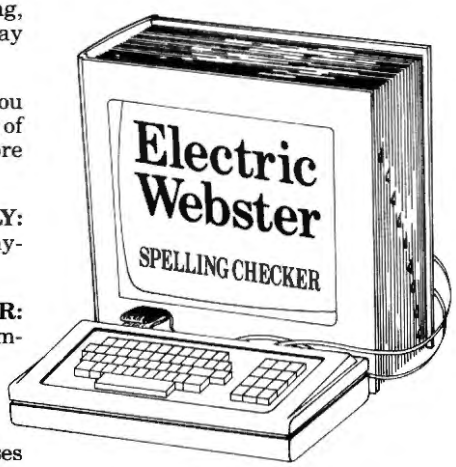

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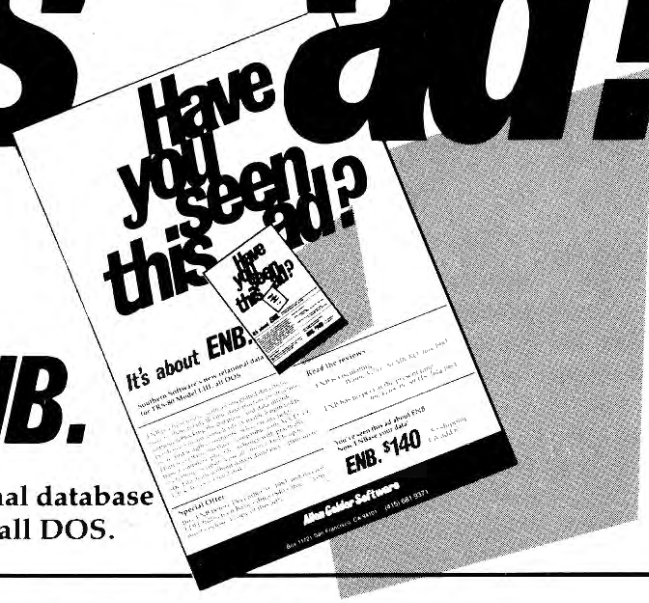

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```
10 '*****************************
20 '*                           *
30 '*    Sound Demonstration    *
40 '*         Program           *
50 '*                           *
60 '*****************************
70 '
80 '
90 CLS
100 DEFUSR = &H7FE8     'See Table 3
110 PRINT @ 17,"Connect Amplifier to AUX Plug"
120 PRINT @ 151,"Then Press <ENTER>"
130 IF INKEY$ <> CHR$(13) THEN 130
140 CLS
150 FOR I = 1 TO 8
160   READ A,B
170   K = A + B*256
180   IF K>32767 THEN K=K-65536
190   T = USR(K)
200 NEXT I
210 END
220 '
230 DATA 255,114
240 DATA 192,227
250 DATA 192,76
260 DATA 192,151
270 DATA 152,191
280 DATA 171,255
290 DATA 192,76
300 DATA 171,170
```

Program Listing 7. Sound demonstration.

demonstrates the marquee effect.

Making Noise

The last Assembly-language program this month (Program Listing 6) is a short Sound routine that, like many games, produces tones when you connect the cassette AUX plug to a small amplifier. There are complex Sound routines that allow greater variations in duration, timbre, and pitch. However, this routine is one of the simplest and serves to demonstrate how the TRS-80 produces sound.

Line 220 sets the label Port equal to 0FF hex. (To use the Model 4's internal sound speaker, change this to 90 hex.) On Models I and III, you can use port 0FF hex as a cassette interface.

The computer normally writes data on cassette by toggling bits zero and 1 of the cassette port, producing both a high and low output. Sending a value of 1 to the port produces the top half of a square wave; sending a value of 2 produces the bottom half. Sending a 1 then a 2 produces a single square wave tone. The length of time it takes to create the wave determines the pitch, with longer times producing lower notes. The number of wave cycles determines the duration of a note.

Line 250 loads the HL register pair with a value sent from Basic. The L register contains the note's pitch, the H register its duration. Since the program stores tone and duration information separately in Basic, you must combine them before sending them to the sound program. Listing 7 is a short Basic demonstration program showing how you might perform the combination.

Line 280 contains the command DI (Disable Interrupts). If you have a 16K Model I without an expansion interface, ignore this instruction. Otherwise, you must include it to avoid generating a gravel-like sound. Any computer capable of a constantly updated clock display interrupts the program presently running several times a second to update the clock counters. The DI instruction keeps those interrupts from occurring, but causes the clock to lose time.

Line 290 loads the duration count (the number of times to repeat the tone's wave) into the C register. Then, in line 300, the program loads the frequency value into the B register. The program loads register A with a 1, which the program sends to the cassette port with the OUT (PORT),A command in line 320. Then a short DJNZ loop, LOOP2, decrements the B register to zero.

So far, the program has sent half of the wave to the port. Line 340 again loads B from the H register, loads A with 2, sends the new value to the port, and uses another DJNZ loop to form the second half of the wave.

Line 380 decrements the C register once. If its value is not yet zero, it performs a relative jump to LOOP1, and forms a new wave to send to the port. When C reaches zero, it re-enables the interrupts with the EI command in line 400, and control returns to Basic. Although you can make the Sound routine more complex, it is adequate for use in games and for alerting an operator.

Table 3 shows the correct set-up values for the Sound routine depending on your computer type and memory size. Program Listing 6 demonstrates how to read tone values from a data table and send them to the machine-language routine. Each data line contains two values for the tone's pitch and duration. Notice that the larger a pitch value, the lower the note sounds. Because the machine-language program decrements both B and C before it tests them, a zero (equal to 256) represents the lowest pitch and the longest duration. However, to make the data values easier to manipulate, the program uses only values between 1 and 255.

To calculate relative pitches of notes, you need to know that two notes a half-step apart form a ratio of 1.05946. If you use 255 for the lowest note, the pitch one-fourth higher is $255/(1.05946)^5$. Round any fractions to the closest integer. If you don't feel like calculating exact note values, experiment until you find acceptable tones.

Note lengths are a function of the pitch value times the duration value. You can reproduce a piece of music by using a duration of 255 for the longest, highest note, and scaling other duration values from there.

Learning More

So far, I have shown you: how to use approximately 20 opcodes and pseudo-ops, the general structure of Assembly language, and one way to add machine-language routines to Basic programs. Most programmers use Assembly language for one of three purposes: to add machine-language routines to Basic, to write stand-alone game programs, or to write utility and application programs.

It is beyond the scope of this series to explore utilities and applications, which are almost always long and complicated. So next month I'll show you some of the structures and programming considerations required to write a stand-alone game, as well as how to use more of the Z80's instruction set. If you want more help writing subroutines for your Basic programs, try reading my column The Next Step in back issues of *80 Micro*. A major purpose of that column is to explore ways of mixing machine language and Basic.

If you subscribe to CompuServe and want to discuss any part of this series, leave me a message on the SASIG message board. Type GO PCS-117 to arrive at SASIG; my PPN is 72165,735. Feel free to join in on discussions other readers start. ■

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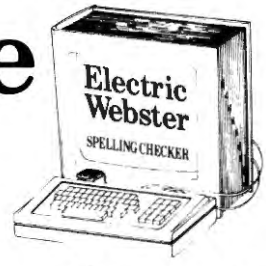

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Synthetically Speaking—Part I

by David L. Engelhardt

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Although I built this system on a Model III, it also works on a Model I since both computers use the same input/output communications signals (see Table 1). The only difference between the set-up of the two units is that the Model III uses a 50-pin connector and the Model I uses a 40-pin connector.

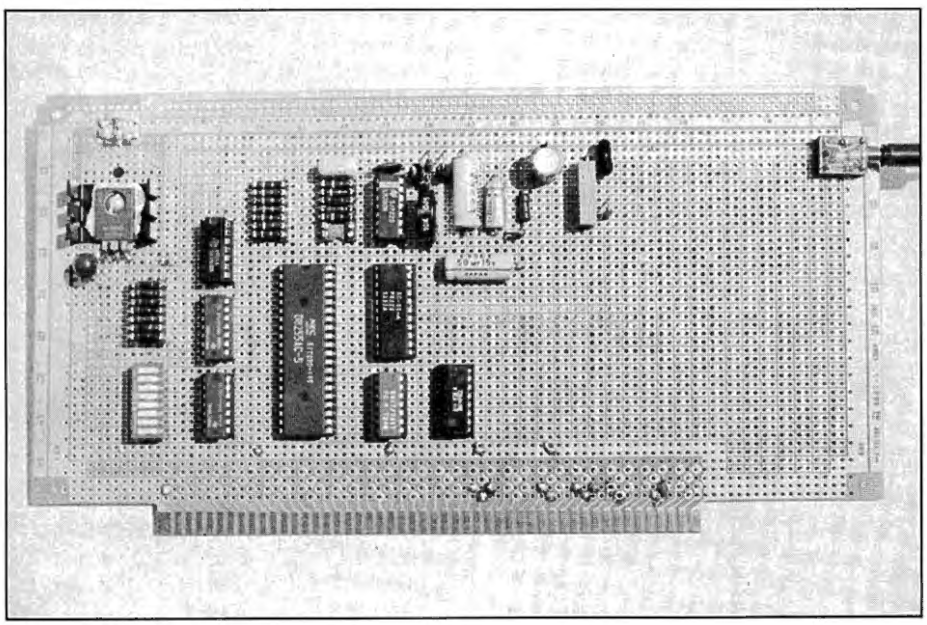

Photo. Speech board.

Parts to Buy

I based the entire speech circuit on the Votrax SC-01 speech synthesizer chip, which costs about $50. I bought the chip from Micromint Inc. (the addresses of all the manufacturers cited appear at the end of this article).

Since I have an S-100 expansion bus, I built the speech circuit on an S-100 plug-in card. The Photo shows the complete circuit, consisting of the decoding circuit, 8255 controller, SC-01 speech chip, and the amplifier that operates an external 8 ohm speaker. Notice that there's still room left on the S-100 card for future additions to the speech circuit.

The Vector Electronic Co. manufactures the S-100 plug-in card (part number 8802-1). I like to use these cards because the two-connections-per-trace design allows easy point-to-point wiring. The cards plug into an S-100 motherboard manufactured by Wameco Inc. (part

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number QMB-12).

The motherboard allows expansion to 12 extra cards, not including the speech board. As it stands, I have the computer interface/clock board in one slot, the port control board in another, and the speech board in a third slot. I still have plenty of room for future expansion. You must provide a 5- and 12-volt power supply to operate the speech board.

If you use a different plug-in card design, chances are it will be smaller. You can still build the speech board using smaller cards, but you may have to split up the total circuit. Using smaller cards shouldn't present any problems as you can easily link them together with ribbon cables. Adapt the required computer signals to your bus configuration according to the circuit schematics.

Port Decoding Circuit

The port decoding section shown in Fig. 1 consists of U1, U2, and two gates of U3. U1 and U2 are two-input, exclusive OR gates that make up the main port decoding section. Switches S1–S6 consist of an 8-DIP-switch (dual in-line processor) package that plugs into a 16-pin integrated circuit (IC) socket with two switches left for future use. Use these switches to set or change the speech ports to the configuration you need, but keep them within the zero to 7F hexadecimal (hex) port limits set by Radio Shack.

I use four ports to operate the speech board via an 8255 programmable peripheral interface chip that controls the Votrax chip. For simplicity, Fig. 1 shows the port decoding signals that consist of everything to the left of the 8255 chip (U4). Figure 2 details the signals that control the SC-01 chip.

I use the 8255 chip as the interface between the Model I/III and the SC-01, due to the SC-01's internal set-up requirements. I'll cover this when I describe the SC-01 synthesizer chip below.

Address lines A2–A7 in Fig. 1 tie to U1 and U2 to decode the base port value. Address lines A0 and A1 tie directly to the 8255 to decode its four internal ports. U1 and U2 turn on and stay selected for a decoding range of four, while address lines A0 and A1 actually perform the internal selection of the four ports within the 8255 chip.

Since I selected ports 16–19 decimal to control the Votrax chip, U1 and U2 set up the base, or bottom, port number (16 decimal) and stay selected while the combination of A0 and A1 make up the actual four ports (16–19) that control the 8255 chip.

U1 makes up the most significant half of the SC-01's base port number. Only one-half of U2 makes up the least significant half of the SC-01's port. The unused gates are available for future use. Select the port number by setting switches S1–S6 to either high (open) or ground. The switches you set to ground actually make up the port's decoded number.

When you don't select the port, the logic state on pin 1 of U3A is normally low. This is because the exclusive OR gate always outputs a logic low whenever either two lows or two highs are on the gate's inputs. Thus, when a decoding switch is open, one of the inputs goes to a high state. If an address line on the other input is high at the same time, it yields a logical low on the output gate that turns off the decoder.

The decoder section requires only one gate with a low output from U1 or U2 to turn off. Since a logical high is one-half the requirement on pin 1 of U3A to turn on the decoder, all decoding exclusive OR gates must have a logical high output. The exclusive OR gate supplies a logical high output only when both of the inputs on each gate are of opposite states.

For example, I decoded the speech board for ports 10–13 hex (16–19 decimal). Since the most significant port digit is 1 hex, I set switch S4 to ground and leave switches S1–S3 open. Since the least significant hex digit is a zero, switches S5 and S6 are also open. The switches tied to ground apply a logic low to one-half of a gate's inputs while

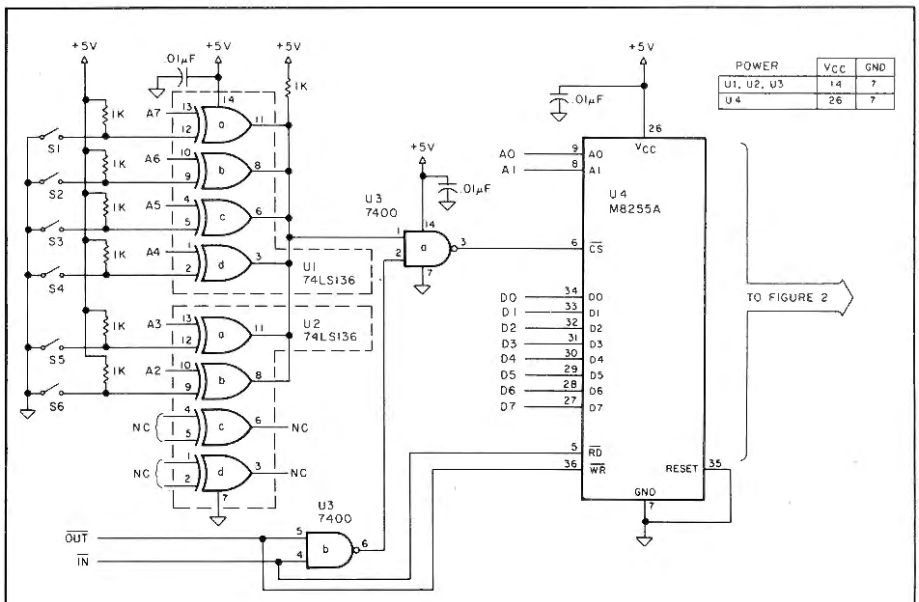

Figure 1. Decoder section.

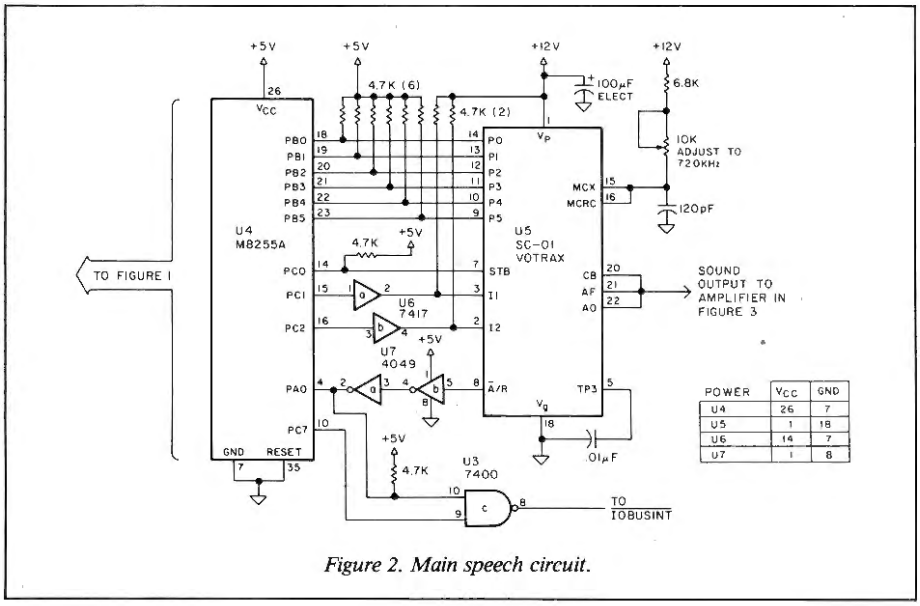

Figure 2. Main speech circuit.

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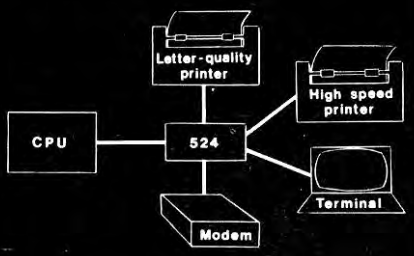

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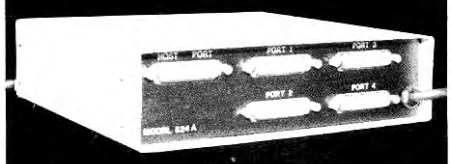

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the open switches apply logical highs.

At the selection of port 10 hex, address lines A5–A7 are logical low giving opposite states on the inputs to the gates. This results in logical highs on their outputs. Address line A4 is high, and since its corresponding switch is low, the inputs are of opposite states and result in a logical high as an output.

The least significant digit using address lines A2 and A3 works the same way as the most significant digit. Since address lines A2–A7 decode the base port (10 hex), the decoder enables no matter what state address lines A0 and A1 are in. While address lines A2–A7 stay selected to enable the 8255, the combination of address lines A0 and A1 changes to select the four internal ports required to operate the 8255.

Any time the Input or Output command selects a port, the computer generates a corresponding in or out signal. The computer applies these two signals to the gates of U3B and its output goes high in the presence of either one of the in or out signals. The computer applies the logical high output of U3B combined with the decoded port signal to the inputs of U3A to give a logical low

Model I pin designations

Signals	Computer Pin Designations
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D1	Pin 22
D2	Pin 32
D3	Pin 26
D4	Pin 18
D5	Pin 28
D6	Pin 24
D7	Pin 20
A0	Pin 25
A1	Pin 27
A2	Pin 40
A3	Pin 34
A4	Pin 31
A5	Pin 35
A6	Pin 38
A7	Pin 36
In*	Pin 19
Out*	Pin 12
IOBUSINT*	Pin 21

(* = negative true)

Model III pin designations

Signals	Computer Pin Designations (J2)
D0	Pin 1
D1	Pin 3
D2	Pin 5
D3	Pin 7
D4	Pin 9
D5	Pin 11
D6	Pin 13
D7	Pin 15
A0	Pin 17
A1	Pin 19
A2	Pin 21
A3	Pin 23
A4	Pin 25
A5	Pin 27
A6	Pin 29
A7	Pin 31
In*	Pin 33
Out*	Pin 35
IOBUSINT*	Pin 39
	All Even
	Ground >----------< 2 TO 50

Table 1. Model I and Model III pin designations.

output.

The output of U3A enables the 8255 chip for the Read and Write commands needed to control the SC-01 speech chip. The computer also ties the in and out signals directly to the 8255 to control the direction of data flow in conjunction with the actual Input or Output command. The computer ties the in signal to the RD input and the out signal to the WR input of the 8255. The computer connects all data lines to the 8255 for reading from and writing to the SC-01 synthesizer chip.

You may wonder why U3 is a standard TTL (transistor to transistor logic) chip instead of an LS (low power Schottky) chip like the others. I discovered through part-swapping and troubleshooting that a 74LS00 doesn't have enough drive capability to enable the 8255. The system either locks up or gets lost when I used a 74LS00, but runs without trouble with a 7400 chip. Please keep this in mind when you buy the parts for the speech circuit.

"Through part-swapping and troubleshooting I discovered that the system runs without trouble with a 7400 chip."

The 8255 Controller

The programmable peripheral interface, or 8255 (U4) for short, allows configuration to any system or device with little difficulty. You can set it up to run in three different modes. I opted to run the 8255 in mode zero for the speech board application.

There are 16 possible configurations within mode zero and Table 2 shows these different configurations. Configuration 8 applies to the speech board application. (Get Intel's *Component Data Catalog* for more information on the 8255 interface chip. This book describes in detail the many combinations and configurations available with this chip in all three modes of operation.)

Writing a control word to the 8255 sets mode zero, making two 8-bit ports and two 4-bit ports available. Ports A and B are the 8-bit ports and port C is split in half to create the two 4-bit ports. All outputs are latching outputs and all inputs are non-latching inputs.

For the speech application, decoded port 19 decimal writes the control and configuration word (144 decimal) to the 8255 chip. Decoded port 18 sets up communications with the 8255's internal port C. Decoded port 17 sets up port B and port 16 communicates with the 8255's port A.

Figure 2 shows the ports that control the SC-01 speech chip. Port B, with its latching outputs, sends a code to the SC-01 and stores it there while port C tells the SC-01 to latch port B's contents. Port C also controls the SC-01's inflection inputs. Port A samples an output from the SC-01 to indicate that it's ready for a new phoneme code. I'll discuss phonemes in more detail below.

The SC-01 Speech Synthesizer

The SC-01 is a self-contained chip capable of phonetically synthesizing continuous speech by combining phonemes. This chip can reproduce the 64

Num	Value	Port A	Port B	Port C/Upper	Port C/Lower
0	128	output	output	output	output
1	129	output	output	output	input
2	130	output	input	output	output
3	131	output	input	output	input
4	136	output	output	input	output
5	137	output	output	input	input
6	138	output	input	input	output
7	139	output	input	input	input
8	144	input	output	output	output
9	145	input	output	output	input
10	146	input	input	output	output
11	147	input	input	output	input
12	152	input	output	input	output
13	153	input	output	input	input
14	154	input	input	input	output
15	155	input	input	input	input

Table 2. Mode zero configurations for the 8255.

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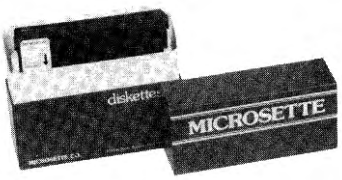

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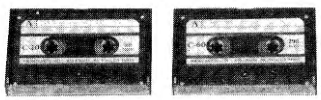

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different phonemes that emulate the English language using 6-bit access codes.

Sending out these different phonemes at a continuous rate produces synthesized speech. Table 3 lists the 64 different phonemes, their symbols, average duration time in milliseconds, and examples important in creating speech. You can create any word by combining the proper phonemes. I use a Basic program to test the hardware circuits by putting together phonemes to create actual speech (see the Program Listing).

Refer again to Fig. 2. Port B of the 8255 (U4) transfers the 6-bit phoneme code to the Votrax chip. Since the program sets the outputs of port B to latch, the phoneme code stays on the inputs (pins 9–14) of the SC-01 chip (U5) until the program sends a new one. Now that the phoneme code is on the SC-01's input pins, it must latch in through the STB input (pin 7). Latching occurs on a rising edge signal so that the PC0 of the 8255 is set high to latch in the pending phoneme code.

A time delay in the latching set-up time is necessary. The Votrax chip requires at least 100 microseconds to stabilize its internal circuits. After stabilization, the program sets the STB input high to latch in and hold the phoneme code. Due to this latching capability, the Votrax chip is capable of continually sending out the same code until it receives a new one.

Since each phoneme code has its own time duration, it's necessary to know when the SC-01 finishes creating it. This is where the acknowledge/request (A/R) output (pin 8) from the SC-01 comes into play. The A/R output indicates when the program should send the next phoneme. Upon completion of the phoneme, the A/R output goes from a low state to a high state. Since the A/R output is CMOS and the input to the 8255 is TTL, the A/R output doesn't have enough drive capability to operate the TTL gate. U7 takes care of the interface requirement.

U7 (4049) is a hex inverter/buffer capable of driving two TTL loads. Since it has CMOS input and TTL-compatible output, the SC-01 and 8255 chips are completely compatible. The 4049 inverts the signals, while two gates keep U7B's input the same as U7A's output.

A 4050 CMOS chip also works in place of the 4049. The only difference between the two is that the 4050 doesn't invert the logic signals. Should you use a 4050 chip, you need only one gate. I used a 4049 because I had one available when I built the circuit.

"You can synthesize four different voices or mix sounds together to change the pitch of a spoken sentence."

Input PA0 (pin 4) of the 8255 constantly scans the state of the A/R output. When the A/R line goes from a low to a high state, it tells the controlling program to send another phoneme to the SC-01 chip. The sequence of events using the phoneme inputs, STB line, and A/R line continues until the controlling program stops sending new phoneme codes.

I1 (pin 3) and I2 (pin 2) represent the inflection inputs to the Votrax chip. These inputs let you change inflection or pitch for a higher- or lower-sounding output. This gives you the ability to synthesize four different voices or to mix sounds together to change the pitch of a spoken sentence.

Because inflection inputs must be at a constant logical state, they require external latches. The latched outputs of PC1 and PC2 (pins 15 and 16) of U4 provide this function. The gates of U6 act as a buffer between U4 and U5 for the inflection inputs. Notice that the outputs of U6 are tied to 12 volts through 4.7K resistors. The inflection inputs require the same voltage as the SC-01's power supply and U6 provides this interfacing requirement. Remember this because the circuit doesn't function if U6's outputs are tied to 5 volts instead of 12 volts.

Gate U3C is one of two methods that uses interrupts to let the computer know it's time to send out another phoneme code via the 8255. The program sets the state of PC7 (pin 10) to high to enable the interrupt gate. When the A/R line signals the readiness for a new phoneme, its high output combines with PC7's output to give the required low signal for an interrupt.

The other method used is scanning PA0 for the low to high transition. I use this method and scan the PA0 input for a logic change. I set the interrupt usage aside for advanced applications in the future.

The master clock frequency inputs, MCRC and MCX, are connected to a resistor and a capacitor. These two inputs and components reach an oscillating frequency of approximately 720 kHz. This frequency sets up the standard phoneme timing so that, by varying the variable resistor, the voice and sound output change from a low pitch to a high pitch.

If you use the external clock source option instead of the internal one, the MCRC output (pin 16) is tied to ground while the external frequency source is applied to the MCX input (pin 15). Since I use the internal clock, both MCRC and MCX are tied together as shown in Fig. 2. The easiest way to adjust the internal clock is to send out a phoneme code or message and set the frequency for the most pleasing sound. I'll cover this in the testing section of this article.

I tied audio outputs CB, AF, and AO together so I could use them in conjunction with a class A amplifier. If you use these outputs in an amplifier other than a class A amplifier, separate them. I chose class A because it's popular and easy to build. The combined output of the three signals are tied to the amplifier's input shown in Fig. 3.

Figure 3 also shows the speech amplifier circuit, consisting of a pre-amp and a main amplifier. I decided to design an amplifier that could handle speakers larger than those in transistor radios to get better sound quality.

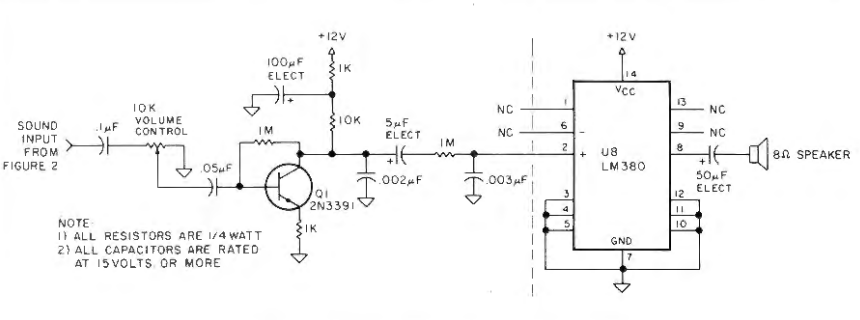

Figure 3. Sound pre-amp/amplifier circuit.

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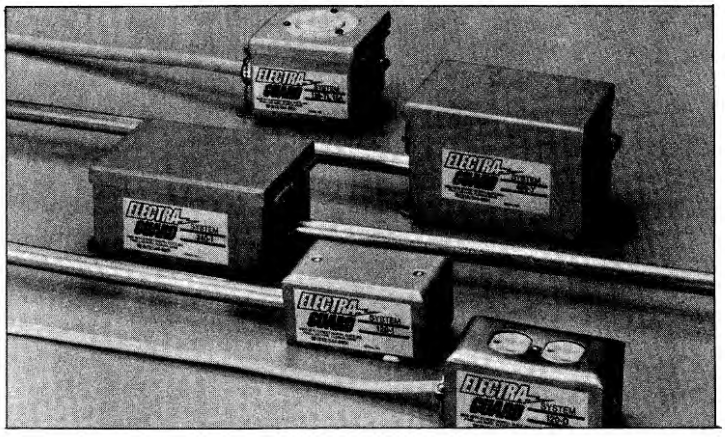

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The pre-amp section consists of everything to the left of the dotted line in Fig. 3. It conditions the signal from the SC-01 and sends it to the main amplifier section, to the right of the dotted line. Note that the volume control for the speaker is located in the pre-amp section.

U8 (LM380) is an amplifier chip capable of handling speaker loads of up to 2.5 watts with proper heat sinking. A typical 6-inch car speaker shouldn't present any heat problems when used with this amplifier chip. The pre-amp/amplifier circuit is powered from the same 12-volt supply that powers the Votrax chip.

Generating a Phoneme

Here is the sequence of events that creates a phoneme sound. First, enable the external bus with the command OUT 236,16 to allow any input or output from or to the computer (Model III only). The next step is to set the 8255 interface chip to mode zero, option 8, with the OUT 19,144 command. The OUT 17,'CODE' sends a phoneme code to the Votrax chip through the 8255 (PB0 to PB5). Now consider the required set-up time delay.

If Basic controls the Votrax chip, a time delay loop isn't necessary due to the internal slow speed of the Basic language as compared to machine-language code. If you use machine-language code, the program loads register pair BC with a value and calls 60 hex for the time delay. I use this last method and will describe it under the Text-to-Speech program section next month.

After the controlling program sends the phoneme code to the SC-01 chip, the chip must latch in the code to start the sound output via the STB line input. Port 18 controls the 8255's PC0, PC1, PC2, and PC7 outputs. It always starts the SC-01 chip by making the STB line into a high state.

The value sent to port 18 controls the STB line, inflection levels, and enables gate U3C for interrupt control. The value must always be an odd number to ensure control of the STB line. The phoneme sounds when an OUT 18,X command latches in.

After phoneme generation, the program monitors the Votrax chip to know when to send out another code. Port 16 samples the 8255's PA0 input, which is the same as the A/R line. The program scans the A/R line in a loop until a positive value indicates the Votrax chip is ready for a new code. The Basic command that samples port 16 is A = INP (16). A positive value causes the entire sequence of events to start all over again with a new phoneme until stopped under program control.

Speech Construction

Regardless of the board system on which you build the circuit, be sure to use sockets for all the integrated circuits. Figure 4 shows the component layout of the speech board. Table 4 is the parts list for all the circuits.

Since there are a couple of CMOS chips in the circuit, especially the Votrax chip, take extra precautions to discharge static electricity when handling them. A good rule to practice is never to assemble a project in an area that has a rug beneath your feet. The rug can gen-

Phoneme Code	Phoneme Symbol	Duration (ms)	Example Word
00	EH3	59	jacket
01	EH2	71	enlist
02	EH1	121	heavy
03	PA0	47	no sound
04	DT	47	butter
05	A2	71	made
06	A1	103	made
07	ZH	90	azure
08	AH2	71	honest
09	I3	55	inhibit
0A	I2	80	inhibit
0B	I1	121	inhibit
0C	M	103	mat
0D	N	80	sun
0E	B	71	bag
0F	V	71	van
10	CH*	71	chip
11	SH	121	shop
12	Z	71	zoo
13	AW1	146	lawful
14	NG	121	thing
15	AH1	146	father
16	OO1	103	looking
17	OO	185	book
18	L	103	land
19	K	80	trick
1A	J*	47	judge
1B	H	71	hello
1C	G	71	get
1D	F	103	fast
1E	D	55	paid
1F	S	90	pass
20	A	185	day
21	AY	65	day
22	Y1	80	yard
23	UH3	47	mission
24	AH	250	mop
25	P	103	past
26	O	185	cold
27	I	185	pin
28	U	185	move
29	Y	103	any
2A	T	71	tap
2B	R	90	red
2C	E	185	meet
2D	W	80	win
2E	AE	185	dad
2F	AE1	103	after
30	AW2	90	salty
31	UH2	71	about
32	UH1	103	uncle
33	UH	185	cup
34	O2	80	for
35	O1	121	aboard
36	IU	59	you
37	U1	90	you
38	THV	80	the
39	TH	71	thin
3A	ER	146	bird
3B	EH	185	get
3C	E1	121	be
3D	AW	250	call
3E	PA1	185	no sound
3F	STOP	47	no sound

/T/ must precede /CH/ to produce CH sound.
/D/ must precede /J/ to produce J sound.

Table 3. Phoneme chart.

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erate static charges with a potential of thousands of volts that, in dry climates, could easily destroy CMOS chips.

I use Radio Shack wire-wrap for all of my connections. If you use wire-wrap, use a wire stripper to facilitate working with the small-sized wire. I recommend using wire-wrap because it's small, easy to work with, and comes in various colors. I standardized my color coding system so that blue wire is for address lines, yellow for data lines, green for control signals, and red for power. The color codes make troubleshooting easy.

All of the control signals coming from the computer are labeled in the schematics. How you get them to the speech circuits is up to you. You have two options. You can run them directly from the computer or go through an interface like the one described in the March 1983 issue of *80 Micro* ("Real World, It's About Time!", p. 342).

If you don't build an interface, tie the appropriate signals from the Model III to the speech circuits directly through a 50-pin edge connector and conductor cable. Use a 40-pin edge connector and conductor cable for a Model I. Table 1 shows the signals and pin-outs of the Model I and Model III expansion buses.

You can buy the 40- and 50-pin connectors from Radio Shack, but you'll have to get the cable from an electronics dealer. Run the appropriate signals to the designated inputs shown in Figs. 1 and 2. For the Model III, be sure to connect all the even cable conductors to ground as shown in Table 1. The Model I doesn't use this configuration. (The article referred to above explains the cable/conductor assembly in greater detail.)

I mount both the 5- and 12-volt regulators on opposite sides of the S-100 card. Be sure to mount these regulators on heat sinks to keep them cool. Install a 5 μF electrolytic capacitor on each regulator's input lead to suppress any oscillations should they occur. These oscillations drop the output voltage to an undesirable value. Install the 100 μF electrolytic capacitor across the SC-01's 12-volt power supply to ground as shown in Fig. 2 to prevent noise from entering the circuit.

Although it isn't required, I highly recommend that you add .01 μF disk capacitors across each integrated circuit's power and ground pins. These ICs sometimes produce noise when they're involved in high-speed switching. The capacitors filter out most of it. I always mount mine on the back side of the S-100 card, soldering one lead directly to the chip's power input pin and the other to the chip's ground pin.

On completion of the speech board, check your circuits carefully for wiring errors, opens, and shorts before you apply power to the circuits. If everything checks out, apply power and measure the 5- and 12-volt supplies for correct operation. It's also a good idea to check each IC socket's power pins for voltage. Take time to read all of the SC-01's socket pins for voltages.

Use a miniature plug and socket to connect the speaker to the speech board as shown in the Photo. Install all of the pull-up resistors as shown in Fig. 2. These resistors ensure correct logic levels between the 8255 (U4) and SC-01 (U5) chips. I install my resistors on 14-pin component carriers to obtain a neater appearance.

With the power off, carefully install all of the ICs. Make sure you set the port address decode switches (S1 to S6) to decode the base port of 10 hex.

Decoder Section Parts List (Figure 1)

U1, U2	74LS136
U3	7400
U4	8255A
S1–S6	RS #275-1301
4-Filter Caps	.01 μF @ 25V disk
7-Resistors	1k ohm @ 1/4 watt

Main Speech Circuit Parts List (Figure 2)

U4	8255A
U5	Votrax SC-01 chip
U6	7417
U7	4049
3-Filter Caps	.01 μF @ 25V disk
1 Cap	120 pF cap @ 25V
1 Cap	100 μF @ 25V electrolytic
Resistors are 1/4 watt:	
4.7k ohm	Quantity = 10
6.8k ohm	Quantity = 1
10k ohm pot	Quantity = 1 (any power rating)

Sound Amplifier Circuit Parts List (Figure 3)

U8	LM380
Q1	2N3391
Capacitors: (rated minimum of 25V)	
100 μF elect.	Quantity = 1
50 μF elect.	Quantity = 1
5 μF elect.	Quantity = 1
.10 μF	Quantity = 1
.05 μF	Quantity = 1
.003 μF	Quantity = 1
.002 μF	Quantity = 1
Resistors are 1/4 watt:	
10k ohm pot	Quantity = 1 (any power rating)
1M ohm	Quantity = 2
10k ohm	Quantity = 1
1k ohm	Quantity = 2
Phone Jack	RS #274-249
8 ohm speaker	

Miscellaneous

Wameco QMB-12 Motherboard (if used)
Vector 8802-1 S-100 card (if used)
12V regulator
5V regulator
IC sockets
PC board
50 pin connector and cable (40 pin for Model I)
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solder, hardware, suitable enclosure

Table 4. Parts list.

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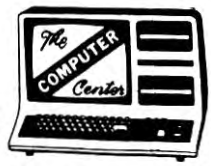

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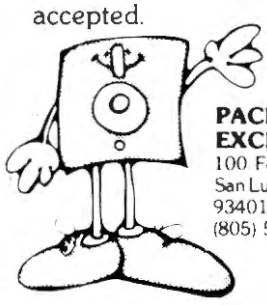

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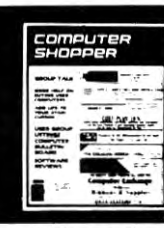

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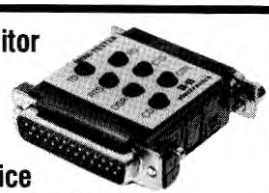

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Testing the Speech Board

The Program Listing is a Basic program that tests the speech board and sets up the master clock frequency. It is well-commented and follows my earlier discussion on the creation of phonemes. Type in and save the Listing. Turn on the speech board's power. You may hear a phoneme sounding at a constant rate due to the possible erratic power-up condition of the circuits. Type RUN to execute the test program.

The computer should now say "Hello, I am now a talking computer." After this message, the speech board is quiet since the last data value sent consists of the Votrax stop code of 63 decimal.

If the speech board doesn't talk, check the DIP switch to see if you selected the correct base port number. If the problem persists, recheck all your circuits for possible errors. If the board does talk, you can set the master clock frequency.

"When you type RUN to execute the test program, the computer should say 'Hello, I am now a talking computer.' "

Change line 270 in the Listing to RUN. This puts the program into a continuous talk mode. Now run the program and adjust the variable resistor that changes the master clock frequency as shown in Fig. 2. Adjust this resistor to obtain the most pleasing sound pitch. When the sound pitch is set, check the inflection circuits.

To do so, modify the Listing once more. Change line 170 to INPUT "ENTER INFLECTION VALUE";VO. This lets you enter different inflection values to see how they change the voice output. Line 180 ensures that the value is odd between 1 and 7. If you use the interrupt option, add a value of 128 to the 1 to 7 value.

Run the program and enter odd values from 1–7 to hear how the voice changes pitch. You should be able to detect a total of four different voices. I incorporate the ability to change the pitch or inflection inputs in the Text-To-Speech program, which I'll discuss next month. This lets you change pitch within sentences.

When you order and receive the Votrax chip, you also get the data sheets and a phonetic speech dictionary that gives you the codes to make up numerous words. The values in the data statements located in the Listing were taken from this book. You must, however, go through a conversion process to obtain the correct decimal value for the data statements.

Refer again to Table 3. Note that each phoneme code has a hex value. You must convert this value to its decimal equivalent in order to put it into data statements. To make it easier, I put

```
10 '***********************************************
20 '              L I S T I N G  1
30 '***********************************************
40 '
50 '       TEST PROGRAM FOR THE SPEECH BOARD
60 '                    BY
70 '              DAVID ENGELHARDT
80 '
90 '                  05/04/83
100 '
110 ' THIS BASIC PROGRAM IS USED TO TEST THE
120 ' HARDWARE CIRCUITS.
130 '
140 '*******************************************
150 '
160 CLS
170 VO=1
180 IF VO=1 OR VO=3 OR VO=5 OR VO= 7 THEN GOTO 190  ELSE 170
190 E=43
200 DATA 27,2,35,24,35,53,55,62,62 :     ' HELLO
210 DATA 21,0,9,41,62,47,0,12,62  :      ' I AM
220 DATA 13,21,35,55,62,6,33,41,62:      ' NOW A
230 DATA 42,61,25,10,20,62        :      ' TALKING
240 DATA 25,50,12,37,34,54,55,42,58,63: ' COMPUTER
250 '
260 GOSUB 5000  :                        ' DO IT.
270 STOP
280 '
290 '***********************************************
300 ' THIS SUBROUTINE WILL MAKE THE VOTRAX CHIP TALK
310 '***********************************************
320 '
5000 OUT236,16:
                ' ENABLE EXTERNAL BUS
5010 FORX=1 TO E:                        ' SET UP LOOP
5020 READ C:                             ' GET PHONEME CODE
5030 OUT19,144:                          ' SET 8255 FOR MODE 0
5040 OUT17,C:                            ' SEND PHONEME CODE
5050 OUT18,VO:                           ' LATCH CODE AND TALK
5060 A=INP(16):IFA=0 GOTO 5060 :         ' SCAN A/R  HIGH = DONE
5070 NEXT X:                             ' DO AGAIN
5080 RETURN
5090 END
```

Program Listing. Test speech program.

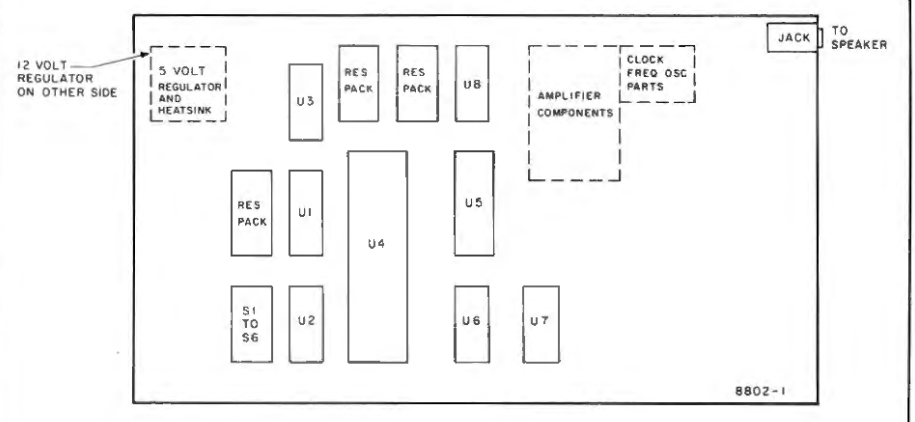

Figure 4. Parts placement for speech board.

the decimal equivalent just to the right of the hex value. Start with the phoneme code 00 and number them from zero to 63.

You can adapt the Listing to run in any Basic program. Just put the subroutine from lines 5000–5080 in your program with the appropriate data statements. Change the data statements and you can apply the talk feature to games, and so on. If the application requires only certain spoken phrases, you can save memory by putting them into data statements, when you use the Text-To-Speech program in next month's issue.

Using Table 3 might seem a little complicated at first, but it gets easier with experimentation. For practice, break the word "hello" down into its phoneme equivalent by using the example word pronunciations given in Table 3.

First find the H sound in the table, phoneme code 1B hex or 27 decimal. The next letter, E, comes closest in pronunciation to that in the word "enlist," so the phoneme code is 01 decimal. Since the next two letters are L's, add two decimal L codes, which are 24,24. The final code for the letter O is 38. The last value should always be the stop code of 63 for any spoken phrase.

Now put the decimal codes 27, 01, 24, 24, 38, and 63 into the first data statement in the Listing. Also, change the E value (line 190) to 6 for the loop count. Run the program and listen to the pronunciation of hello. You may find that some words need a little more work by adding a few extra phoneme codes.

For example, compare the phoneme codes for hello to those in the first data statement in the original Program Listing and you'll see what I mean.

When you get the speech board built and running, you're ready for the software that converts ASCII text to speech, as well as some practical applications. I'll present those next month, along with some instructions on how you can assemble the listings on your particular system. ■

Write to David Engelhardt at 10221 West 101st Place, Broomfield, CO 80020.

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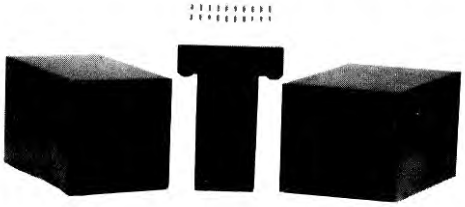

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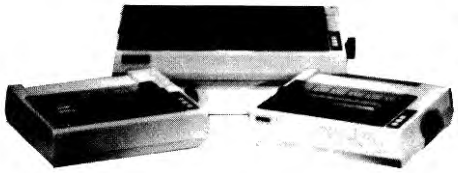

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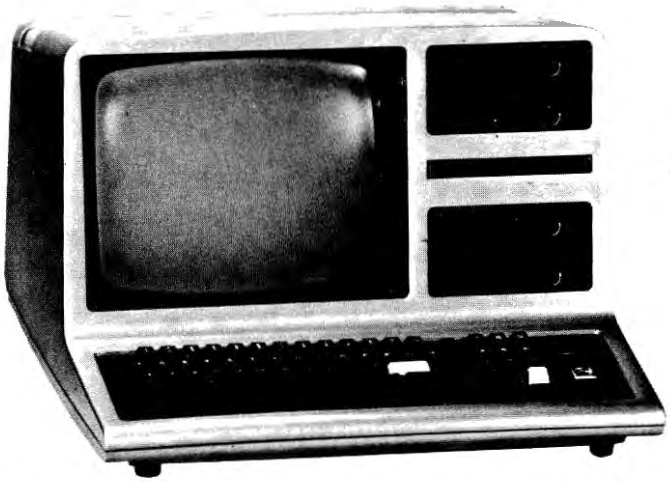

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Phantom Disk

by Donald Goss

Use the Model 4's Memdisk utility instead of a real disk to speed random access searches.

When the Model 4 first hit the stores, most of us Radio Shack groupies were so dazzled by the 80×24 screen and the promised CP/M operating system that we overlooked the Memdisk feature. Unfortunately, the TRSDOS 6.0 manual that accompanies the Model 4 does a poor job of explaining Memdisk. So I'll describe the use of the Memdisk in random-access files.

The basic concept behind Memdisk—using a bank of random-access memory as a pseudo-disk—is by no means new. Usually referred to as a RAMdisk, it is useful to reduce the thrashing that accompanies a random-access search while simultaneously speeding up the search process.

While writing a data-base program for a small school, I learned how to use the Memdisk feature. Rather than quoting the program as I demonstrate Memdisk, I refer only to those aspects that illustrate the feature.

First, you must create and format Memdisk. If you have only one disk drive, Memdisk functions as drive 1. For the purpose of this illustration, I assume that you have two drives (zero and 1) and want to create a Memdisk as drive 2.

From the TRSDOS READY prompt, type SYSTEM (DRIVE=2,DRIVER="MEMDISK/DCT") and press the enter key. Answer the next prompt with D to indicate that you want to use all 64K of upper memory.

Answer the following prompt by typing D to indicate that you want the pseudo-disk to be double density, then answer the prompt Do You Wish to Format It? by pressing the Y key. After formatting, you'll have 12 cylinders on the Memdisk with 4,608 bytes each, for a total of just over 55K of usable memory.

To access the pseudo-disk with the greatest speed, transfer some of the system modules from your TRSDOS disk to high memory.

You need only the first three modules for the functions associated with random-access files. To transfer these, type SYSTEM (SYSRES=1) and press the enter key. Repeat the command with =2 and =3 to transfer the other modules.

I assume that your program and data are on a disk in drive 1. My project contains a Basic program, named Program/BAS, a data file, Student/DAT and a short, one-record file Count/DAT that holds the counters on a disk in drive 1.

Use the Copy command to transfer the data file(s) over to drive 2, just as if

```
SET *PD CLICK/FLT
FILTER *KI *PD
SYSTEM (DRIVE=2,DRIVER="MEMDISK/DCT")
D
D
Y
SYSTEM (SYSRES=1)
SYSTEM (SYSRES=2)
SYSTEM (SYSRES=3)
COPY STUDENT/DAT:1 :2
COPY COUNT/DAT:1 :2
BASIC
CLS
LOAD "PROGRAM/BAS:1"
RUN
//STOP
```

Figure. Build Startup/JCL File.

The Key Box

Model 4
TRSDOS 6.0

it were a real disk drive. It's not necessary to transfer your program to Memdisk. At this point load Basic, load your program, and run it—accessing your data files in drive 2 just as you normally use random-access files.

You'll have to get used to not seeing the disk access lights go on and off periodically and to the speed of file access, which is surprisingly fast.

To simplify all of this, and to eliminate the possibility of errors, I suggest that you put this process into a Build file and execute it with the Do command.

From the TRSDOS READY prompt, type BUILD STARTUP/JCL and press the enter key. Then enter the commands in the Figure, substituting your own program names. I am including the click filter here, since this is unclear in the manual.

After following the instructions in the Figure, hold down the shift and control keys, and press the @ key to end the Build sequence. By typing DO STARTUP/JCL, you can execute all of the commands without error.

You can also set the disk to automatically perform all these tasks during boot-up by entering AUTO DO STARTUP/JCL. That way, after turning on your computer and entering the correct date, you'll have time to pour yourself another cup of coffee while your program executes. Depending on the length of your data files, you should have between 1½ and 2 minutes of execution time.

Make certain that you copy your data back to your data disk at the end of each session. Although you may begin to think of Memdisk as a very real and fast disk drive, when the power goes off, Memdisk's data disappears. To prevent this from spoiling your day, I suggest that you set up another Build file (EXIT/JCL) with the commands:

```
COPY STUDENT/DAT:2 :1
COPY COUNT/DAT:2 :1
```

Then you can set up an orderly exit by typing SYSTEM "DO EXIT/JCL" instead of END, and so file your data away. By doing this, your data is always waiting for you on your next boot-up.

Happy filing! ■

Dr. Donald Goss is Chairman of the Division of Humanities at Volunteer State Community College in Gallatin, Tennessee. He can be reached at the Division of Humanities, Volunteer State Community College, Gallatin, TN 37066.

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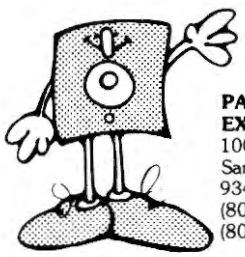

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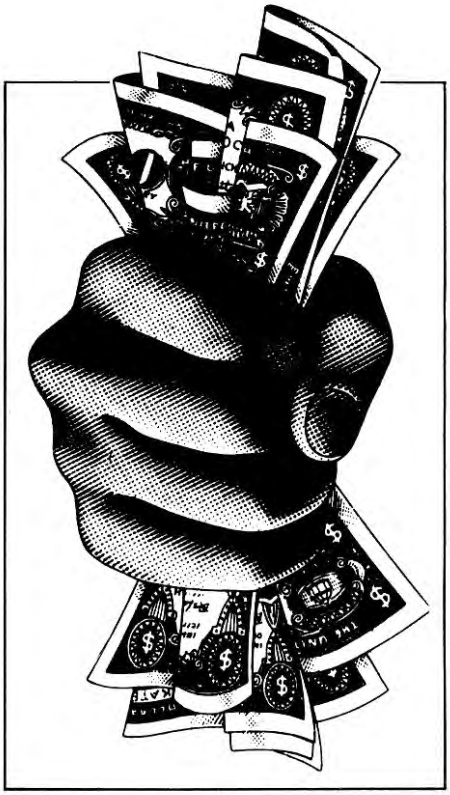
The Bucks Start Here

by N.B. Parrish

You're expecting a tax refund, but you're not sure how to invest it. Use this program to evaluate the options, then enjoy the payoff.



Everyone knows there's no such thing as a free ride. You can, however, come close to getting something for nothing if you know where to invest your hard-earned money. This little Model III program can help (see the Program Listing). With the changes I've noted, this program also runs on a Model II, Model 100, and a Color Computer.

Those of you fortunate enough to receive an income tax refund this year may wonder what to do with it. If you decide to invest it, then additional questions arise.

How can you get the most return from your money investment? Do you invest in tax-free bonds or some other form of tax-free security? Is a fully taxable bond, treasury bill, or regular savings account best for you? Other factors, such as liquidity of assets, may be important to you, but if you want yield, read on.

Enter Uncle Sam

The answers depend on your federal income tax bracket. A while ago, I stumbled on an article in *Changing Times* called "What is Tax-Free Income Worth to You?" It included a table comparing taxable and nontaxable yields for various tax brackets.

As usual, my bracket and the yield I wanted fell between those listed. In the process of interpolating up, down, and across, I lost my place. And I didn't know what to do about state and local taxes.

Instead of giving up, I wrote a program that brings all these factors together.

The Menu

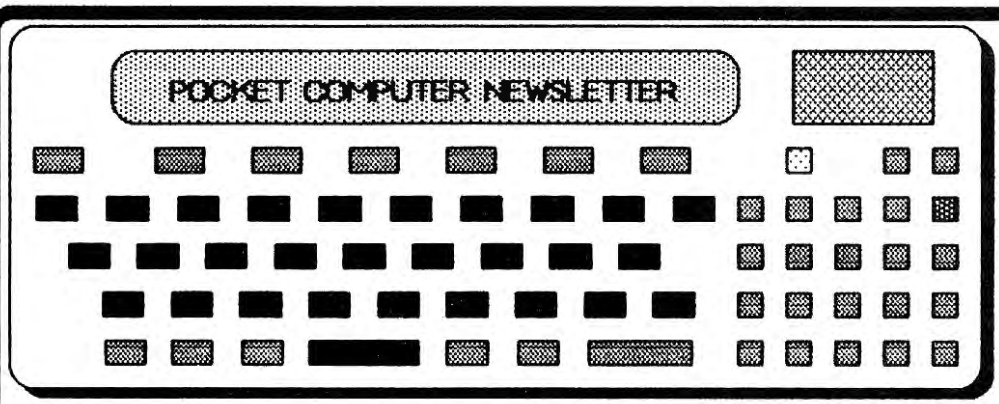
The main menu has three options. The first calculates the break-even tax bracket for a specific taxable and nontaxable investment. The second option figures the tax-free equivalent of a taxable yield, while the third gives the taxable equivalent of a tax-free yield.

Sample Problem

Say you're in the 35 percent federal income tax bracket and have the choice between purchasing a taxable security yielding 10.55 percent and something that yields 7.75 percent tax-free.

The Key Box

Models I and III
Model II (with changes)
Model 100 (with changes)
Color Computer (with changes)
16K RAM Cassette Basic
32K RAM Disk Basic
16K RAM Color Basic



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100 ONBGOSUB200,300,400:PRINT:PRINT:INPUT"PRESS ENTER TO CONTINUE"
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110 CLS:TA=0:RX=0:TG=0:ST=0:SS=0:TX=0:TT=0:CF=0:CD=0:TA=0:FI=0:FX=
0:FR=0:FE=0:ZZ=0:ZX=0:GOTO50
200 CLS:PRINT@134,"MAX. TAX BRACKET TO BENEFIT FROM A SPECIFIED YI
ELD"
205 GOSUB500:PRINT
210 INPUT"TAX FREE YIELD? (10%=10)";TF
220 INPUT"TAXABLE YIELD? (10%=10)";TY
225 INPUT"ENTER EXEMPTED STATE AND LOCAL TAXES, IF ANY";RT:RX=RT/1
00
230 TB=1-(TF/(TY-(RX*TY))):IFTF>TYTHEN260
240 PRINT:PRINT"** IF YOU ARE IN THE ";USINGS$;TB*100;:PRINT"% OR
LOWER BRACKET, YOU WILL COME OUT BETTER BY OBTAINING THE TAXABLE Y
IELD"
250 PRINT"BUT, IF YOUR BRACKET IS GREATER THAN ";USINGS$;TB*100;:P
RINT"%, YOU WILL COME OUT AHEAD BY OBTAINING THE TAX FREE YIELD**"
:RETURN
260 PRINT:PRINT"INVALID ENTRY - TAX FREE YIELD IS GREATER THAN TAX
ABLE AND WOULD RESULT IN A NEGATIVE BRACKET. RE-ENTER DATA":GOTO21
0
300 CLS:PRINT@140,"TAX FREE EQUIVALENT OF A TAXABLE YIELD"
305 GOSUB500
310 PRINT:INPUT"ENTER YOUR INCOME TAX BRACKET (40%=40)";TA:TG=TA/1
00
315 INPUT"ENTER EXEMPTED STATE AND LOCAL TAXES, IF ANY (7%=7)";ST:
SS=ST/100
320 INPUT"TAXABLE YIELD? (10%=10)";TX:TT=TX/100
330 CD=TT*(1-(SS+(TG*(1-SS)))):CF=CD*100:PRINT
340 PRINT"A";TX;"% TAXABLE YIELD IN THE";TA;"% TAX BRACKET IS EQUI
VALENT TO A TAX FREE YIELD OF";USINGS$;CF;:PRINT"%":RETURN
400 CLS:PRINT@140,"TAXABLE EQUIVALENT OF A TAX FREE YIELD"
405 GOSUB500
410 PRINT:INPUT"ENTER FEDERAL INCOME TAX BRACKET (40%=40)";FI
420 FX=FI/100:INPUT"ENTER EXEMPTED STATE AND LOCAL TAXES, IF ANY (
7%=7)";ST:SS=ST/100
430 INPUT"TAX FREE YIELD? (10%=10)";FR:FE=FR/100
440 ZZ=FE/(1-(SS+(FX*(1-SS)))):ZX=ZZ*100:PRINT
450 PRINT"A";FR;"% TAX FREE YIELD IN THE ";FI;"% TAX BRACKET IS EQ
UIVALENT TO A TAXABLE YIELD OF"; USING S$;ZX;:PRINT"%":RETURN
500 FORX=1TO64:PRINT"=";:NEXT:RETURN
```

Program Listing. Evaluation of taxable and tax-free income.

Using option 3, the computer asks you for your income tax bracket. In this example, enter 35. Next, it prompts you to enter any state or local taxes. If none, simply press the enter key. For this example, assume 7 percent and enter 7. Finally, it asks you to input the tax-free yield (in this case 7.75 percent).

You find that a 7.75 percent tax-free yield in this case is equivalent to a 12.82 percent taxable yield. Which investment would you rather have?

If you deal in bonds, there are other considerations (such as whether you should buy at greater- or less-than-face value, and long term capital gains and losses). If in doubt, see your investment counselor or broker.

Program Conversions

The program listed here is for the Model III, and since there are no laser-zap sound effects or spectacular graphics, it works on most computers with a few conversions.

For the Color Computer, Model II, and Model 100, change all PRINT@ statements in lines 10, 50, 200, 300, and 400 to PRINT statements. Instead of specifying an X value of 1 to 64 in line 500, change it to 1 to 80 for the Model II and 1 to 40 for the Model 100.

For use on the Color Computer change line 500 to:

```
500 PRINT STRING $(32 "=");:RETURN
```

See you at the bank. ■

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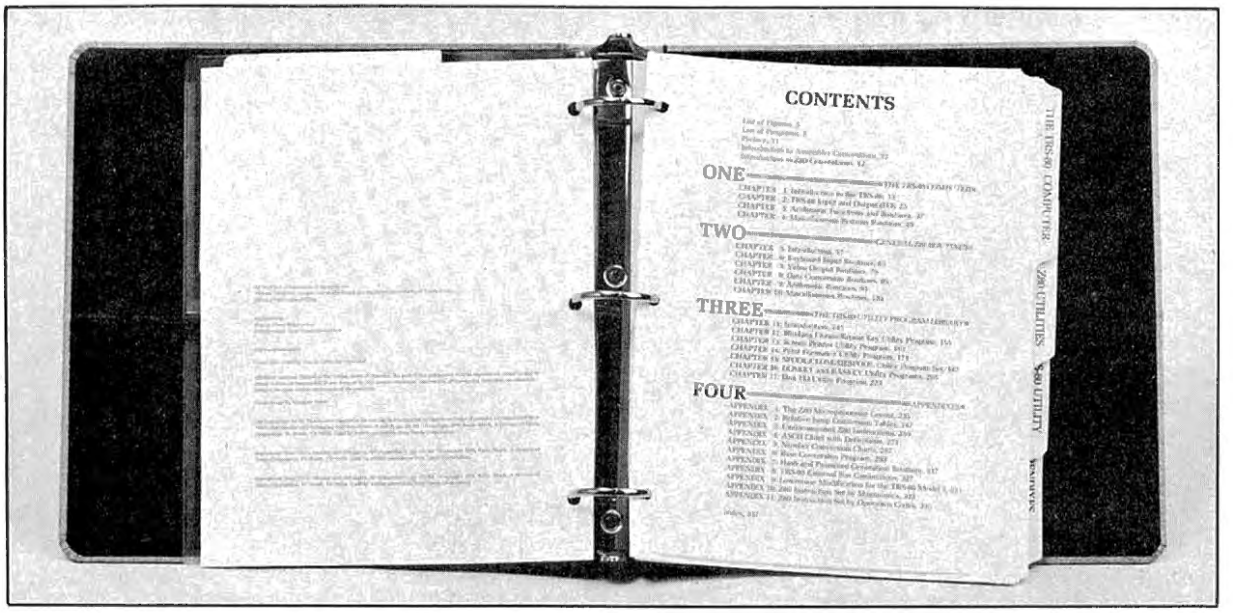

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Bill of Fair Repair

by Terry Kepner

Here's the low-down on repair costs for your TRS-80—whether Tandy or an independent works on it.

One of the decisions Radio Shack computer owners face is whether to buy upgrade equipment from Radio Shack or from a less expensive, independent source. Similar to this decision is whether to modify the hardware in your computer yourself (such as adding a true uppercase/lowercase modification to your Color Computer, or adding non-Tandy memory to your Model III) or take it to Radio Shack.

Radio Shack's Hard Line

In the past, Radio Shack insisted that its customers patronize only Radio Shack company stores or associate dealers when shopping for upgrade equipment. Many times Tandy has said that it can't and won't work on, or provide repair support for, equipment manufactured by outside companies or for modifications made by unauthorized individuals. Tandy used to refuse to repair any modified computers, even when the problem was obviously the Radio Shack equipment and not the modification. This generated ill will and rapid growth of a new "cottage" industry—repairing modified Radio Shack computers.

This new industry has spawned horror stories of modified computer owners and the difficulties they have getting their machines repaired. Stories of burned-out chips, expensive and unending repair trips, and shoddy workmanship abound.

Radio Shack usually advertises a 90-day warranty. This warranty means that Radio Shack makes any repairs required due to manufacturing defects free of charge. Any repairs needed after the warranty period are charged at a basic labor rate, plus the cost of parts.

You void the warranty if you open the case of the computer and install non-Radio Shack equipment or make modifications to the existing equipment. Officially, the repair technicians consider the warranty void if the case has been opened, even if no alterations to the Radio Shack equipment are made. Fortunately, most technicians are more lenient than this official policy.

Change of Heart

Last year Radio Shack relaxed its hard-line stance on repairing out-of-warranty (modified) equipment. Radio Shack now allows its technicians to work on computers that have non-Radio Shack alterations or additions, but only when the non-Radio Shack modifications don't affect the problem being corrected.

This means that if you add non-Radio Shack disk drives to your computer and begin experiencing memory problems, Radio Shack will unplug your drives and test the computer. If the Radio Shack memory is bad, they'll replace it. If the added memory is bad, Radio Shack charges a minimum "check-out" charge, and you must replace the bad memory. (Optionally, the Radio Shack technician can remove the non-Radio Shack modifications and return the unit to its standard setup. There is a charge for this service.)

If, on the other hand, you begin having disk input/output problems with your non-Tandy drives, don't bother asking Radio Shack for help. You have to go to the company that sold you the disk drives, because Radio Shack works only on its own drives.

This is a reasonable position to take. Radio Shack technicians have repair manuals only for Tandy equipment, and their training is similarly restricted. Just because the foreign equipment is compatible with the Radio Shack computer doesn't mean that the parts, and design, inside the equipment are identical with Radio Shack equipment.

Radio Shack's new attitude makes the decision involving foreign equipment easier. Now you know that Radio Shack will take care of the basic equipment in your computer. You must take care of any unauthorized equipment or modifications.

Repair Rates

This leaves you in a delicate position. The main reason for purchasing non-Radio Shack equipment is cost. But once you have the equipment, how do you repair it, and how do you know what represents a fair repair cost? Saving $200 by buying a disk drive from someone else isn't much of a savings if you have to spend $300 to repair it a year later.

Before buying non-Tandy equipment, ask the manufacturer what its policies are regarding repair work, and if it recommends any local technicians who can take care of its merchandise. Most important, ask about technical manuals for the equipment (I strongly suggest you do this. That way when you find a technician, you don't have to wait for him to write the manufacturer for repair manuals before he can begin working on your computer).

When your computer malfunctions, you must determine where the problem lies—in the Radio Shack equipment, or

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System Requirements: Either CP/M® or MS-DOS (PC-DOS) • Microsoft BASIC • 64K RAM • Two disk drives or hard disk • 132 column wide carriage printer, *or* an 8½"x11" printer with compressed print mode (an Epson MX-80 or similar printer).

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in the foreign equipment. Sometimes it's easy, sometimes it isn't. If the problem is with the non-Radio Shack equipment, take your computer to an outside repair technician. If Radio Shack's equipment is at fault, you have a choice: take your computer to a Radio Shack computer repair center or take it to an outside technician. The decision is up to you, and will probably be based on cost.

Radio Shack's policy is that it charges a basic rate for any computer brought in for repair work that's out of warranty (see Table 1). Additionally, if you bring in a peripheral (printer, modem, Vox Box, etc.) at the same time Radio Shack charges an additional $5 for each peripheral the technician checks out with the CPU. If the peripheral is brought in at the request of the service center, then they don't charge you. If you bring in the peripheral separately, there is an appropriate service charge (see Table 1) i.e., the Vox Box repair service charge is normally $15. If you bring it in with the CPU for checkout, the charge is only $5 for the Vox Box, plus $15 for the CPU checkout.

The policy for installing kits is similar. If you install more than one upgrade kit, the highest labor charge is at list price, while the additional kits' labor charge is discounted by 30 percent. If you are installing multiple RAM or ROM upgrades all at the same time, then Radio Shack charges only the base labor rate for one installation. For example, installing three 26-1102 RAM kits in the same computer has a single labor charge of $15.

If the equipment has any non-Radio Shack parts or modifications, the rates in Table 1 don't apply. Instead the repair cost is $15 per half hour. These prices don't include the cost of parts required for the repair.

Table 1 is a listing of the current service charges and checkout charges Radio Shack uses. These prices are subject to change without notice, but if past experience is any indication, the prices should be good for about a year.

Any Radio Shack computer product (catalog #26-xxxx) not listed in Table 1 has a maximum checkout of $30 for all CPUs and $15 for all other items. As a matter of policy, any checkout charge billed within 45 days of a repair is credited against the labor charge for that repair. The amount credited does not exceed the labor charge.

The primary use of Table 1, for those with modified computers, is to determine a fair rate for repair work by independent repair technicians. If Radio Shack charges $25 to align a disk drive, an independent technician shouldn't charge much more (usually, it's less).

If your computer is unmodified, and contains only Radio Shack parts, Table 1 gives you a good idea of what to expect when you take your computer in for repairs. ■

You can reach Terry Kepner c/o 80 Micro, *80 Pine St., Peterborough, NH 03458.*

Table 1. Radio Shack computer service charges.

Catalog Number	Description of Service	Service Charge	Checkout Charge
26-100X	Repair Model I CPU (Maximum labor = $30.00, maximum parts = $50.00)	$15.00/½hr	$15.00
26-1006	Install DISD Modification	$50.00	(NO DISCOUNT)
26-106X	Repair Model III w/o Drives (Maximum labor = $30.00, maximum parts = $45.00)	$15.00/½hr	$15.00
26-106X	Install REV "B" ROM "C" (includes parts)	$20.00	N/A
26-106X	Install Network III Download ROM"C" in shop (On Site charge is time and material)	$15.00	N/A
26-1101	Install 16K RAM & Keypad (note 1)	$30.00	N/A
26-1102	Install 16K RAM (note 2)	$15.00	N/A
26-1103	Install Keypad (note 1)	$15.00	N/A
26-1104	Install Lowercase (note 1)	$15.00	N/A
26-1120	Install Level II Basic (note 2)	$15.00	N/A
26-1121	Install Model III Basic and 16K RAM (note 2)	$15.00	N/A
26-1125	Install Model III Hi Res Graphics Kit	$30.00	$10.00
26-1131 new	Install Model I/III Hard Drive 1/2/3 Slave	$30.00	$15.00
26-1140/1/2	Repair Expansion Interface *(1 hr. max)	$15.00/½hr	$10.00
	Repair Buffer Cable	$15.00	N/A
26-1143	Install Double Density Adapter	$15.00	N/A
26-1145	Repair RS-232C	$15.00	$10.00
26-1145	Install RS-232C connector if req'd	$15.00	N/A
26-1148	Install RS-232C (note 1)	$15.00	N/A
26-1150	Install Tractor Feed (AXX-5006)	$30.00	N/A
26-1158	Install New Revision ROM	$30.00	N/A
26-1158	Replace Line Feed motor	$15.00	(NO DISCOUNT)
26-1160/1/4	Repair and/or Align Disk Drive	$30.00	$10.00
26-1162	Install Disk Drive #0	$30.00	N/A
26-1163	Install Disk Drive #1 (note 1)	$15.00	N/A
26-1170	Repair Telephone Interface I *(1 hr. max)	$15.00/½hr	$10.00
26-1171	Repair Telephone Interface II *(1 hr. max)	$15.00/½hr	$10.00
26-1172	Repair Modem I (1 hr. max)	$15.00/½hr	$10.00
26-1173	Repair Modem II (1 hr. max)	$15.00/½hr	$10.00

Table continued

Catalog Number	Description of Service	Service Charge	Checkout Charge
Table continued			
26-1174	Repair AC 3 Modem (1 hr. max)	$15.00	$10.00
26-1180	Repair Voice Synthesizer	$15.00	$ 5.00
26-1181	Repair Vox Box (1 hr. max)	$15.00/½hr	$ 5.00
26-1182	Repair Plug'n Power Controller	$10.00	$ 5.00
26-1190	Install New Revision ROM	$15.00	N/A
26-120X	Repair/Align Cassette Recorder	$15.00	$ 5.00
26-1210/11/12	Repair Network I/II/III (1 hr. max)	$15.00/½hr	$10.00
26-1260	Install Envelope Feeder for 26-1158	$45.00	$10.00
26-1411	Repair Printer Interface Cable	$15.00	$ 5.00
26-1429	Repair Auto Control Power Strip	$15.00	$ 5.00
26-1448	Install Single Sheet Feeder for 26-1158	$45.00	$10.00
26-1451	Repair Line Filter	$15.00	$ 5.00
26-1498	Repair Parallel Printer Switch	$15.00	$ 5.00
26-1499	Repair RS-232C Selector Switch	$15.00	$ 5.00
26-300X	Repair Color Computer (Maximum labor = $30.00, maximum parts = $20.00)	$15.00/½hr	$15.00
26-300X	Install RFI Disk Clip Kit (Charged to 0097)	$15.00	(NO DISCOUNT)
26-3015	Install 16K RAM	$15.00	N/A
26-3015/18	Install 16K RAM and Extended Basic ROM	$15.00	N/A
26-3017/18	Install 32K RAM and Extended Basic ROM	$30.00	N/A
26-3017	Install 32K RAM	$30.00	N/A
26-3018	Install Extended Basic ROM	$15.00	N/A
26-3022	Repair and/or Align Controller	$15.00	$10.00
26-3022/23	Repair and/or Align Drive	$30.00	$10.00
26-3501	Repair Pocket Computer 1	$30.00	$10.00
26-3503	Repair Pocket Computer 1 Cassette Interface	$15.00	$ 5.00
26-3505	Repair Pocket Computer 1 Printer	$30.00	$10.00
26-3601	Repair Pocket Computer 2	$30.00	$10.00
26-3605	Repair Pocket Computer 2 Printer/Plotter	$30.00	$10.00
26-3615	Repair PC 2 4K RAM Module	$15.00	N/A
26-3616	Repair PC 2 8K RAM Module	$15.00	N/A
26-3801/2 (new)	Repair Model 100	$15.00/½hr	$10.00
26-3801 (new)	Install 8K RAM for Model 100 (note 2)	$15.00	N/A
26-400X	Install DMA Modification (TT # II:49)	$15.00	N/A
26-4102	Install 32K RAM (note 1)	$15.00	N/A
26-4104	Install Hi Res Graphics Kit (note 1)	$30.00	$10.00
	Install in Model 12 (no video align) (note 1) ($15.00 additional if video alignment req'd)	$15.00	$10.00
26-4105	Install 64K VisiCalc RAM Board (note 1)	$15.00	N/A
26-4150/2	Install Primary Hard Drive Kit (note 1)	$60.00	$15.00
	Install in Model 12 (note 1)	$15.00	$15.00
26-4153	Install 12 meg slave 1/2/3	$30.00	
26-4163/4	Install Drive Kit (Model II Bay) (note 1)	$30.00	N/A
26-4167	Install Drive Kit (Model 16 Bay/CPU) (note 1)	$30.00	N/A
26-4715/16	Install Bi sync Modification (TT # II:38)	$15.00	N/A
	Install Model 12 Bi sync (On Site charge is time and material)	$30.00	
26-5000/1/2	Repair Videotex (Maximum labor = $30.00, maximum parts = $20.00)	$15.00/½hr	$15.00
26-6010	Install Model 16 Enhancement Option (note 1)	$45.00	N/A
	Install 6010 in Model 12 (note 1)	$15.00	N/A
26-6011	Install 128K RAM Board (note 1)	$15.00	N/A
26-6012	Install 128K RAM Kit (note 2)	$15.00	N/A
26-6017	Install Model 12 Card Cage	$30.00	N/A
26-6050	Repair DT 1 Terminal (Maximum labor = $30.00)	$15.00/½hr	$15.00
76-1001	Repair PT 210 Terminal	$15.00/½hr	$15.00
76-1009 (new)	Exchange DC1200 Modem Board		$15.00

Note 1: If more than one kit is being installed at the same time in the same machine, the highest labor will be charged at listed price; each additional kit's labor will be discounted by 30%.

Note 2: If multiple RAM and/or ROM upgrades are installed in the same machine at the same time, then only one base labor rate is to be charged. Example—Installing two 26-1102 RAM kits in the same machine is charged at $15.00 labor.

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The program itself does just about everything you'd ask of a personal finance package. — Popular Computing, November 1982

MOD III

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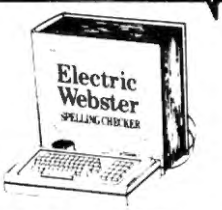

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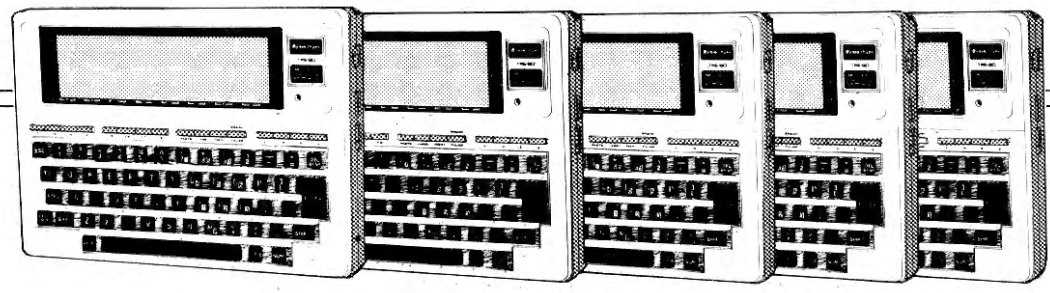

Mnemonic Powers

by Dan Robinson

Radio Shack's Model 100 is a chip off the old block, so to speak. It uses a low-powered version of the 8085 central processing unit (CPU) and its instruction set is almost identical to that of the 8080 chip.

Since the Z80 CPU that drives the Models I, II, III, and 4 is upwardly compatible with the 8080, most of the 100's 8085 instructions should be familiar to Model I/II/III/4 Assembly-language programmers. But some significant differences exist. I'll go over them and provide you with a table listing the command mnemonics for each chip.

The primary differences between the chips arise from the fact that the 8085 is short a few registers. It has no IX and IY index registers, and no primed alternate register set. Also, the 8085 has no instruction to directly load the interrupt register. Instead, a pair of RIM and SIM instructions use a bit pattern in the A register to set the interrupt mask and data bus, and to perform a restart instruction. The restart instructions—numbered RST zero through 7—work from locations in the first 64 bytes of memory.

The 8085 doesn't support relative jumps, and is missing the set and reset bit tests. The miscellaneous instructions that compare blocks and moves are also missing, as are the CB, ED, DD, and FD families of instructions.

In theory, it's possible to use Model I/III utilities such as EDTASM to write assembler code for the Model 100, but you'll have to avoid commands that the Model 100 doesn't support. The object is to send code to the Model 100 through a modem while filtering out unsupported loading codes.

Intel uses its own jargon with the 8085 (MOV instead of LD, for example). Since Z80 terms are currently more familiar to TRS-80 owners, you're likely to see many Zilog words applied to the 8085. Table 1 helps you make the translation. ■

You can reach Dan Robinson at 1625 Higgins Way, Pacifica, CA 94044.

Table 1. Translation of Intel 8085 mnemonics to Zilog Z80.

Intel 8085	Zilog Z80	Description
M	(HL)	Contents of HL register pair
ACI n	ADC A,n	Add n + carry bit to A
ADC r	ADC r	Add r + carry bit to A
ADD r	ADD r	Add r to A
ADI n	ADD A,n	Add n to A
ANA r	AND r	Logical AND r & A
ANI n	AND n	Logical AND n & A
CALL nn	CALL nn	Call routine at nn
CC	CALL C,nn	Call nn if carry bit set
CM	CALL M,nn	Call nn if minus
CMA	CPL	Complement A
CMC	CCF	Complement carry flag
CMP r	CP r	Compare r to A
CNC nn	CALL NC,nn	Call nn if no carry
CNZ nn	CALL NZ,nn	Call nn if not zero
CP nn	CALL P,nn	Call nn if positive
CPE nn	CALL PE,nn	Call nn if parity even
CPI n	CP n	Compare n to A
CPO nn	CALL PO,nn	Call nn if parity odd
CZ nn	CALL Z,nn	Call nn if zero
DAA	DAA	Decimal adjust A
DAD r	ADD HL,rr	Add HL & register pair
DCR r	DEC r	Decrement register
DCX r	DEC rr	Decrement register pair
DI	DI	Disable interrupts
EI	EI	Enable interrupts
HLT	HALT	Stop processor
IN n	IN n	Read byte from port n to A
INR r	INC r	Increment register
INX r	INC rr	Increment register pair
JC nn	JP C,nn	Jump to nn if carry
JM nn	JP M,nn	Jump to nn if minus
JMP nn	JP M,nn	Jump to nn if minus
JNC nn	JP NC,nn	Jump to nn if no carry
JNZ nn	JP NZ,nn	Jump to nn if not zero
JP nn	JP nn	Jump to nn
JPE nn	JP PE,nn	Jump to nn if parity even
JPO nn	JP PO,n	Jump to nn if parity odd
JZ nn	JP Z,nn	Jump to nn if zero
LDA nn	LD A,(nn)	Load A with contents of nn
LDAX	LD A,(rr)	Load A with contents of register pair
LHLD nn	LD HL,(nn)	Load HL with data contained at address nn
LXI r,nn	LD rr,nn	Load register pair with nn
MOV r,r	LD r,r	Load register with contents of second register
MVI r,n	LD r,n	Load register with n
NOP	NOP	No Operation
ORA r	OR r	Logical OR r with A
ORI n	OR n	Logical OR n with A
OUT n	OUT n,A	Send byte in A out port n
PCHL	JP (HL)	Jump to address in HL
POP r	POP rr	Load register pair from stack
PUSH r	PUSH rr	Put register pair on stack
RAL	RLA	Rotate A left with carry
RAR	RRA	Rotate A right with carry
RC	RET C	Return if carry
RET	RET	Return
RIM	---	Load A with byte & read interrupt mask & serial port
RLC	RLCA	Copy A to carry, rotate left

Table 1 continued

Table 1 continued

RM	RET M	Return if minus
RNC	RET NC	Return if no carry
RNZ	RET NZ	Return if not zero
RP	RET P	Return if positive
RPE	RET PE	Return if parity even
RPO	RET PO	Return if parity odd
RRC	RRCA	Copy A to carry, rotate right
RST	RST	Restart instruction
RZ	RET Z	Return if zero
SBB r	SBC A,r	Subtract r from A with carry
SBI n	SBC A,n	Subtract n from A with carry
SHLD nn	LD (nn),HL	Load HL to address nn
SIM	---	Set interrupt mask from A, read byte from serial port reset data bus
SPHL	LD SP,HL	Load stack pointer with HL
STA nn	LD (nn),A	Load address nn with A
STAX r	LD (rr),A	Load address pointed to by register pair with A
STC	SCF	Set carry flag
SUB r	SUB r	Subtract r from A
SUI n	SUB n	Subtract n from A
XCHG	EX DE,HL	Exchange DE & HL registers
XRA r	XOR r	Logical exclusive OR, r & A
XRI n	XOR n	Logical exclusive OR, n & A
XTHL	EX (SP),HL	Exchange contents of stack pointer with HL

Program Listing 1. COM/CMD.

```
                    00100 ;     cOMXTXT/SOR    COM/CMD
                    00110 ;  A MODEL 1 DISK UTITLITY
                    00120 ;  FOR FILE TRANSFER BETWEEN
                    00130 ;  THE MODEL 1 AND MODEL 100
                    00140 ;  USING RS232 COMMUNICATION
                    00150 ;BY RONALD F. BALONIS 8/23/83
                    00160 ;
                    00170 ;
7000                00180          ORG     07000H
                    00190 ;
                    00200 ;------  PROGRAM PARAMETERS
                    00210 ; RS232 COM STATS
                    00220 ;     9600 BAUD. 8 BIT WORD,
                    00230 ;     PARITY ENABLED,
                    00240 ;     ONE STOP BIT
                    00250 ;     XON/XOFF ON SEND TO
                    00260 ;     MODEL 100 ONLY
                    00270 ;  ON MODEL 100 USE COM
                    00280 ;  STATS OF  88E1E
                    00290 ;
                    00300 ;  TO OUTPUT A DISK FILE
                    00310 ;  TYPE: COM O FILENAME
                    00320 ;
                    00330 ;  TO INPUT A 100 FILE
                    00340 ;  TYPE: COM I FILENAME
                    00350 ;
00EE                00360 BAUDS   EQU     0EEH
00E5                00370 CONFG   EQU     0E5H
0011                00380 XON     EQU     11H
0013                00390 XOFF    EQU     13H
404A                00400 HIMEM   EQU     404AH
4318                00410 CMD     EQU     4318H
431C                00420 FUNCT   EQU     CMD+4
431E                00430 FILE    EQU     CMD+6
402D                00440 QUIT    EQU     402DH
4420                00450 DINIT   EQU     4420H
4424                00460 DOPEN   EQU     4424H
4436                00470 DREAD   EQU     4436H
4439                00480 DWRITE  EQU     4439H
4428                00490 DCLOSE  EQU     4428H
0033                00500 VIDEO   EQU     33H
                    00510 ;------  RESET THE UART FIRST
7000 CDDB71         00520 START   CALL    RSRST
```

Listing 1 continued

100 Disks

by Ronald F. Balonis

The Model 100's tape file system is great, but this is 1984 and I prefer disk storage. So I wrote a program called COM/CMD (Program Listing 1) that allows easy file transfer between a Model I/III and the Model 100 and adds manual disk storage to your Model 100.

To use the utility, connect the machines' RS-232 ports with a null modem cable or directly to the Model I if the communications terminal (COM/TERM) switch is set to COM.

File Transfer

To transfer a file from the Model 100 to a Model I/III, get into DOS on the Model I/III, type COM I and the file name, and press the enter key. Then, on the Model 100, type SAVE "COM:88E1E and press the enter key.

After a time, depending on the file type and length, COM/CMD sends the file to the Model 100's RS-232 port and saves it to the Model I/III disk. When the READY prompt and cursors appear on both computers, the transfer is complete.

To transfer a file from the Model I/III to the Model 100, type LOAD "COM:88E1E on the Model 100 and press the enter key. In DOS on the Model I/III, type COM 0 and the file name and press the enter key.

After a time, again depending on the file type and length, the program reads the disk file and sends it to the Model I/III's RS-232 port. When the READY prompt and cursors appear, the transfer is complete.

The Program

My program is a collection of familiar Model I Z80 routines (see Table 2 for Model III modifications). The program first reads the DOS command line to select input or output mode and for the file name. The program then reads the files, whether input or output, into memory storage and then outputs them according to the mode of operation. In sequence, the routines are: Disk In, Com Out, Com In, Disk Out, Error messages, and the software for the RS-232 port.

The RS-232 stats are set in the software. It ignores configuration switches and sets communications parameters at 9600 baud, 8-bit word length, even parity, 1 stop bit, and XON/XOFF enabled on send to the Model 100 only.

The XON/XOFF, which enables the Model 100 to turn the Model I/III data stream on and off, is necessary to the communication link. Otherwise, the Model 100's housekeeping routines would lose data.

To get a copy of my utility program running on your Model I/III, if you have a Z80 disk assembler, simply key in the source listing and compile it. I use the Misosys modified version of the Radio Shack Series I Editor Assembler—Cassette. Alternatively, key in the hex listing with Debug, then use the DOS Dump command to put a copy on disk. ■

Contact Ronald F. Balonis at 118 Rice St., Trucksville, PA 18708.

The Key Box

The programs in "100 Disks" require 8K RAM on the Model 100, 32K RAM on a Model I or III. The programs in "Rooting Out the Problem" and "Autoliner" run in 8K RAM.

Listing 1 continued

```
7003 11E771   00530          LD      DE,DCB
7006 211E43   00540          LD      HL,FILE
7009 011700   00550          LD      BC,23
700C EDB0     00560          LDIR
              00570 ;------  SELECT  COM <I>N  OR  COM <O>UT
700E 3A1C43   00580          LD      A,(FUNCT)
7011 FE49     00590          CP      'I'
7013 287B     00600          JR      Z,GETCOM
7015 FE4F     00610          CP      'O'
7017 C20071   00620          JP      NZ,ERCMD
              00630 ;------  PUT THE DISK FILE IN STORAGE
701A 11E771   00640 GETDSK   LD      DE,DCB
701D 010000   00650          LD      BC,0000H
7020 C5       00660          PUSH    BC
7021 210772   00670          LD      HL,BUFFER
7024 CD2444   00680          CALL    DOPEN
7027 C20571   00690          JP      NZ,EROPEN
702A 110773   00700          LD      DE,STORAG
702D C1       00710          POP     BC
702E C5       00720 READLP   PUSH    BC
702F D5       00730          PUSH    DE
7030 11E771   00740          LD      DE,DCB
7033 CD3644   00750          CALL    DREAD
7036 FE1C     00760          CP      1CH
7038 281C     00770          JR      Z,RCLOSE
703A FE1D     00780          CP      1DH
703C 2818     00790          JR      Z,RCLOSE
703E B7       00800          OR      A
703F C20A71   00810          JP      NZ,ERREAD
7042 D1       00820          POP     DE
7043 210772   00830          LD      HL,BUFFER
7046 010001   00840          LD      BC,256
7049 EDB0     00850          LDIR
704B C1       00860          POP     BC
704C 0C       00870          INC     C
704D 3A4A40   00880          LD      A,(HIMEM)
7050 BA       00890          CP      D
7051 CA2071   00900          JP      Z,TOOBIG
7054 18D8     00910          JR      READLP
7056 11E771   00920 RCLOSE   LD      DE,DCB
              00930 ;------  PUT FILE LENGTH IN BC
7059 3AF371   00940          LD      A,(DCB+12)
705C 47       00950          LD      B,A
705D 3AEF71   00960          LD      A,(DCB+8)
7060 4F       00970          LD      C,A
7061 CD2844   00980          CALL    DCLOSE
7064 C20A71   00990          JP      NZ,ERREAD
              01000 ;------  SEND FILE TO RS232 COM PORT
7067 210773   01010 PUTCOM   LD      HL,STORAG
706A CDCB71   01020 COMOUT   CALL    RSIN
706D FE13     01030          CP      XOFF
706F 2007     01040          JR      NZ,COMO
7071 CDCB71   01050 XXON     CALL    RSIN
7074 FE11     01060          CP      XON
7076 20F9     01070          JR      NZ,XXON
7078 7E       01080 COMO     LD      A,(HL)
7079 CDBE71   01090          CALL    RSOUT
707C 23       01100          INC     HL
707D 0B       01110          DEC     BC
707E 79       01120          LD      A,C
707F FE00     01130          CP      0
7081 20E7     01140          JR      NZ,COMOUT
7083 78       01150          LD      A,B
7084 FE01     01160          CP      1
7086 20E2     01170          JR      NZ,COMOUT
7088 3E1A     01180          LD      A,01AH
708A CDBE71   01190          CALL    RSOUT
708D C32D40   01200          JP      QUIT
              01210 ;------  GET FILE FROM RS232 COM PORT
7090 CDF470   01220 GETCOM   CALL    READY
7093 010000   01230          LD      BC,0000H
7096 210773   01240          LD      HL,STORAG
7099 CDCB71   01250 COMIN    CALL    RSIN
709C B7       01260          OR      A
709D 2002     01270          JR      NZ,DATAIN
709F 18F8     01280          JR      COMIN
70A1 FE0A     01290 DATAIN   CP      0AH
70A3 28F4     01300          JR      Z,COMIN
70A5 FE1A     01310          CP      01AH
70A7 2805     01320          JR      Z,EOF
70A9 77       01330          LD      (HL),A
70AA 23       01340          INC     HL
70AB 03       01350          INC     BC
70AC 18EB     01360          JR      COMIN
70AE C5       01370 EOF      PUSH    BC
              01380 ;------  PUT THE FILE ON THE DISK
70AF 11E771   01390 WDISK    LD      DE,DCB
70B2 210772   01400          LD      HL,BUFFER
70B5 010000   01410          LD      BC,0000H
70B8 CD2044   01420          CALL    DINIT
```

Listing 1 continued

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Listing 1 continued

```
70BB C21571   01430          JP      NZ,ERWRIT
70BE 210773   01440          LD      HL,STORAG
70C1 C1       01450          POP     BC
70C2 C5       01460 WRITLP   PUSH    BC
70C3 110772   01470          LD      DE,BUFFER
70C6 010001   01480          LD      BC,256
70C9 EDB0     01490          LDIR
70CB C1       01500          POP     BC
70CC C5       01510          PUSH    BC
70CD E5       01520          PUSH    HL
70CE 210772   01530          LD      HL,BUFFER
70D1 11E771   01540          LD      DE,DCB
70D4 CD3944   01550          CALL    DWRITE
70D7 B7       01560          OR      A
70D8 C21571   01570          JP      NZ,ERWRIT
70DB E1       01580          POP     HL
70DC C1       01590          POP     BC
70DD 05       01600          DEC     B
70DE 78       01610          LD      A,B
70DF FEFF     01620          CP      255
70E1 C2C270   01630          JP      NZ,WRITLP
70E4 11E771   01640 WCLOSE    LD      DE,DCB
70E7 79       01650          LD      A,C
70E8 32EF71   01660          LD      (DCB+8),A
70EB CD2844   01670          CALL    DCLOSE
70EE C21571   01680          JP      NZ,ERWRIT
70F1 C32D40   01690          JP      QUIT
              01700 ;------  DISPLAY MESSAGES
70F4 21AF71   01710 READY    LD      HL,RDY
70F7 7E       01720 DSPLY    LD      A,(HL)
70F8 B7       01730          OR      A
70F9 C8       01740          RET     Z
70FA CD3300   01750          CALL    VIDEO
70FD 23       01760          INC     HL
70FE 18F7     01770          JR      DSPLY
              01780 ;
7100 213471   01790 ERCMD    LD      HL,ERR0
7103 1824     01800          JR      DISPLY
7105 215071   01810 EROPEN   LD      HL,ERR1
7108 181F     01820          JR      DISPLY
710A 11E771   01830 ERREAD   LD      DE,DCB
710D CD2844   01840          CALL    DCLOSE
7110 216871   01850          LD      HL,ERR2
7113 1814     01860          JR      DISPLY
7115 11E771   01870 ERWRIT    LD      DE,DCB
7118 CD2844   01880          CALL    DCLOSE
711B 217E71   01890          LD      HL,ERR3
711E 1809     01900          JR      DISPLY
7120 11E771   01910 TOOBIG   LD      DE,DCB
7123 CD2844   01920          CALL    DCLOSE
7126 219971   01930          LD      HL,TOBIG
7129 7E       01940 DISPLY   LD      A,(HL)
712A B7       01950          OR      A
712B CA2D40   01960          JP      Z,QUIT
712E CD3300   01970          CALL    VIDEO
7131 23       01980          INC     HL
7132 18F5     01990          JR      DISPLY
              02000 ;
7134 20       02010 ERR0     DEFM    '     '
     20 20 20 20
7139 2A       02020          DEFM    '* COMMAND LINE ERROR *'
     20 43 4F 4D 4D 41 4E 44
     20 4C 49 4E 45 20 45 52
     52 4F 52 20 2A
714F 00       02030          DEFB    0
7150 20       02040 ERR1     DEFM    '     '
     20 20 20 20
7155 2A       02050          DEFM    '* FILE NOT FOUND *'
     20 46 49 4C 45 20 4E 4F
     54 20 46 4F 55 4E 44 20
     2A
7167 00       02060          DEFB    0
7168 20       02070 ERR2     DEFM    '     '
     20 20 20 20
716D 2A       02080          DEFM    '* SOURCE ERROR *'
     20 53 4F 55 52 43 45 20
     45 52 52 4F 52 20 2A
717D 00       02090          DEFB    0
717E 20       02100 ERR3     DEFM    '     '
     20 20 20 20
7183 2A       02110          DEFM    '* DESTINATION ERROR *'
     20 44 45 53 54 49 4E 41
     54 49 4F 4E 20 45 52 52
     4F 52 20 2A
7198 00       02120          DEFB    0
7199 20       02130 TOBIG    DEFM    '     '
     20 20 20 20
719E 2A       02140          DEFM    '* FILE TOO BIG *'
     20 46 49 4C 45 20 54 4F
     4F 20 42 49 47 20 2A
```

Listing 1 continued

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Listing 1 continued

```
71AE 00        02150          DEFB    0
71AF 20        02160 RDY      DEFM    '     '
     20 20 20 20
71B4 2A        02170          DEFM    '* READY *'
     20 52 45 41 44 59 20 2A

71BD 00        02180          DEFB    0
               02190 ;
               02200 ;------  THE RS232 COM PORT
00E8           02210 RESET    EQU     0E8H
00E9           02220 CONFIG   EQU     0E9H
00EA           02230 CONTRL   EQU     0EAH
00EB           02240 DATA     EQU     0EBH
               02250 ;
71BE C5        02260 RSOUT    PUSH    BC
71BF 4F        02270          LD      C,A
71C0 DBEA      02280 SENT     IN      A,(CONTRL)
71C2 CB77      02290          BIT     6,A
71C4 28FA      02300          JR      Z,SENT
71C6 79        02310          LD      A,C
71C7 D3EB      02320          OUT     (DATA),A
71C9 C1        02330          POP     BC
71CA C9        02340          RET
               02350 ;
71CB DBEA      02360 RSIN     IN      A,(CONTRL)
71CD CB7F      02370          BIT     7,A
71CF 2808      02380          JR      Z,NODATA
71D1 E638      02390          AND     38H
71D3 C20A71    02400          JP      NZ,ERREAD
71D6 DBEB      02410          IN      A,(DATA)
71D8 C9        02420          RET
71D9 AF        02430 NODATA   XOR     A
71DA C9        02440          RET
               02450 ;
71DB D3E8      02460 RSRST    OUT     (RESET),A
71DD 3EE5      02470          LD      A,CONFG
71DF D3EA      02480          OUT     (CONTRL),A
71E1 3EEE      02490          LD      A,BAUDS
71E3 D3E9      02500          OUT     (CONFIG),A
71E5 AF        02510          XOR     A
71E6 C9        02520          RET
               02530 ;
0020           02540 DCB      DEFS    32
0100           02550 BUFFER   DEFS    256
7307           02560 STORAG   EQU     $
7000           02570          END     START
00000 TOTAL ERRORS
```

Changes

Line	Label	Source	Stmt
400	HIMEM	EQU	4412 hex
410	CMD	EQU	4225 hex

Additions

Line	Label	Source	Stmt
945		INC	A
1642		LD	A,(DCB + 12)
1644		DEC	A
1646		LD	(DCB + 12),A

Table 2. Model III modifications for disk storage program (COM/CD).

The Great Escape

by Scott Jones

Among the data omitted in the Model 100 user's manual are the escape codes, which control screen functions and cursor positioning. Though designed for use in the text editor, you can use the escape codes in Basic programs and with telecommunications (TELCOM) when transmitted from a host computer.

Using Escape Codes

To use an escape code in Basic, type

```
PRINT CHR$(27);"*";
```

replacing the asterisk with the letter in Table 3 after ESC, noting whether the letter is in upper- or lowercase.

To use an escape code in TELCOM, the host computer must first transmit an escape code (ASCII value of 27 decimal or 1B hexadecimal), then transmit the letter after ESC (see Table 3). The host computer should transmit the two characters together with no intervening space.

Special Instructions

Some of the codes in Table 3 require an explanation.

Use ESC T to set up the label line the Model 100 displays when you press the label key. ESC T protects the bottom line from scrolling and prevents the cursor from entering the bottom line. If the cursor is on the bottom line when you issue ESC T, it stays there until it's moved up or past the lower right position on the display.

ESC U unlocks the label line by allowing the cursor to move onto the last line; it does not clear the last line. If you press the label key and issue ESC U, you can print over the label line.

ESC V keeps the display from scrolling. When the cursor is in the lower right position and you've invoked ESC V, characters print over each other. ESC W allows scrolling to reoccur.

Use ESC Y to position the cursor. You must issue two characters after ESC Y: The first one determines the row; the second one, the column where the cursor goes. The cursor is positioned at the ASCII value of the characters minus 32. To move the cursor to row R and column C in Basic, type this command:

```
PRINT CHR$(27);"Y";CHR$(R + 32);CHR$(C + 32);
```

Note that column numbers begin with zero instead of 1. The upper left corner is Row 0, Column 0. This method may be more convenient than using the one value in a PRINT@ statement. ■

Contact Scott Jones at 3908 Stoney Ridge Trail, Charlotte, NC 28210.

Table 3. Escape codes.

Escape Code	Description
ESC A	Moves cursor up
ESC B	Moves cursor down
ESC C	Moves cursor to the right
ESC D	Moves cursor to the left
ESC E	Clears display and homes cursor
ESC H	Homes cursor (does not clear display)
ESC J	Clears from current position to end of display
ESC K	Clears from current position to end of line
ESC L	Inserts a blank line at the current line; moves text below cursor down a line
ESC M	Deletes the current line; moves text below cursor up a line
ESC P	Turns on flashing cursor
ESC Q	Turns off flashing cursor

Table 3 continued

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Table 3 continued

ESC T	Protects bottom line from scrolling and overprint (used by label key)
ESC U	"Breaks through" label line
ESC V	Stops scrolling
ESC W	Starts scrolling
ESC Y X Z	Moves cursor to row X and column Z (ASCII character values minus 32)
ESC j	Clears display and homes cursor
ESC l	Clears entire current line
ESC p	Displays characters as white-on-black (inverse)
ESC q	Displays characters as black-on-white (normal)

Rooting Out the Problem

by William R. Harlow

Get to the roots of your math problems.

Two short programs for the Model 100, Plot (Program Listing 2) and Bisection (Program Listing 3), help you determine the root(s) of any given function.

Suppose you have an interval I(a,b) and a variable V_{old} associated with it. The equation needed to transfer points to an interval I'(c,d) with associated variable V_{new} is:

$$V_{new} = \frac{(d - c)V_{old} + (b*c - a*d)}{(b - a)}$$

The PSET command of the Model 100 allows 15,360 pixels. I decided to use a horizontal range of five to 235 units and a vertical range of three to 60 units. To establish the horizontal range, let XL and XR be the old values of X-to-the-left;X-to-the-right. Then XP equals (230*X + 5*XR − 235*XL)/(XR − XL). Use a similar expression for the YP. The program tests whether it can plot the axes; then it plots the curve and PRINT@ puts the original ranges at the top of the plot. The program puts the function at line 140 in the form Y = a function of X.

The program includes two examples. When you run the first, Y = 4*SIN(3*X) − XΛ2 + 3, it asks for XL and XR. I keyed in −4,4. The suggested increment becomes .08. I keyed in .1. Too large an increment spreads pixels out; too small an increment slows the plotting speed. Line 30 gives a reasonable value.

The program then asks for Y below and Y above. I keyed in −15,10. Now plotting takes place reasonably quickly. Line 200 is a loop; press the break key to get control back. A subroutine to select the smallest and largest Y value would add about five lines to the program. If the plot is poor, you can always try again with different values. You can also estimate roots by expanding the plot range.

The Bisection Program

The bisection method, one of the oldest known algorithms to determine a real root, isn't fast but it's fairly foolproof. If a function changes sign in an interval, there is at least one root in that interval and the bisection method will get it. Here is where the plot comes in handy: you can see places where roots occur or are close together and can use the appropriate values.

Line 300 is in the form F = a function of X. Here I used F = LOG(X) − XΛ2 + 4. X must be greater than zero. The plot revealed two roots: one close to zero and the other between two and three. The program asks you to key in X left, X right, and epsilon. I keyed in .01,.2,1E−8. The program iterates, showing successive values. When ABS(F) is less than epsilon, the program displays the root and functional values. You can then run the program for other possible roots.

To check your program, print out the two roots of the log function. The six roots of the trigonometry function displayed show how the plot helps you see close roots and how the bisection method determines them. ■

William R. Harlow has taught at the University of Cincinnati (the Department of Mechanical and Industrial Engineering, 836 Rhodes Hall, Cincinnati, OH 45221) since 1943.

```
10 CLS
20 INPUT"KEY IN X-LEFT, X-RIGHT ";XL,XR
30 PRINT"A SUGGESTED INCREMENT IS ";(XR-
XL)/100
40 INPUT"KEY IN YOUR INCREMENT ";DX
50 INPUT"KEY IN YOUR Y-BELOW, Y-ABOVE
";YB,YA
60 CLS
70 YV=(60*YA-3*YB)/(YA-YB)
80 IF YV<3 OR YV>60 THEN 100
90 FOR H=5 TO 235:PSET(H,YV):NEXT H
100 XH=(5*XR-235*XL)/(XR-XL)
110 IF XH<5 OR XH>235 THEN 130
120 FOR V=3 TO 60:PSET(XH,V):NEXT V
130 FOR X=XL TO XR STEP DX
140 Y=4*SIN(3*X)-X^2+3
145 XP=(230*X+5*XR-235*XL)/(XR-XL)
150 YP=(60*YA-3*YB-57*Y)/(YA-YB)
160 IF YP<3 OR YP>60 THEN 180
170 PSET(XP,YP)
180 NEXT X
190 PRINTXL;"<x<";XR;TAB(27);YB;"<y>";YA

200 GOTO 200
```

Program Listing 2. Plot.

```
10CLS
20PRINT"      SOLUTION OF Y=F(X) BY
BISECTION"
30INPUT"KEY IN X-LEFT,X-RIGHT,EPSILON
";L,R,E
40X=L:GOSUB 300:FL=F
50X=R:GOSUB 300:FR=F
60M=(L+R)/2:X=M:GOSUB 300:FM=F
70CLS:PRINT:PRINT:PRINT
80PRINTTAB(10)USING"ITERATE IS +
#.###^^^^";M
95IF ABS(FM)<E THEN 200
100IF FL*FM<0 THEN 120
110L=M:FL=FM:GOTO 60
120R=M:FR=FM:GOTO 60
200PRINT:PRINTUSING"      F(+
#.##########^^^^)=+#.##^^^^";M,FM
210PRINT:END
300F=LOG(X)-X^2+4
310RETURN
```

Program Listing 3. Bisection.

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From the January 1981 issue of the CSRA Computer Club newsletter:

There was some amusement at the November meeting when the Radio Shack representatives stated that the software in the ROM cartridges could not be copied. This month's 68 Micro Journal reported they had disassembled the programs on ROM by covering some of the connector pins with tape. They promise details next month. Never tell a hobbyist something can't be done! This magazine seems to be the only source so far of technical informations on the TRS-80 color computer™. Devoted to SS-50 6800 and 6809 machines up to now, 68 Micro Journal plans to include the TRS-80 6809 unit in future issues.

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Autoliner

by Richard Ramella

Autoliner (Program Listing 4) gives the Model 100 an automatic line-numbering capability similar to what Level II Basic provides.

The program lets you specify the starting line number of a program and the increment for each succeeding line. It is most useful when keying in published programs with regular line increments—100, 110, 120, and so on. Autoliner can also handle irregular line numbers—for instance, a line number of 237 in a program otherwise marked by lines in increments of 10.

Autoliner creates a text (.DO) file that becomes the program you key in.

Program Operation

First the prompt Name of Program ? appears. Name the program as you wish. If the name has more than six characters, the text file name becomes the first six characters in the name. This is required because a text file must be named in six or fewer characters.

The next prompt is Starting line number ? and may be any number from zero to 65,529, the highest line number the Model 100 accepts. Type the number and tap the enter key.

The final parameter-setting prompt is Line increment ? and

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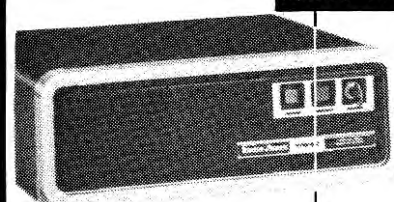

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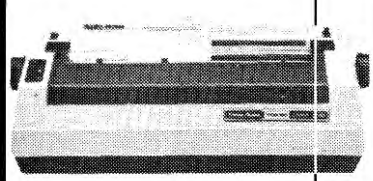

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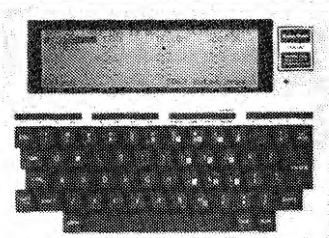

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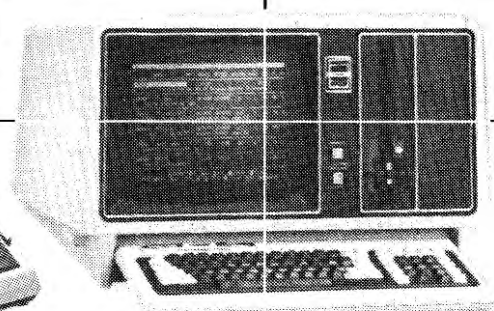

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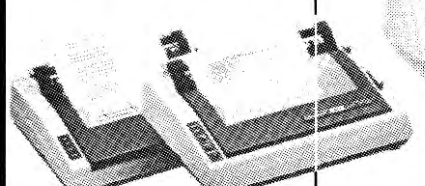

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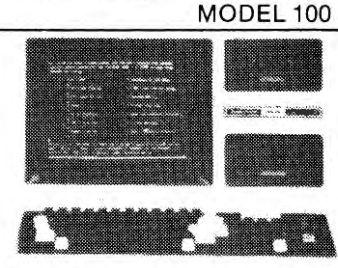

MODEL 4

may be any number from one up. Type the number and tap the enter key.

Now you're ready to key in the program. The prompts appear starting with the first line number and continuing in the increments you set.

An Example

Run the program Autoliner. Answer the first prompt by typing TEST and tapping the enter key. Answer the second prompt by typing 100 and hitting the enter key. Answer the third prompt by typing 10 and pressing the enter key. Line 100 appears with a prompt; answer it REM TEST and tap the enter key. Answer the line 110 prompt by typing PRINT "IT WORKS!" and hitting the enter key. Answer the line 120 prompt by typing ! and pressing the enter key. Answering any line prompt with an ! ends the program.

As it stops, the program announces See TEST.DO for program. TEST is the name of the program you have keyed in.

Then type RUN "TEST" and the program creates and runs a Basic version of the text file. Break into this new program and type SAVE "TEST" and tap the enter key. This puts the program in a Basic (.BA) file where it will be safe. Then type KILL "TEST.DO" and tap enter. This kills the unneeded text (.DO) version of the program.

Don't attempt to run your new program until you have completely keyed it in. It doesn't exist as a Basic program until

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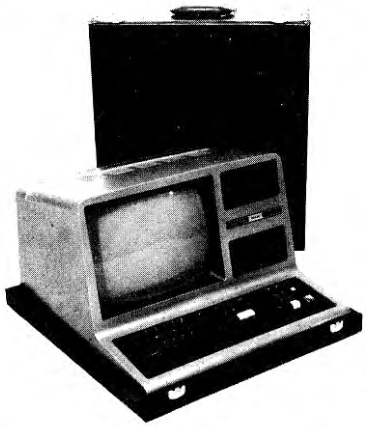

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you end things by typing ! and tapping the enter key.

If you find an irregular number in the listing, answer the line prompt with an asterisk and the program responds New line number and data ?. Answer this by typing the irregular line number and the program information that accompanies it. Then tap the enter key, and the program returns to the regular line increments you specified.

To correct a line, answer a line prompt with the asterisk and then type in the line number you want corrected and the correct version of the line. While useful for short lines, the program doesn't allow the full-screen text editing available when you've turned your program into a Basic file. You can put the same line number twice into a text file, but when you run it as a Basic program, it eliminates the old line and uses the new one.

A few lines at the start serve no purpose other than goof-proofing the program. If your starting line number is 65,000 or more, the program tells you the number of lines with which you have to work. If the increment you choose allows 150 or fewer lines for the program, Autoliner tells you that number. ■

Richard Ramella can be reached at 1493 Mt. View Ave., Chico, CA 95926.

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```
100 REM * Autoliner * TRS-80 Model 100
8K / Richard Ramella
110 CLS
120 MAXFILES=1
130 CLEAR 500
140 DEFSTR A
150 INPUT "Name of Program";L$
160 C=ASC(LEFT$(L$,1))
170 IF C>96 THEN C=C-32: L$=CHR$(C)+
RIGHT$(L$,LEN(L$)-1)
180 IF L$="" THEN GOSUB 420: GOTO 150
190 M$=LEFT$(L$,1)
200 IF ASC(M$)<65 OR ASC(M$)>90 THEN
GOSUB 420: GOTO 150
210 IF LEN(L$)>6 THEN Z$=LEFT$(L$,6)
ELSE Z$=L$
220 OPEN Z$ FOR OUTPUT AS 1
230 CLS
240 INPUT "Starting line number";B
250 B=INT(B)
260 IF B<0 THEN CLS: GOSUB 420: GOTO 240

270 IF B=>65000 THEN PRINT "The Model
100 allows line numbers up to 65529. You
have"65529-B"lines with which to": PRINT
"work.": GOSUB 570
280 CLS
290 INPUT "Line increment";D
300 F=INT((65529-B)/D)
310 IF F<150 THEN PRINT "You
have"F"lines with which to work.":
GOSUB570
320 CLS
330 PRINT B;
340 LINEINPUT A
350 IF A="!" THEN 530
360 IF A="*" THEN PRINT "New line number
and data": INPUT A: PRINT #1,A: GOTO 330

370 A=STR$(B)+A
380 PRINT #1,A
390 A=""
400 B=B+D
410 GOTO 330
420 PRINT "Impossible. Please try again"

430 GOSUB 500
440 FOR T=1 TO 5
450 BEEP
460 NEXT
470 GOSUB 500
480 CLS
490 RETURN
500 FOR T=1 TO 500
510 NEXT
520 RETURN
530 CLS
540 PRINT "See "Z$".DO for program"
550 PRINT L$
560 END
570 PRINT
580 INPUT "Tap a key to continue";G
590 CLS
600 RETURN
610 END
```

Program Listing 4. Autoliner.

Disassembler Debug

Several errors appeared in my Disassembler program (September 1983, p. 283) that make it run improperly. The following is a list of corrections:

RCLA in line 20 should be RLCA.

Lines 160 and 170 are the same in the listing. Line 160 should read:

```
160 DATA"LD   L,D","LD   L,E","LD
L,H","LD      L,L","LD
L,(HL)","LD   L,A","LD   (HL),B"
```

Don't forget that tabs, not spaces, separate the mnemonics and operands.

Line 170 is missing a right parenthesis. "LD (HL,H" should read "LD(HL),H".

Lines 1760 and 1770 should end in RETURN:ELSE RETURN.

Finally, the two spaces in line 10530 in Fig. 1 should be carets for exponentiation (press the shift/6 keys).

I also have a few changes in the mnemonics. When I wrote the program I used Z80 code, but no relative jumps or alternate register sets exist in the 8085. You should make EX AF,AF' and EXX undefined. Leave EX DE,HL, and EX (SP),HL as they are.

All but two JR...@ (including DJNZ @) should be changed to undefined. JR NZ,@ should be RIM and JR NC,@ should be SIM. RIM is the read interrupt mask, and SIM is the set interrupt mask.

I put the equivalent restart commands for the Z80 and the 8085 in Table 1. Their functions are identical.

David A. Cloutier
Bullard Road
North Brookfield, MA 01535
CIS #75705,730

CR Patch

Most printers have a switch labeled "Auto LF after CR." Most computers (e.g., the IBM PC) require this switch to be off to distinguish between a line feed (LF) and a carriage return (CR).

TRS-80 computers require this switch be on so when the computer sends a carriage return, the printer supplies the implied line feed.

If you use two different computers with the same printer, this protocol can be a hassle. We wrote the patch in Program Listing 1 to eliminate this problem.

Model 100 document files have CR/LF pairs embedded in them (try using control/P, control/M, control/P, control/J in Text), but the printer driver strips out any line feed immediately following a carriage return. This patch intercepts the printer driver between each character so it never knows that it just printed a carriage return.

We offer this patch with some trepidation, since it redirects a system jump vector into user memory. It presents no problems under most circumstances, but if you leave it switched on and load a program that clears memory above 62700 decimal, the results are unpredictable, and probably disastrous if you try to print anything.

The programs from the Portable Computer Support Group (PCSG) are an exception to the above caveat. They are fully compatible with this patch, even though they reserve memory above 62700.

Michael Stanford &
Robi Robinson
Portable Computer Support Group
11035 Harry Hines #207
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Built-in Criticism

Publicity for the Model 100 always emphasizes the five built-in programs, including the editing program, Text; the scheduler program, Schedl; and the address organizer, Addrss.

Schedl and Addrss consist of nothing but the search and find parts of Text, with the rest of the text modification capabilities turned off so you can't accidentally clobber any of your address or schedule information. This is OK, but it's more like one and a half programs than three.

In addition, Addrss only operates on the ADRS.DO file, and Schedl can only operate on the NOTE.DO file. This is quite inconsistent.

Next time around, Tandy should combine Schedl and Ad-

Z80	8085
RST 00H	RST 0
RST 08H	RST 1
RST 10H	RST 2
RST 18H	RST 3
RST 20H	RST 4
RST 28H	RST 5
RST 30H	RST 6
RST 38H	RST 7

Table 1. Restart commands for the Z80 and the 8085.

```
0  '  Program CRLFIX V1.0  830827
10 ON KEY GOSUB 20,30:KEY ON
12 CLS:PRINT@130,"PCSG Line Feed Patch";:P
RINT@281,"On    Off";
14 GOTO 14
15 DATA 245,58,172,250,254,13,194,48,245,6
2,10,50,172,250,241,201
20 CLEAR 256,62700:FOR I!=62754 TO 62769:
READ A:POKE I!,A:NEXT
25 POKE 64228,34 :POKE 64229,245: MENU
30 POKE 64228,243:POKE 64229,127: MENU
```

Program Listing 1. Patch to insert a line feed after a carriage return.

drss into a single program that operates on any Model 100 file. You can then keep and search multiple lists of data, addresses, jobs, and so on.

A.E. Siegman
Edward L. Ginzton Laboratory
Stanford University
Stanford, CA 94315

Bar Graph Program

I am looking for a bar graph program for the Model 100 that either produces printable data from the program from "The Year in Review" (August 1983, p. 207) or from another program containing a hard copy print routine.

The program must work on my A.M.P. 120 printer.

T. Hardy McCoy
7718 D.S. Victor
Tulsa, OK 74136

Cram Notes

Brad Dixon's Cram 100 program (October 1983, p. 283) is a barrel of fun.

He mentions sound capabilities, so I changed lines 100 and 130 to values other than 2216 for variety. In line 200 I put SOUND0,2: between BEEP: and NEXT.

The best change is to put Avg in addition to Turns and High at the top of the screen. Add G=G+1 to line 40, TT=TT+N to line 200 (before CLS), and add AV=TT/G.

I'm looking forward to the expansion of C•Notes.

David Dunn Thomas
2308 Chetwood Circle #103
Timonium, MD 21093

Screen RAM Location

While stepping through the Model 100's RAM (24K), I found that the screen RAM is located at 65024 to 65343, inclusive, for a total of 320 bytes.

While I can't POKE characters on the screen, I can PEEK them. Even stranger, the information POKEd to the screen is in RAM, but is not on the screen! I have displayed the keyboard matrix setup in Table 2.

I use Program Listing 2 to PEEK about in RAM. The commands are:

- CTRL to enter a new address.
- SHIFT to add one to the address.
- GRPH to subtract one from the address.

The program displays both the decimal value and the ASCII value if it is printable. The best feature of this program is that it constantly updates information on the screen.

I hope the readers of *80 Micro* can make use of this information.

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Value found when PEEKing matrix:

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65425	Z	X	C	V	B	N	M	L
65426	A	S	D	F	G	H	J	K
65427	Q	W	E	R	T	Y	U	I
65428	O	P	BRAKT	:;	" '	<,	>.	?/
65429	1	2	3	4	5	6	7	8
65430	9	0	—_	+ =	LA	RA	UA	DA
65431	SPC	DEL	TAB	ESC	PASTE	LABEL	PRINT	ENTER
65432	F1	F2	F3	F4	F5	F6	F7	F8
65433	SHIFT	CTRL	GRPH	CODE	NUM	CAPS	?????	BREAK

Table 2. Keyboard matrix setup for the Model 100.

```
100 ' "RAMER.BA" - A RAM SCANNER
110 PRINT:PRINT:INPUT"Start @;A:CLS
120 PRINT@,A;:FORP=0TO6
130 PRINT@+4*P,PEEK(A+P);"   ";
150 IFPEEK(A+P)>32THEN PRINT @9+4*P,CHR$(PEEK(A+P));
ELSE PRINT @9+4*P," ";
160 NEXT
170 C=PEEK(65433):IFC=0THEN120
180 IFC=1THENA=A+1
190 IFC=2THEN110
200 IFC=4THENA=A-1
500 GOTO 120
```

Program Listing 2. RAM screen POKE for the Model 100.

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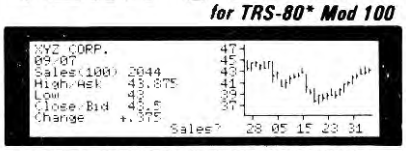

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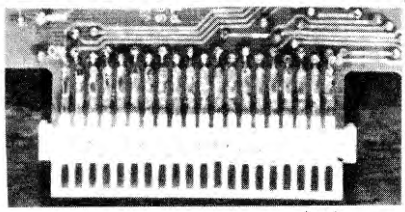

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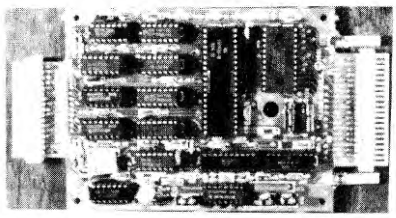

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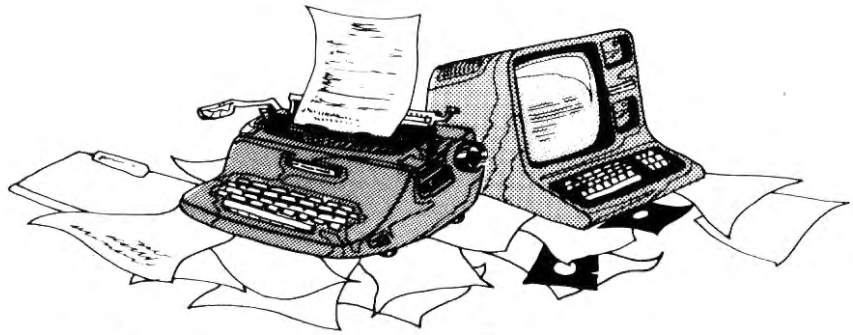

From House to school

Micros in class: will Congress foot the bill?

Even before Rep. Pete Stark presented his "Apple bill" to Congress in 1982 (see *80 Micro*, May 1983, p. 340), micros were pouring into America's schools. Now seven other proposals, including one from Radio Shack sponsored by House Majority Leader Jim Wright, have increased the pressure to make computers a classroom prerequisite.

Stark's original bill, which would have encouraged computer makers to donate micros to schools and take the machines' value as a tax write-off, passed the House last year by a 323–62 vote. It stalled in the Senate, amid charges it was mainly a boost for Apple—which was poised to contribute $200 million worth of IIe's, reaping not only the tax break but an enormous market among school officials buying replacements and parents buying computers to use at home.

The California Democrat has reintroduced the "Apple bill," essentially unchanged, as H.R. 701 in the current session. In the meantime, however, Majority Leader Wright has introduced H.R. 2417—which might, considering its technical specifications and Wright's Texas constituency, be described as "the Tandy bill."

While its overall concept is similar to Stark's, H.R. 2417 has several vital differences. One requires that dealers give teachers eight hours of training on donated equipment, this training to take place within "the immediate vicinity of the participating teacher's school." While mileage has not been specified, the training requirement favors Radio Shack, whose 6,500-plus outlets far outnumber Apple or other brands' dealers.

TRSDOS to go: Tandy's new transportable.

The Model 4P

The Model III mode's on a disk instead of in ROM, but the slogan is terrific: Radio Shack's TRS-80 Model 4P, "a microcomputer worth carrying about," reached dealers on Nov. 15. The transportable version of the 64K Model 4 weighs 26 pounds and costs $1,799.

The 4P's white case contains a 9-inch screen, two slimline 184K disk drives, and a detachable keyboard (with all 70 Model 4 keys, including Control, Caps Lock, and three function keys). Like its deskbound cousin, the 4P offers both a 64-column Model III mode and an 80-column by 24-line display for TRSDOS 6.0 programs, as well as compatibility with Tandy's long-delayed CP/M Plus.

Memory is expandable to 128K. A $149.95 modem board offers direct-connect 300-baud communications; Radio Shack describes the board as "user installable," which—considering Tandy's famous void-warranty warning against opening a TRS-80's case—is as revolutionary a development as the 4P itself.

The transportable's $1,799 price is $200 under the 12-inch-screened Model 4's; with the demise of the Osborne 1, the 4P's closest competitor seems to be another 64K Z80 suitcase, the Kaypro II. The Kaypro currently sells for $1,595, with 10 CP/M applications programs included. ■

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Wright's bill also outlines hardware standards, recommending a system with two 184K disk drives. To skeptics, this translates as "a TRS-80 Model 4"; the system Apple has been giving to California schools includes one 140K drive.

Finally, Wright appeals to legislators' thrift: Apple's plan lets manufacturers write off 200 percent of the hardware's "basis cost" (a bit more than production cost), while Tandy would settle for 125 percent and throw in software equal to 10 percent of the machines' value.

Naturally, the two manufacturers disagree on the bills' pros and cons. Stephen Scheier, director of Apple's Kids Can't Wait program (now distributing micros to California schools), told *InfoWorld*'s Scott Mace that the Radio Shack bill "would limit the number of computers we or other manufacturers can offer."

Tandy's director of corporate planning, George Kuhnreich, countered by criticizing Apple's lack of training requirements: "You can't just dump the CPU on someone's desk."

Both the Stark and Wright proposals are currently stalled in committee.

A Full House

Meanwhile, six other computer bills are now crowding Capitol Hill. Rep. Tim Wirth (D-Colorado) would let schools choose their micros as independent shoppers rather than giveaway recipients, with government subsidies for purchase of systems, software, and peripherals. Wirth also advocates training facilities similar to those created by the Defense Education Act after the USSR launched Sputnik in 1957.

His bill, H.R. 3750, attracted 40 cosponsors in its debut before the Labor Day recess, despite an estimated cost of up to $200 million for each of 10 years.

Rep. Tom Downey (D-New York) has introduced legislation to create computer education and information centers, which would provide some software in addition to teacher training and demonstration facilities.

Finally, Mace writes, Rep. Brian Donnelly (D-Massachusetts) grants the same 200 percent deduction as Stark, but his bill requires companies to make 75 percent of their donations to "schools with students whose parents' incomes are below the national median."

In the Senate, John Danforth's S. 1194, written by the American Electronics Association, has attracted endorsements from the National Association of Secondary School Principals and the National Committee on Industrial Innovation. The Missouri Democrat's bill, which would cost some $300 million, encourages teacher training and educational research and development, as well as supplying tax breaks for the donation of hardware and software.

Sen. Lloyd Bentsen (D-Texas) has introduced a similar bill. Along with his Apple proposal, Stark has put a bill identical to Danforth's before the House.

Though S. 1194 has strong support in the Senate, as do Stark, Wright, and Wirth in the House, no single plan seems likely to break out of committee before the others. With legislators torn between election-year economy and rising demand for better education, an alliance between schools, micro manufacturers, and the federal government—an idea reportedly born in early 1982, when Stark met Apple Chairman Steve Jobs on a cross-country plane trip—may be ready to graduate. ■

HARDWARE

Remember PMC?

From Model I clones to CP/M boxes.

With the IBM PC inspiring a dozen imitators and the Apple/Franklin copyright lawsuit making headlines (see *80 Micro*, December 1983, p. 258), it's easy to forget that the first microcomputer work-alike was based on Radio Shack's trusty Model I. Today, Personal Micro Computers Inc. is phasing out its Tandy twin in favor of an 8-pound box that gives CP/M power to mainframe terminals—and PMC's president is optimistic that the corporate market will bring better sales than did their TRS-80 copies.

"We're pioneers in the clone field," President Ron Troxell told *80 Micro*. Originally a vendor of printers and peripherals, the Mountain View, CA, firm made its systems debut in 1980 with the $495 PMC-80, a beige-cased micro with 16K RAM, Level II Basic in ROM, CRT interface, and built-in high-speed cassette deck.

A year later, the PMC-81 appeared: the same machine, with upper- and lowercase standard and a numeric keypad replacing the tape deck, for $595. Users could upgrade both machines to 48K with a PMC expansion interface, and run all Model I software.

PMC sold its micros through mail order and a small group of about 60 dealers. They didn't sell very many. Datapro Research Corp. of Delran, NJ, estimates that 35,000 of the Model I compatibles are in operation; Troxell, while claiming "that's probably low," won't give an official figure.

Is PMC still making 80s and 81s? As of September 13, Troxell indicated the work-alikes aren't long for this world: "Yes, we are [selling them]. We've also introduced a new computer which will take the place of that product."

That may be a little misleading; the new PMC-101 MicroMate is not a personal computer, but a Z80A-based unit with 128K RAM, one 400K disk drive, RS-232 and Centronics ports, and no monitor or keyboard. It operates with any asynchronous terminal, turning a mainframe outlet into a workstation for CP/M Plus software.

"We have targeted the market very accurately on this product to the installed terminal base existent in large corporations and government agencies, where these agencies are looking to add local computing power to their existing mainframe operations," Troxell said.

"They can switch between dumb terminal operation and intelligent workstation operation, where they can do local word processing and spreadsheet, things like that, or any other CP/M program off-line from the mainframe, and also upload information to and from the mainframe.

"There's also a very strong OEM market for this particular product because it's nice packaging," he continued. "It's a simple little thing that provides a lot of computing power at a small price [$1,195]."

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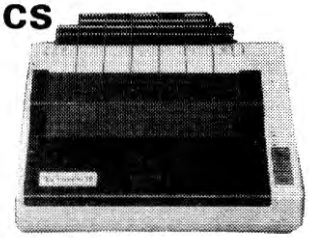

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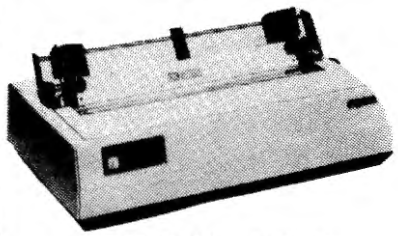

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The old: PMC's EPS-80 word processor.

Considering that corporations are rushing to complete office automation systems from makers like IBM and DEC—and that demand today is for 16-bit rather than 8-bit machines—the MicroMate might be considered an underdog. Nevertheless, Troxell anticipates success when his distributors' salespeople call on data processing managers.

"[The MicroMate] doesn't compete with [the big firms' products] at all," he said. "It really augments the systems that they're providing."

As for software, Troxell sees CP/M Plus (Digital Research's 3.0 version) and the PMC-101's price as offsetting any 16-bit advantages. "We were the first people on the market with a CP/M Plus system delivered," he claimed. "We've been very happy with it. It's a good [operating] system.

"The wealth of software that's available on CP/M right now makes this approach very reasonable, and something that other CP/M companies have bypassed. Nearly every other CP/M machine on the market is sold with a terminal and keyboard. So there's a huge market, my gosh, there're six million terminals out there."

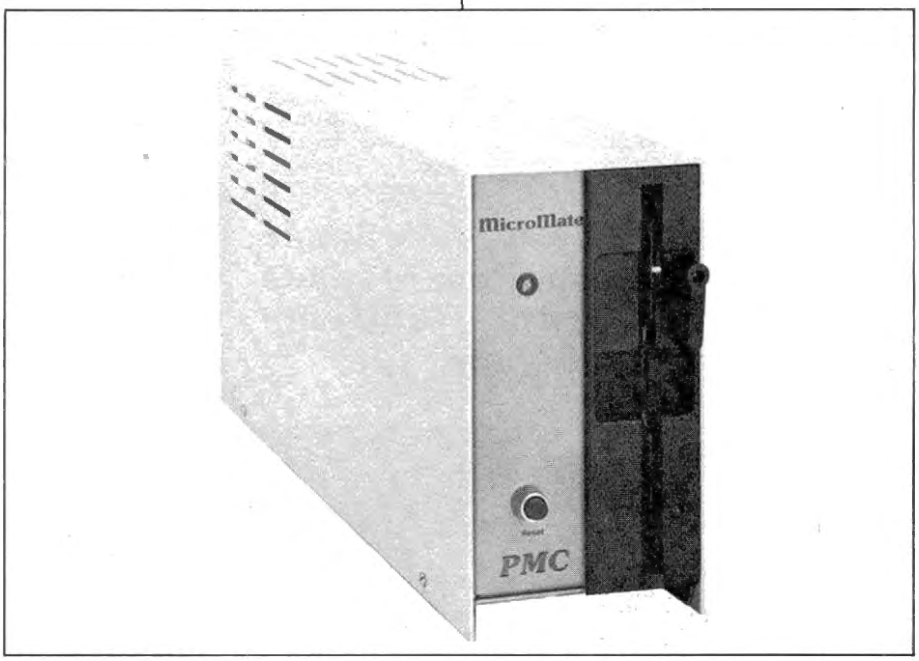
As for the PMC-80 and -81, Troxell reassures owners, "We'll continue to support the product, provide service and so forth, here. And we're still involved in selling peripherals, printers, disk drives, that sort of thing." In addition, PMC's EPS-80 word processor, a 48K model with both Basic and Electric Pencil in ROM, will be sold at least a while longer at $795.

"We're pioneers in the clone field."

Looking to the future, Troxell said, "We're in very good shape. The MicroMate's going to make a very significant impact on PMC sales; as the MicroMate picks up we'll probably phase the others out completely as we expect the MicroMate to be a very good seller."

Beyond that? "All I can say is that the logical direction for everybody is toward 16-bit systems, but it's not practical for us at this time." ■

—E.G.



The new: PMC's MicroMate for CP/M.

UPDATE

The Model I: Staying alive

Vendors vow continued support.

Nothing lasts forever, and three years is forever in the computer industry. Nevertheless, the TRS-80 Model I—the first mass-marketed personal computer—is hanging in there nearly seven years after its introduction, defying both old age and its replacement by newer Radio Shack micros. Perhaps 250,000 of the 300,000 Model I's sold are still in service—and, judging from an unofficial survey, some vendors think the I will survive for some time to come.

The survey, conducted by questionnaire to 69 TRS-80 hardware and software manufacturers and distributors, yielded 18 opinions of the Model I marketplace. A solid majority of respondents described the I as "still viable" for hardware and software sales (57 and 73 percent respectively), and a quarter of them said their business had increased in the past year.

Among hardware vendors, 28 percent said the Model I market was up, 43 percent said it was unchanged, and 28 percent admitted business was down. Model I software seems less popular, with figures of 27 percent (up), 27 percent (unchanged), and 36 percent (down).

The Model I has always attracted hardware buyers, since it's a system designed to be upgraded. Many of today's vendors began as frustrated hackers selling their own solutions to Model I problems—clock speed-up kits, disk storage doublers, gold-plated replacements for unreliable connectors, and so on.

When the Model III appeared in 1980, fixing many of the I's limitations but lacking complete compatibility, Radio Shack's move forward—plus the I's expandable, modular design—opened the door to outside initiative. In a sense, Tandy taught the Model I to fly by pushing it out of the nest.

Is it still flying? Questionnaire responses fell roughly into three categories, describing the Model I in negative, neutral, and positive terms—or, to pick distinctive adjectives, obsolete, adequate, and wonderful.

Swaim: New life for "a dead horse."

On the negative side, George Blank of New Classics Software said, "[The Model I] is unreliable and getting more so as time goes on." In addition to "not reliable," Eugene Shklyar of XYZT Computer Dimensions Inc. mentioned "slow processor," "limited memory," and "not produced any more," and Arlene Schaffer of Taranto & Associates Inc. said, "Too many problems, too slow, not enough capacity."

On the other hand, Logical Systems Inc.'s J. Kyle DiPietropaolo pointed out, "The fact that new computers exist doesn't make [the Model I] any less useful for doing the things it is capable of." Several vendors echoed John Monin of Alpha Products Co., who said the I "does the basic job once the bugs are fixed."

And some are loyal fans, who see the Model I as a workhorse that still works for technically astute or upgrade-conscious owners. George Geczy of JMG Software International wrote, "Compared to my Model I, the Apple IIe is not so hot." United Software Associates' John Burgan added, "My Model I does everything my Model III can three times faster [with a speedup mod]."

Rather than comparing the I to younger machines, Theresa Welsh of AlphaBit Communications Inc. summed up TRS-80 pioneers' situation pragmatically: "Our customers like it. Their only worry is lack of service, parts, and software. People will keep their Model I's as long as there's support for it."

As for that, the prospects aren't all bad. Fifty-seven percent of the hardware vendors claimed their firms had new Model I products coming, as did 55 percent of software respondents.

To companies not already involved, LNW Research Corp.'s Jim Swaim admitted that the Model I has "basically been abandoned in the marketplace. It's simply a dead horse." For current supporters, though, "the Model I can become a very viable marketing area for someone with a product that makes sense, at a price the user can live with."

Besides, Swaim added, "The mentality of people who own Model I's is superior from an electronics standpoint, and of course their dedication to the machine is almost legendary." Age may not count for much in the computer industry, but 250,000 owners pack some clout. ■

—Vester Scott

PULSE TRAIN

Apple sings the blues?

No one expects Apple Computer Inc. to go the way of Atari, TI, or Mattel, but there are some clouds over Cupertino, CA. Apple stock fell from last June's high of $62 to $24.25 a share by late September, and fourth-quarter profits were expected to total $5 million to $8 million, compared to $18.7 million a year ago. Still worse, some industry analysts predict that up to 600 Apple employees might be laid off by Christmas.

The trouble, to put it briefly, was that the IIe and III were getting old, the McIntosh was still in the wings, and the Lisa was too expensive. Despite rave reviews for its integrated software, Apple's $10,000 flagship has been trounced by the IBM PC in corporate sales—and industry analysts like Charles Newton of Newton-Evans Research Co. fear Apple has "too many eggs in its Lisa basket."

One corporate move, though it scared Wall Street (sending Apple stock down eight points), made sense: a cut in Lisa prices, bringing the system to $8,190. Apple also began selling an "empty" Lisa for $6,995, offering its six programs (LisaWrite, Calc, Graph, Project, Draw, and List) individually or as a $1,195 set.

As *InfoWorld* reported, this made it possible to buy a Lisa package for less than an IBM PC XT with VisiOn software. (The XT has 10 megabytes of hard disk storage to Lisa's five, but Lisa has 1 megabyte of RAM versus the IBM's 256K.)

Even so, buyers are hesitating to spend the money for

Lisa: Low in sales appeal.

Lisa, especially since rumors ever since its January 1983 introduction have promised a similar Apple at a fraction of the cost. The McIntosh, first described as a $3,000 PC competitor, is now supposedly a $1,200 rival to IBM's Peanut. January is expected to bring a Lisa-like upgrade for the Apple IIe, perhaps reviving sales of the antique machine.

And there are various rumors about the fate of the Apple III: disappearance (as Apple concentrates on the IIe, McIntosh, and Lisa for the low-, middle-, and high-end markets), a comeback sparked by a new business unit in Cupertino, or anything in between.

Most of all, Apple finds itself (in *Computerworld*'s phrase) "swimming in a Big Blue sea." A crucial part of Lisa's quest for corporate acceptance, the ability to link with IBM mainframes, was postponed when a widely reported deal with Cullinet Software Inc. collapsed, and the harsh realities of the software world have brought about the specter of Lisa owners junking their integrated programs and running MS-DOS with an 8086 card.

Marc Rudov of Venture Development Corp., Wellesley, MA, and other analysts say that Apple, like Osborne, created a market and then fell behind its changes. As *CW*'s Patricia Keefe reports, "Rudov recommended Apple abandon its 'No. 1 strategy' and start thinking of itself as 'No. 2.' "

Modem technology patented

For most of 1983, industry watchers were saying that 1984 would be the year of the $50 smart modem—that lower prices would spark the same boom in telecommunications that cheaper micros have brought to home computing. Now it looks like just the opposite may occur: A Sunnyvale, CA, firm has patented the technology used in many modems. If its claim is upheld, the company can command licensing fees from manufacturers, thereby driving retail prices up.

Michael Eaton, president of Bizcomp, told *InfoWorld* that he thought of the intelligent modem, which automatically switches between command and data status, in 1978. Bizcomp began selling a unit in March 1980, 14 months before Hayes Microcomputer Products introduced its popular Smartmodem.

Besides the Hayes unit, *IW*'s John Markoff reports, "virtually all currently marketed personal computer modems that link to the serial interface," as opposed to being bit-mapped directly to a bus, use Bizcomp's switching technique.

As a result, though the exact amount is a secret, Hayes "has signed a multimillion-dollar licensing agreement" for the use of "technologies...defined in the Bizcomp patent." And Bizcomp intends to sign up other manufacturers.

"It's not our intent to drive anyone out of business," Eaton said. "[However,] we expect a lot of reaction [from modem makers] when they realize their product line is subject to licensing."

As for reaction from buyers, Eaton admits, "Costs will go up because of royalty payments to us." Kenneth Bosomworth, president of International Resource Development Corp. of Norwalk, CT, calculated that Smartmodem prices would rise 3 to 5 percent.

Others disagree. Bert Weiss, national sales manager for Anchor Automation, predicted Bizcomp would have trouble enforcing its patent: "It's tough to patent a smart modem. I don't think we're using anyone else's designs."

Bizcomp Marketing Director Bruce Miller, on the other hand, told Markoff that the company would pursue patent users: "If we are challenged, it's safe to say we'll take them to court."

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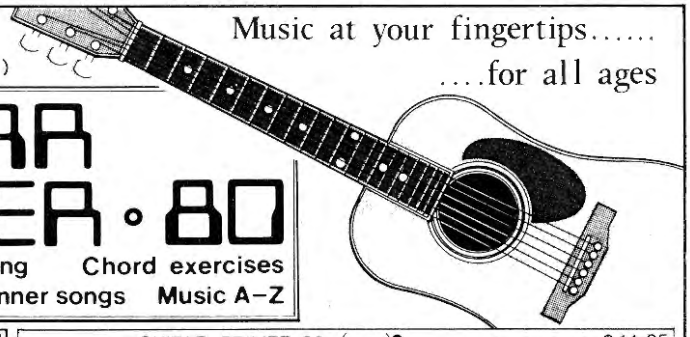

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PULSE TRAIN

make Bizcomp a household word. Hayes and Novation, according to Dan Foley of Dataquest in Cupertino, CA, control 70 percent of the personal computer modem market.

Nevertheless, Foley said, "I think the agreement is significant in the sense that it will provide Bizcomp with a great deal of capital." With the power of the patent, one of the Network Nation's major players may be behind the scenes.

The silicon college

Education via correspondence courses has been around almost as long as the mailbox, but the "electronic university" is an idea whose time has come. According to Ron Gordon, former chief executive officer of Atari Inc., his new venture, TeleLearning Systems Inc., will soon link as many as 5,000 teachers, half a million students, and micros in homes and offices across the U.S.

The San Francisco company plans to offer a 24-hour network giving students 170 courses, with hundreds more planned by late 1984. Its "knowledge module," a 300-baud modem, transfers lectures, questions, answers, and homework assignments and exams, as well as giving students a high-resolution image of the professor on the other end of the wire.

The modem, the only way to access TeleLearning's network, is available for disk-equipped Apple IIs and IBM PCs ($229.95) and Commodore 64s ($129.95), with Radio Shack and Atari versions on the way. Tuition is $35 to $250 per course, for lessons ranging from college prep work to accounting and law.

TeleLearning's two selling points are ease of use—its software automatically handles log-on sequences and other protocols and verifies data transmission in both directions—and impressive academic credentials. Gordon promises that the American Medical Association plans to offer at least 100 courses, and "world-famous instructors" will be among those establishing on-line office hours in other subjects.

By "breaking down the barriers of time and distance," Gordon told *Computerworld*, his project will "bring education to millions and millions of people who are unable to have an education." In addition, TeleLearning is offering its software to corporations or existing schools interested in setting up tutoring systems of their own.

The Reagan Administration likes the idea. U.S. Secretary of Education T.H. Bell attended TeleLearning's initial press conference in Washington, along with James Coyne, head of the White House Office of Private Sector Initiatives.

Said Coyne, "This is like the first day of school for a whole generation of Americans. It's a wonderful new beginning, and we at the White House wish it well and look forward to providing it with assistance."

Osborne U.K. to press on

Osborne Computer Corp. has filed for bankruptcy in California, but the micro may yet survive in Adam Osborne's native England. According to *MicroScope*, Osborne U.K. Managing Director Mike Healy hopes to set up production of the new Executive transportable and introduce the low-end Osborne that never made it to America.

"We have always traded on an arms-length basis with the U.S. manufacturer, and have always paid our way," Healy told the British biweekly. "We can get supplies of the [Executive], and we can continue trading."

While competition from Compaq and Kaypro is less severe in Britain and Australia, Healy admitted that "credibility is the problem" in keeping afloat as buyers watch his parent firm collapse.

"We have to take steps to protect our customers," he said. "In principle, we could have a 'Made in Britain' label on by February, and I think the Executive and the IBM-compatible Executive are competitive."

In addition, *MicroScope* says, Healy plans to sell the Vixen, the smaller, lighter replacement for the Osborne 1 that was rumored but never reached the U.S. market.

As for Adam Osborne, *MS* reports that the company founder was using idle post-bankruptcy hours to finish a novel, when not pointing out that his work with the Hayward, CA, firm had been primarily ceremonial since Robert Jaunich became president in January 1983.

Osborne has also been approached by science fiction writer and *Byte* columnist Jerry Pournelle, who's reportedly interested in writing a novel about the company's rise and fall. ■

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Comdex fever

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● For some time, people have been saying that the biannual **COMDEX** shows are getting too big. The expos' sponsor, The Interface Group, has responded with more and bigger Comdexes: a third show on the West Coast, to be held each winter, will join the spring and fall events in 1984. Meanwhile, the Needham, MA, group has joined with the producers of the Consumer Electronics Show to finance a 120,000-square-foot addition to the Las Vegas Convention Center.

● The **ADAM** chronicles continue. In October, with FCC approval in hand and the $600 system about to make its delayed debut, Coleco Industries execs were hit with a lawsuit from stockholders, claiming stock manipulation—selling shares in June, when Adam's announcement sent Coleco soaring, while concealing the real or rumored technical defects that surfaced later.

● Remember Cadillac's short-lived V-8-6-4 **ENGINE**, that ran on more or fewer cylinders depending on power demand? The latest trend in computing is multiple-personality micros. The Seequa Chameleon and Lanier's new Business Processor 1000 each have both Z80 and 8088 processors to run 8-bit CP/M and 16-bit MS-DOS software, and Micro Craft Corp.'s 8-, 16-, and 32-bit Dimension supports its own 68000 CPU and plug-in Z80, 8086, and 6502 cards.

● Half a dozen colleges assigned micros to incoming **FRESHMEN** last fall; Dallas Baptist College is the first to hand out Model 100s for in-class use. Each of DBC's 500 campus newcomers paid a computer-use fee of $150 to $300 to pick up a portable. After paying for four semesters, students will own their 100s, or can apply the fees toward purchase of a larger computer.

● In addition to challenging AT&T in long distance phone service, MCI Communications Corp. is moving into **VIDEOTEX**: For $1, an MCI Mail subscriber with a micro and modem can call a local number and send a 7,500-character message to another subscriber anywhere in the U.S. If you're writing to someone who isn't on line, MCI will deliver a printout via the U.S. Postal Service for $2 or Purolator Corp. for $6.

● The forecasters at International Resource Development Inc. have given a morning line on the **DOS WARS**: CP/M-80, they say, will go from running on 58 percent of 1983's micros to 54 percent of 1986's, while MS-DOS' percentage climbs from 29 to 50 and Unix's from 2 to 10. AppleDOS will decline from 24 percent to 10 percent, and the big winners will be Smalltalk- or Lisa-style systems, with 0 percent today but 30 percent in 1986.

● Making the government-endorsed BBC micro has given **ACORN** 80 percent of the British educational market. The firm has launched a $3 million ad campaign in hopes of placing its 64K, 6502-based machine in U.S. schools, but its chances seem dim: an Acorn costs $995 with no monitor or disk drives.

● Speaking of dim, Acorn has proudly announced a new line of **NON-SEXIST** software, rightly declaring, "Britain is in danger of losing half its talent if girls don't acquire vital computer skills" and planning software that is "more relevant and useful to women." The first feminist release? A gardening program. ■

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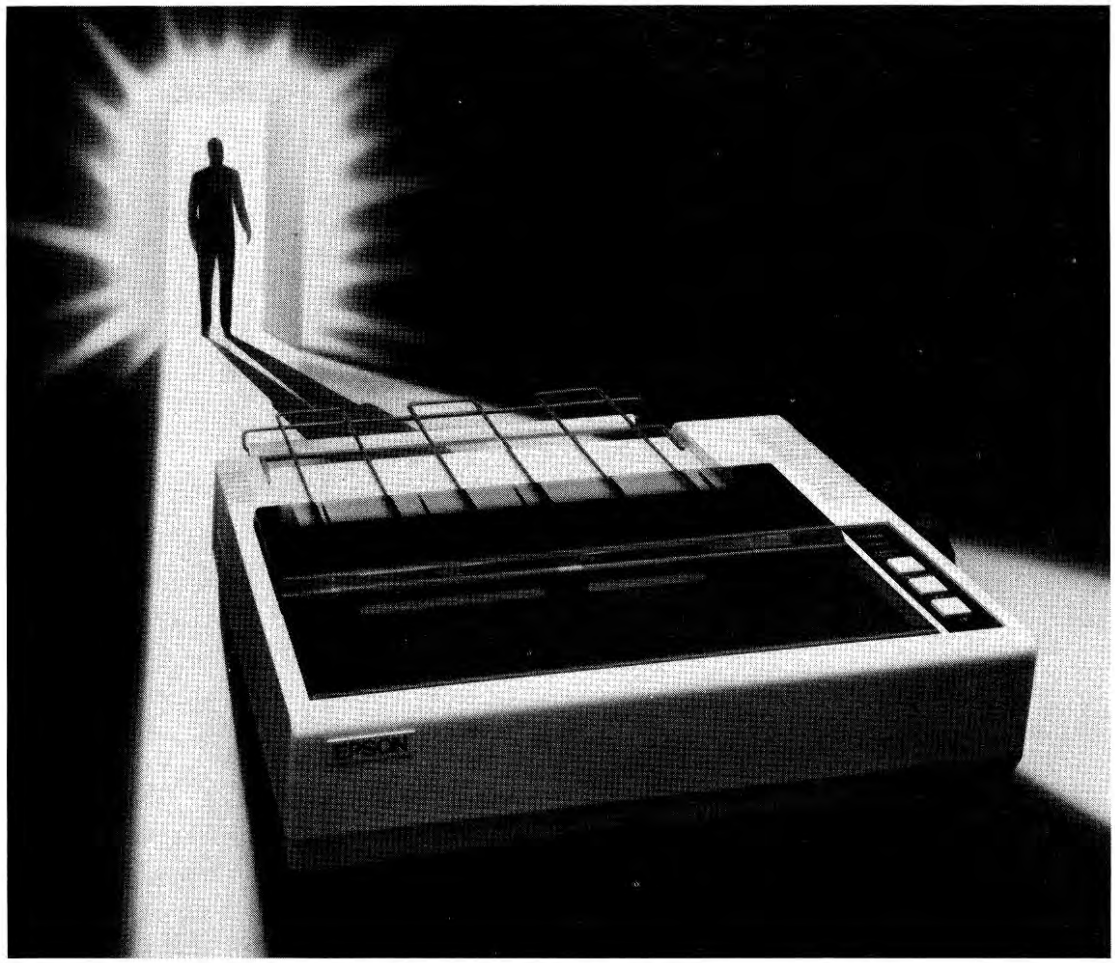

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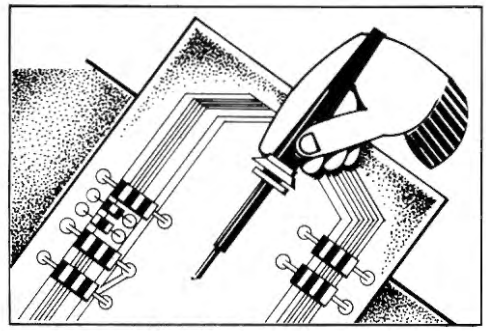
by Roger C. Alford

Project 80, a regular column devoted to hardware projects, premieres in this issue. This month Roger Alford describes how to build a communications interface for your Model I or III.

—Eds.



Hardware that communicates

The ability to communicate with other computer systems and devices makes today's computers versatile. By using a standard interface on a TRS-80, for example, you can communicate with a mainframe computer system, transfer messages and files to and from other personal computers, send data to a printer, and control ongoing processes.

It's surprisingly simple and inexpensive to make such an interface using very large scale integration (VLSI) technology.

A variety of standard communications interfaces define the physical links whereby computers and other devices communicate. Included among these are: IEEE-488 (general purpose interface bus, or GPIB), RS-232C, RS-422, and the Hewlett-Packard interface loop (HPIL) interfaces. To help complicate things, several standard communications protocols define the format of the communicated data, including asynchronous, binary synchronous (BISYNC), synchronous data link control (SDLC), and higher data link control (HDLC) protocols, among others. After carefully observing the computer industry—not only the communications aspect—I've concluded that there are too many standards, and too few "standard" standards.

For this project, I've chosen the popular RS-232C interface with the asynchronous protocol. The board I'll discuss contains two RS-232C ports with handshaking and individual baud rate selection, three input switches, three LEDs for output, a beeper and a 16-bit counter/timer. You can use the interface with a 16K Model I or III. The Program Listing lets you use the computer as a terminal with the RS-232C board.

RS-232C Principles

The RS-232C interface standard specifies a logical high in the −3V to −25V voltage range, and a logical low in the +3V to +25V range. Generally, devices using this interface use a DB-25 connector, either male (DB-25P) or female (DB-25S), for the physical interface. I've specified most of the pins on the DB-25 in the RS-232C standard (see Table 1), though in general they aren't all used in any given application. In fact in many, if not most, applications, you use only the ground, transmit, receive, and possibly a handshaking line (for example, clear to send/request to send).

DB-25 Pin #	Mnemonic	Description
1	AA	Protective ground
2	BA	Transmitted data
3	BB	Received data
4	CA	Request to send
5	CB	Clear to send
6	CC	Data set ready
7	AB	Signal ground
8	CF	Received line signal detector
9	—	Reserved
10	—	Reserved
11	—	Unassigned
12	SCF	Sec. received line signal detector
13	SCB	Sec. clear to send
14	SBA	Sec. transmitted data
15	DB	Transmitted signal element timing (DCE)
16	SBB	Sec. received data
17	DD	Receiver signal element timing (DCE)
18	—	Unassigned
19	SCA	Sec. request to send
20	CD	Data terminal ready
21	CG	Signal quality detector
22	CE	Ring indicator
23	CH/CI	Data signal rate selector
24	DA	Transmitted signal element timing (DTE)
25	—	Unassigned

Table 1. RS-232C connector pin/function breakdown.

Asynchronous Protocol Operation

Asynchronous communication, probably the most popular low-speed protocol, is quite simple in principle. While asynchronous communication is generally limited to a maximum rate of 19,200 baud (bits per second), the board I'll describe allows up to 38.4K baud.

Figure 1 shows the operation of the asynchronous protocol. Normally, when the computer isn't transmitting characters, the communication line is at a logical high state. When transmitting, the computer adds a start bit to the beginning of the character. The high-to-low transition that results indicates to the receiving device that a character is on the way.

The receiving device must have a clock available with a frequency that is an even multiple of the receive data's transmit rate. Typically, a frequency of 16 times (16X) the transmit rate is used. For example, if the incoming data is being sent at 300 baud, the receiving device will have a 4,800 Hz (300 times 16) clock available. For the remainder of

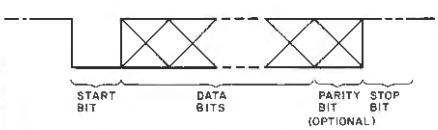


Figure 1. Asynchronous communication protocol format.

this discussion I'll assume a 16X clock frequency.

After the high-to-low transition from the incoming start bit, the receiver counts eight clocks (again, assuming a 16X clock) to find the middle of the start bit. It then checks to ensure that the bit is still low; if it isn't, the receiver assumes line noise and resumes its search for a new start bit.

If the start bit verifies as a low level, the receiver counts 16 more clocks to find the middle of the first data bit (the low-order bit), and stores this bit value in its internal shift register. The receiver then continues to count 16 clocks and read in the data bits until all of them are in the shift register. It also reads in the optional parity bit, if specified.

After the receiver acquires all of these bits, it expects to see a stop bit, which is always a logical high. This helps verify that it properly found the end of the character, and confirms that the line is high, allowing the next start bit to cause a high-to-low transition.

By reading each bit in the middle of the bit cell, the receiver allows for error between its own 16X clock frequency and the frequency of the transmitter's clock. Even if the frequencies are slightly off, the receiver should still read the correct bit values. The typical variation of transmitter/receiver clock frequencies generally keeps baud rates from exceeding the 19,200 baud mentioned above. At high frequencies even small differences between transmitter and receiver frequencies can cause problems.

You can use asynchronous protocol to send and receive a break—a logical low on the line for a period greater than one character time. Many systems use a break as an interrupt or as an abort.

The receiving device usually detects error types that occur during asynchronous communication, though the processor on the receiving end may ignore them. A parity error indicates that the parity of the received data was not what the receiver expected. A framing error indicates that a character was received without a valid stop bit. An overrun error indicates that a previously received character was not removed from the receiver's shift register before a new character started coming in, resulting in the loss of the former character.

Quantity	Description	Manufacturer	Part Number
1	Prototype grid board	Radio Shack	276-158
2	20 pF capacitors		
1	Sonalert (see text)	Mallory	SC628
3	General-purpose red LEDs (D1–D3)		
3	270-ohm resistors		
3	4.7k-ohm resistors		
1	4-pin DIP switch	Radio Shack	275-1304
1	3.6864 MHz crystal	(see below)	
1	DUART (U1)	Signetics	SC2681AC1N40
	(see below)		
2	1488 RS-232C drivers (U3, U5)		
2	1489A RS-232C drivers (U4, U6)		
1	1N914 general-purpose diode (D4)		
1	74LS04 hex inverter (U2)		
1	74LS32 quad two-input OR (U7—Model III only)		
1	40-pin cable header	3M	3432-4205
1	(50-pin for the Model III)	3M	3433-4205
2	Right angle PC mount DB-25S connectors		
	(see text)	Winchester Electronics	47-1125S
1	4-pin power connector sockets for IC's (wirewrap or PC mount, as needed)		
1	40-pin card edge connector (for cable)	Radio Shack	276-1558
1	(50-pin for the Model III)	3M	3415-0001
1	40-pin socket connector	3M	3417-6000
1	(50-pin for the Model III)	3M	3425-6000
1	8-inch piece of 40-conductor ribbon cable		
1	(50-conductor for the Model III)		

The 2681 DUART with the 3.6864 MHz crystal, including a copy of the 2681 DUART data sheet and a cassette tape with the terminal routine object files for all common memory configurations, are available from the author for $32 plus a $1 shipping and handling fee. Michigan residents should add 4 percent sales tax. Winchester Electronics is located at Main St. and Hillside Ave., Oakville, CT 06779, (203) 274-9981.

Table 2. Dual RS-232C board parts list and ordering information.

UART Basics

A universal asynchronous receiver/transmitter (UART) is a device that operates with a processor over a parallel bus, but sends and receives data using the asynchronous format I've described. I use a dual UART (DUART) in this project since it has two independent asynchronous communication channels. The following discussion of UART basics also applies to the DUART.

Most UARTs allow for flexibility when setting up. By sending commands to the UART, the processor can usually specify the number of data bits to send and receive (generally between five and eight), the parity of transmitted and received data, or no parity, the number of stop bits on transmitted data, and often other characteristics.

The transmit section of the UART generally has two registers. The register most important for communication is the parallel load shift register; it adds

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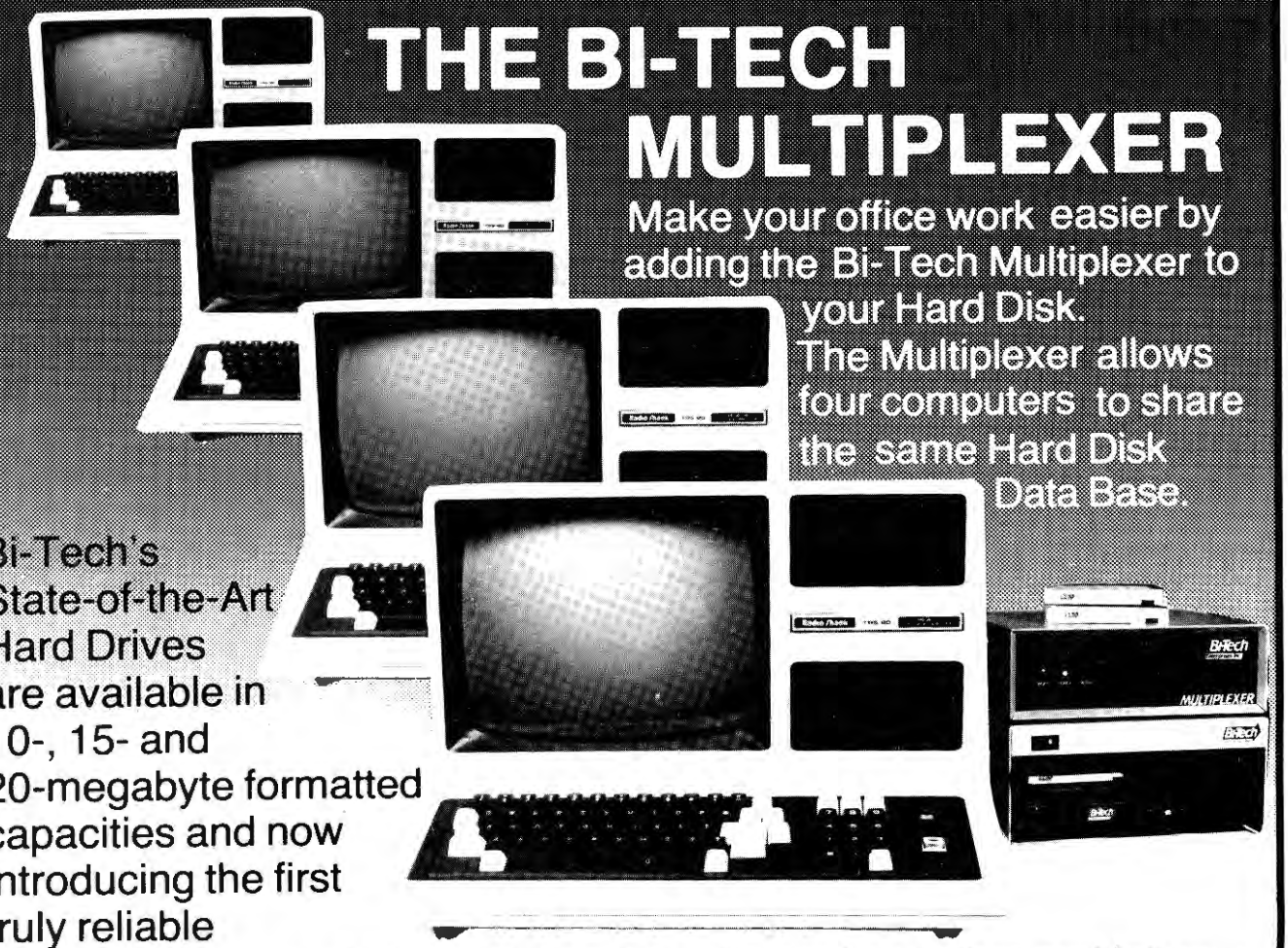

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the start bit, specified parity, and stop bits to the data you're transmitting, and sends the resulting bit pattern out the UART transmit pin at the specified baud rate. The second register is the load register, which the processor loads with the transmit data. This data is transferred to the first register as soon as it's empty. Thus, up to two characters to be transmitted can exist in the UART at the same time. This dual transmit register structure allows maximum compaction of transmitted data, since the start bit of the character in the second register will immediately follow the last stop bit of the preceding character.

On most UARTs the receive section also has two registers whose purposes are similar to those in the transmit section. The computer shunts the incoming data into a shift register where it strips the start, stop, and parity bits. It then places the resulting character into the second buffer register, where it stores it while it transfers new data into the cleared shift register.

Since there are only two receive registers, the processor must be sure to read the characters from the UART before a new character comes into the shift register and destroys the previous character, causing an overrun error. While in many applications this isn't a problem, since the processor can read the character in the buffer register while it moves the next character into the shift register, in some applications it is, at the very least, inconvenient.

Depending on how fast the data arrives and how much other work the processor has to do, it may not be able to get the data out of the UART in time to prevent problems. To help remedy this, many UARTs, including the Signetics 2681 DUART I'm using, have quad-buffered receivers, consisting of four registers instead of two, giving the processor more time to get the characters from the UART.

The Signetics 2681 DUART

The 2681 DUART from Signetics is a relatively new device that packs a lot of function into a 40-pin chip. The DUART has two independent asynchronous communication channels, an on-chip oscillator (requiring an external clock or crystal), separate internal baud rate generators for each channel, a 16-bit counter/timer, an 8-bit output port, and a 7-bit input port, as well as complete interrupt capability.

In my application I use four of the input ports and output ports as RS-232C handshaking lines, leaving four spare outputs and three spare inputs. Three of the spare outputs drive LEDs you can use as status indicators; the fourth drives a beeper to indicate when the RS-232 has received an ASCII bell character. You connect the spare inputs to a DIP (dual in-line package) switch, which the processor then reads to specify certain set-up options.

The Dual RS-232C Board

The accompanying photo shows the prototype dual RS-232C board for the Model I. Though compact, it has many functions. All of the electronics, except for one inverter and the RS-232C interface chips, are on the 2681, so hook-up to the TRS-80 is simple and straightforward (see Fig. 2).

As drawn, the 2681 takes up the input/output (I/O) addressing locations 00–7F hexadecimal (hex), although the 2681 only uses 00–0F hex. If you have other peripherals in this I/O addressing range (the Radio Shack peripherals use higher addresses), you can decode the addressing to a narrower range as needed. I used the current configuration because it required the least amount of support circuitry—a necessary goal in

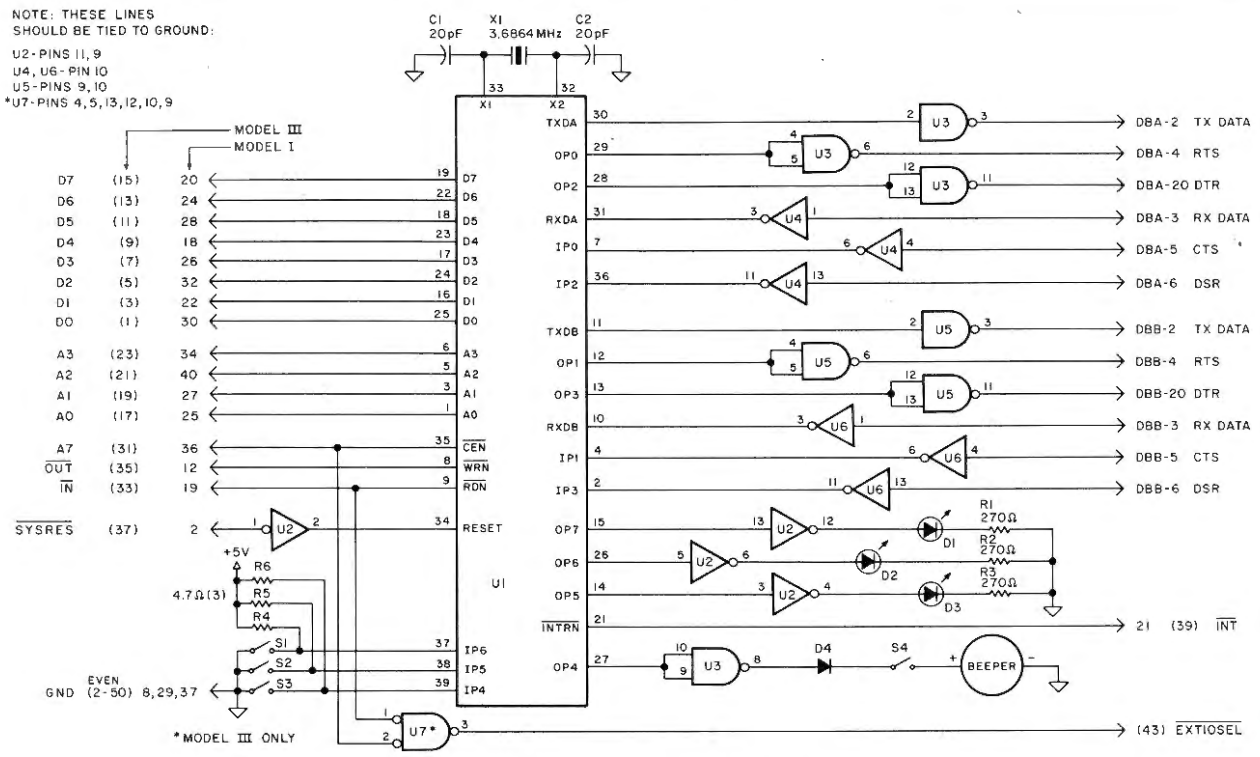

Figure 2. Schematic diagram of dual RS-232C board.

order to keep everything on such a small (2.75- by 3.75-inch) board.

The schematic (see Fig. 2) shows the connector pin numbers for the Model I as well as for the Model III (in parentheses). The Model III also requires one additional signal not necessary on the Model I. In both cases, you connect the interrupt line so that you can use the 2681 interrupts, or the processor can poll the DUART's status register to get the necessary status information. Make sure you know which pins on the board's connector correspond to which pins on the TRS-80 connector; the numbering can be confusing.

The parts list for the board (see Table 2) includes RS-232C connectors—DB-25S's (females), designed for printed circuit board mounting. In a pinch, you can use Radio Shack DB-25S connectors (part number 276-1548). The DUART is available through many electronics distributors, or you can purchase it from Washtenaw Digital Systems (see Table 2).

The RS-232C standard specifies devices as either data terminal equipment (DTE) or data communication equipment (DCE), depending upon their function in a system or network. You wire the two types of devices as opposites, so that a one-to-one straight-through cable connects them properly for communication. For example, a DTE device transmits data on pin 2 and receives data on pin 3, while a DCE device transmits data on pin 3, and receives data on pin 2. The connections shown in the schematic (see Fig. 2) are for a DTE device (such as a standard terminal), allowing the board to connect straight through to a modem, for example.

The beeper I used on the prototype board is a Mallory Sonalert, but you can use any 12-volt beeper requiring a maximum of 8 milliamps.

It's interesting to see how much space you can save from older designs by using a new IC like the Signetics 2681. Motorola's board, which has two asynchronous communication channels, uses two 24-pin UARTs, a 24-pin baud rate generator, a large crystal, and a jumper matrix for baud rate selection, covering over 4 square inches of board space, and requiring a fair amount of interconnecting wiring. You can replace all of this with one 2681 DUART and a small crystal, while providing additional I/O capability, greater interrupt flexibility, and a 16-bit timer/counter. The 2681 and its crystal require only 2.4 square inches—quite a savings!

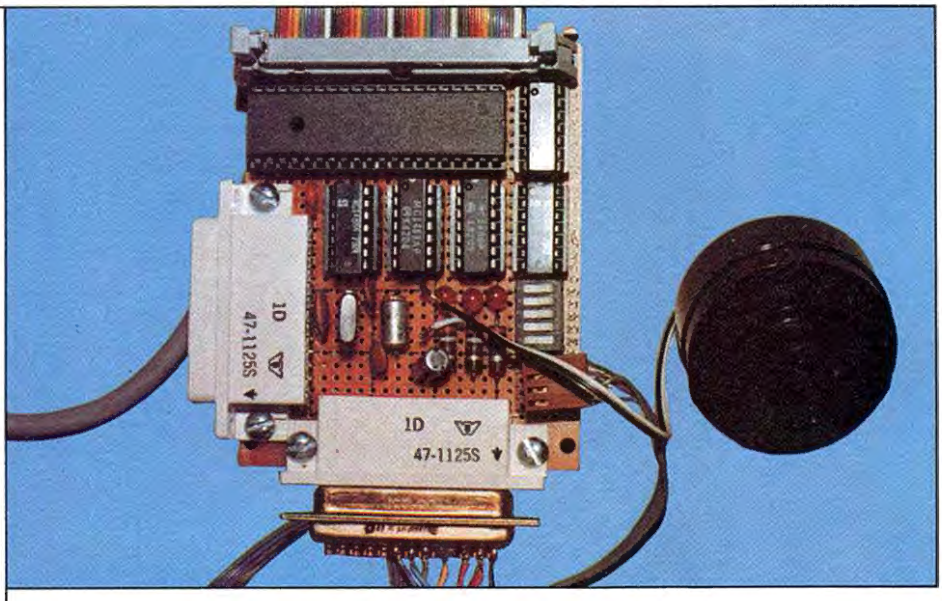

Photo. Prototype dual RS-232C board.

Operation

Once you've constructed the board you'll need three power supplies: +5V (at 150 mA), +12V, and −12V. While lower voltages will suffice in place of the +/−12V supplies, I recommend the higher voltages, which allow greater communication distance.

Since timesharing on the personal computer has become so popular, I've used this function as the set-up example. The handshaking lines I've provided aren't necessary for this application; I've set the handshaking outputs active (low) in case the remote device is looking for an active signal.

Since there are two independent channels to choose from, you can use one as your terminal output, for example, and the other to communicate with another device. For now, use channel A for the terminal output and set up channel B similarly.

My Assembly-language program (see Program Listing) is a complete terminal emulator for the Model I or the Model III (with slight modifications) with the dual RS-232C board, using channel A. The first part of the program refers to the set-up of the 2681.

The first byte the program sends to the 2681, 20 hex, goes to command register A (CRA) and resets the channel A receiver. The program then sends 30 hex to CRA to reset the channel A transmitter. A 40 hex byte sent to the CRA resets channel A error latches. The program sends these 3 set-up bytes only as precautions since a computer reset also performs these functions.

After the program sends the reset functions, it sets up the various communication parameters, including the number of data bits and stop bits, desired parity, if any, and the baud rate

Program Listing. Terminal Emulator.

```
00100 ;TRS-80 TERMINAL ROUTINE
00110 ;CREATED JUNE 25, 1983
00120 ;BY ROGER C. ALFORD
00130 ;LAST MODIFICATION: AUGUST 9, 1983
00140 ;
00150 ;This program allows the TRS-80 model I (or model III
00160 ;with indicated changes) to emulate a terminal, using
00170 ;the dual asynchronous board with the 2681 DUART. After
00180 ;initialization, the communication channel (channel A)
00190 ;is set for 9600 baud communication; this, however, can
00200 ;be changed as mentioned below.
00210 ;
00220 ;This program uses interrupts to receive characters,
00230 ;allowing communication speeds up to 19200 baud. When
00240 ;the computer is performing various functions -- such
```

Listing continued

Listing continued

```
                00250 ;as screen scrolling or keyboard checking -- incoming
                00260 ;characters are stored in a buffer in memory until they
                00270 ;can be processed.
                00280 ;
                00290 ;The Shift/down-arrow combination acts as a Control key,
                00300 ;allowing CTRL-B through CTRL-Y to be transmitted. The
                00310 ;'BREAK' transmits a break for approximately 1/4 of a
                00320 ;second. CTRL-A acts the same as pressing 'BREAK'.
                00330 ;
                00340 ;The 'CLEAR' key is used mostly as a user function key.
                00350 ;By pressing it, followed by a numerical key, various
                00360 ;functions can be implemented, as noted here:
                00370 ;             1 = Enable printer to print incoming data.
                00380 ;             2 = Disable printer from printing data.
                00390 ;             3 = Select a new baud rate.
                00400 ;             4 = Enable back-arrow as a 'DELETE' key.
                00410 ;             5 = Enable back-arrow as a 'BACKSPACE' key.
                00420 ;                                 (default)
                00430 ;             6 = Send CTRL-Z.
                00440 ;             0 = Return to the disk operating system.
                00450 ;
                00460 ;Model III users should include the lines that are
                00470 ;originally inserted as comments, and include the words:
                00480 ;'*** ADD LINE FOR MOD III'.
                00490 ;
7000            00500         ORG     7000H
                00510 ;
                00520 ;DEFINE EQUATES:
FFFF            00530 TOPMEM  EQU     0FFFFH  ;TOP OF MEMORY
37E0            00540 INTCHK  EQU     37E0H   ;LOCATION TO CLEAR 25MS INT.
0006            00550 CTUR    EQU     06H     ;DUART UPPER COUNTER BYTE
0007            00560 CTLR    EQU     07H     ;DUART LOWER COUNTER BYTE
000A            00570 LF      EQU     0AH     ;ASCII LINEFEED
000D            00580 CR      EQU     0DH     ;ASCII RETURN
0008            00590 BS      EQU     08H     ;ASCII BACKSPACE
007F            00600 DELETE  EQU     7FH     ;ASCII DELETE
01C9            00610 TRSCLS  EQU     01C9H   ;SYSTEM CLEAR SCREEN ROUTINE
0020            00620 SPACE   EQU     20H     ;ASCII SPACE
0000            00630 MR1A    EQU     00H     ;DUART MODE REGISTER 1 CH A
0000            00640 MR2A    EQU     00H     ;DUART MODE REGISTER 2 CH A
0001            00650 CSRA    EQU     01H     ;DUART CLOCK SELECT REGISTER A
0002            00660 CRA     EQU     02H     ;DUART COMMAND REGISTER A
000F            00670 STPTMR  EQU     0FH     ;DUART STOP TIMER PORT (READ)
000E            00680 STTTMR  EQU     0EH     ;DUART START TIMER PORT (READ)
0001            00690 SRA     EQU     01H     ;DUART STATUS REGISTER A
000D            00700 OPCR    EQU     0DH     ;DUART OUTPUT PORT CONFIG. REG.
000E            00710 SOPR    EQU     0EH     ;DUART OUTPUT PORT SET REGISTER
000D            00720 INP     EQU     0DH     ;DUART INPUT PORT
000F            00730 COPR    EQU     0FH     ;DUART OUTPUT PRT CLEAR REGISTER
0004            00740 ACR     EQU     04H     ;DUART AUX. CONTROL REG.
0005            00750 ISR     EQU     05H     ;DUART INTERRUPT STATUS REGISTER
0005            00760 IMR     EQU     05H     ;DUART INTERRUPT MASK REGISTER
0002            00770 TXBIT   EQU     2       ;DUART SRA TX READY BIT
0000            00780 RXBIT   EQU     0       ;DUART SRA RX READY BIT
0003            00790 TXDA    EQU     03H     ;DUART TX DATA REG. CH A
0003            00800 RXDA    EQU     03H     ;DUART RX DATA REG. CH A
4012            00810 INTLOC  EQU     4012H   ;TRS-80 INTERRUPT VECT. LOC.
4016            00820 KBDVEC  EQU     4016H   ;TRS-80 KEYBOARD VECTOR LOCATION
005F            00830 CRSCHR  EQU     5FH     ;CURSOR CHARACTER (UNDERLINE)
402D            00840 DOS     EQU     402DH   ;DOS ENTRY POINT
4026            00850 PRDRVR  EQU     4026H   ;PRINTER DRIVER ADDRESS LOCATION
03E8            00860 PRLEN   EQU     1000    ;PRINTER BUFFER LENGTH
37E8            00870 PROKFL  EQU     37E8H   ;PRINTER STATUS PORT
                00880 ;
                00890 ;INITIALIZATION:
7000 310000     00900 TERM    LD      SP,TOPMEM+1     ;SET STACK POINTER TO TOP
7003 F3         00910         DI                      ;DISABLE INTERRUPTS
                00920 ;       LD      A,10H           ;*** ADD LINE FOR MOD III
                00930 ;       OUT     (0ECH),A        ;*** ADD LINE FOR MOD III
7004 DB0F       00940         IN      A,(STPTMR)      ;STOP DUART TIMER
7006 AF         00950         XOR     A               ;CLEAR ACC.
7007 328274     00960         LD      (TMRFLG),A      ;CLEAR TIMER USE BYTE
700A 328474     00970         LD      (CLRFLG),A      ;CLEAR CLEAR FLAG
700D 328374     00980         LD      (PRTFLG),A      ;CLEAR PRINTER FLAG
7010 3E08       00990         LD      A,BS            ;GET ASCII BACKSPACE
7012 328574     01000         LD      (BSDEL),A       ;INIT BSDEL LOCATION
7015 3E20       01010         LD      A,20H           ;RESET DUART RECEIVER
7017 D302       01020         OUT     (CRA),A
7019 3E30       01030         LD      A,30H           ;RESET DUART TRANSMITTER
701B D302       01040         OUT     (CRA),A
701D 3E40       01050         LD      A,40H           ;RESET ERROR LATCHES
701F D302       01060         OUT     (CRA),A
7021 3E13       01070         LD      A,13H           ;NO RX RTS, RX RDY INT
7023 D300       01080         OUT     (MR1A),A        ; NO PARITY, 8 BIT/CHR
7025 3E07       01090         LD      A,07H           ;NORMAL MODE, NO TX RTS
7027 D300       01100         OUT     (MR2A),A        ; NO CTS EN, 1 STOP BIT
7029 3EB0       01110         LD      A,0B0H          ;BRG SELECT
702B D304       01120         OUT     (ACR),A
702D 3EBB       01130         LD      A,0BBH          ;BAUD SELECTS
702F D301       01140         OUT     (CSRA),A        ; 9600 BAUD EACH
7031 3E06       01150         LD      A,06H           ;GET 9600 BAUD CODE
7033 327774     01160         LD      (BDRATE),A      ;SAVE BAUD RATE CODE
7036 3E00       01170         LD      A,00H           ;OUTPUT PORT DEFINITIONS
7038 D30D       01180         OUT     (OPCR),A        ; ALL 'OPR' OUTPUTS
703A 3EEF       01190         LD      A,0EFH          ;GET OUTPUT BYTE
703C D30E       01200         OUT     (SOPR),A        ; TURN ON MOST OUTPUTS
703E 3E10       01210         LD      A,10H           ;GET BEEPER PORT BIT
7040 D30F       01220         OUT     (COPR),A        ;TURN BEEPER OFF
7042 3E0A       01230         LD      A,0AH           ;GET INTERRUPT EN MASK
7044 D305       01240         OUT     (IMR),A         ;ENABLE RX AND CNTR INT
7046 3E05       01250         LD      A,05H           ;ENABLE TX AND RX
```

Listing continued

for each direction; it must also specify the necessary interrupt information.

By sending 13 hex to mode register 1 A (MR1A), the program specifies no parity and 8 bits per character, which are standard for most terminals. Then the program sends 07 hex to the same register (now denoted MR2A), to set the transmitter for 1 stop bit; it also specifies that the RS-232C handshaking lines, connected to the DB-25S connectors, are not to be used.

The program initializes the baud rate at 9,600 baud by first sending 0B0 hex to the auxiliary control register (ACR) to indicate that the clock is from the crystal and the baud selection to be taken from set 2. Then it sends 0BB hex to the clock select register A (CSRA) to specify the particular baud rates. The transmitter and receiver can have different baud rates; each nibble of the CSRA byte specifies a different baud rate.

"It beeps whenever it receives a bell character."

The program follows this with a 00 hex to the ouput port configuration register to specify all of the output bits as general-purpose outputs, then turns on (low) all but one output by sending 0EF hex to the set ouput port register (SOPR). It sends the interrupt mask to its register (IMR), enabling the transmitter and receiver to begin operation.

Terminal Software Operation

Two of the program's lines depend on your system's configuration: line 530 specifies the top of memory, which changes depending upon the amount of memory in your system; line 500 specifies the starting address of the program, which can be a lower location if you're using a non-disk system.

When you start the program, it clears the screen and puts a sign-on message on the first line. It is initially set at 9,600 baud but you can change it from the keyboard. Several user commands, which make the program more versatile, were necessary to make up for the fact that I used the ROM keyboard encoder routine without a standard control key.

All three output LEDs turn on after initialization, but the middle one toggles as the DUART receives characters. If you connect a beeper, enabled with the on-board DIP switch, it beeps whenever it receives a bell character (control/G). The break key sends a break for approximately one-quarter of a second.

The program uses the clear key as a user key. You must press this key, followed by a numerical key, to execute the desired function. Clear/1 enables the line printer, so that the program sends all incoming characters, except most control characters, to the printer. Clear/2 disables the printer so that the program sends it no more input characters.

Clear/3 lets you select a new baud rate. The program displays the current baud rate, along with the available baud options; you need merely press the key associated with the baud rate you want and the program displays the new baud rate.

Clear/4 lets you use the left-arrow key to delete instead of to backspace (it initializes as backspace). Clear/5 restores the backspace function.

Though the simultaneous shift/down-arrow combination usually acts as a control key, a control/Z isn't easily decoded because of the nature of the keyboard decoding software. Consequently, clear/6 is set up to transmit control/Z—somewhat awkward, but it works.

Finally, clear/0 returns you to DOS (the disk operating system)—if you're using one; a DOS isn't necessary to run the terminal program.

The program uses interrupts to process incoming characters, which it places into a memory buffer until the computer can process them. Interrupts prevent the loss of incoming data when the Z80 is otherwise busy—during screen scrolling, for example. If fast data (that is, 4,800 baud or higher) is continually coming in while the screen has to keep scrolling, the full memory buffer can lose incoming characters. The program therefore uses as much of the available memory as possible. ■

Write to Roger C. Alford at Washtenaw Digital Systems, P.O. Box 2014, Ann Arbor, MI 48106, or call him between 7 and 9 p.m. weeknights at 313-973-9763.

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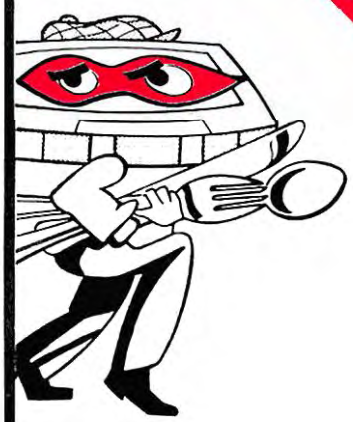

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Listing continued

```
7048 D302     01260          OUT     (CRA),A
704A 217478   01270          LD      HL,BUFFER       ;POINT TO BEG OF BUFFER
704D 227874   01280          LD      (BSTART),HL     ;INIT. START POINTER
7050 227A74   01290          LD      (BEND),HL       ;INIT. END POINTER
7053 210000   01300          LD      HL,0            ;CLEAR HL REGISTER
7056 227C74   01310          LD      (BCOUNT),HL     ;CLEAR BUFFER CHAR COUNT
7059 228A74   01320          LD      (PRCNT),HL      ;CLEAR PRBUFR CHAR COUNT
705C 218C74   01330          LD      HL,PRBUFR       ;POINT TO PRINTER BUFFER
705F 228674   01340          LD      (PRSTRT),HL     ;INIT PRBUFR START PNTR
7062 228874   01350          LD      (PREND),HL      ;INIT PRBUFR END PNTR
7065 2A1340   01360          LD      HL,(INTLOC+1)   ;GET INTERRUPT VECT
7068 227E74   01370          LD      (INTVEC),HL     ;SAVE IN OWN MEMORY
706B 214172   01380          LD      HL,RXISR        ;GET OWN INT VECTOR
706E 221340   01390          LD      (INTLOC+1),HL   ;PUT INTO INT VEC LOC.
              01400 ;        LD      A,08H           ;*** ADD LINE FOR MOD III
              01410 ;        OUT     (0E0H),A        ;*** ADD LINE FOR MOD III
7071 CD7173   01420          CALL    CLS             ;CLEAR SCREEN
7074 218973   01430          LD      HL,SIGMSG       ;POINT TO START MESSAGE
7077 CD1D72   01440          CALL    PRMSG           ;PRINT IT ON THE SCREEN
              01450 ;
              01460 ;MAIN PROGRAM CODE:
707A CD9E71   01470 LOOP     CALL    CHKCHR          ;CHECK FOR CHARACTER
707D 3AE837   01480          LD      A,(PROKFL)      ;GET PRINTER READY FLAG
7080 CB7F     01490          BIT     7,A             ;CHECK READY BIT
7082 200E     01500          JR      NZ.NOPR         ;IF NOT READY, OH WELL.
7084 CDE971   01510          CALL    PRCHK           ;CHECK FOR PRINTER CHAR.
7087 2809     01520          JR      Z.NOPR          ;IF NONE, OH WELL.
7089 4F       01530          LD      C,A             ;PUT CHAR. IN C REG.
708A 219270   01540          LD      HL,NOPR         ;GET RETURN ADDRESS
708D E5       01550          PUSH    HL              ;SAVE ON STACK
708E 2A2640   01560          LD      HL,(PRDRVR)     ;GET PRINTER DRIVER
7091 E9       01570          JP      (HL)            ;PRINT CHARACTER
7092 DB01     01580 NOPR     IN      A,(SRA)         ;CHECK FOR OK TO SEND CHR
7094 CB57     01590          BIT     TXBIT,A         ;CHECK TX READY BIT
7096 28E2     01600          JR      Z.LOOP          ;IF NOT, JUST LOOP AGAIN
7098 21A070   01610          LD      HL,KBDRET       ;GET RETURN ADDR OF CALL
709B E5       01620          PUSH    HL              ;PUT ONTO STACK
709C 2A1640   01630          LD      HL,(KBDVEC)     ;GET KBD VECTOR
709F E9       01640          JP      (HL)            ;CHECK FOR KEY FROM KBD
70A0 B7       01650 KBDRET   OR      A               ;SET FLAGS - CHAR.?
70A1 28D7     01660          JR      Z.LOOP          ;IF ZERO, NO CHAR
70A3 47       01670          LD      B,A             ;SAVE CHARACTER
70A4 3A8474   01680          LD      A,(CLRFLG)      ;CHECK CLEAR FLAG
70A7 B7       01690          OR      A               ;SET CPU FLAGS
70A8 CA5971   01700          JP      Z.NRMCHR        ;IF ZERO, NORMAL CHAR.
70AB AF       01710          XOR     A               ;ELSE, CLEAR ACCUM.
70AC 328474   01720          LD      (CLRFLG),A      ;CLEAR CLEAR FLAG
70AF 78       01730          LD      A,B             ;GET CHARACTER
70B0 FE31     01740          CP      '1'             ;NUMBER 1?
70B2 2005     01750          JR      NZ.CHK32        ;IF NOT CHECK NEXT
70B4 328374   01760          LD      (PRTFLG),A      ;ENABLE PRINTER
70B7 18C1     01770          JR      LOOP            ;LOOP OVER
70B9 FE32     01780 CHK32    CP      '2'             ;NUMBER 2?
70BB 2011     01790          JR      NZ.CHK33        ;IF NOT, CHECK NEXT
70BD 3A8374   01800          LD      A,(PRTFLG)      ;CHECK PRTFLG
70C0 B7       01810          OR      A               ;SET FLAGS
70C1 28B7     01820          JR      Z.LOOP          ;IF ALREADY CLEAR, DONE
70C3 AF       01830          XOR     A               ;CLEAR ACCUMULATOR
70C4 328374   01840          LD      (PRTFLG),A      ;DISABLE PRINTER
70C7 3E0D     01850          LD      A,CR            ;GET CARRIAGE RETURN
70C9 CDC371   01860          CALL    PRBUFF          ;SEND RETURN TO PRINTER
70CC 18AC     01870          JR      LOOP            ;LOOP OVER
70CE FE33     01880 CHK33    CP      '3'             ;NUMBER 3?
70D0 2053     01890          JR      NZ.CHK34        ;IF NOT, CHECK NEXT
70D2 21B273   01900          LD      HL,BDMSG1       ;POINT TO FIRST BD MSG
70D5 CD1D72   01910          CALL    PRMSG           ;PRINT IT ON THE SCREEN
70D8 CD2872   01920          CALL    PRBAUD          ;PRINT CURRENT BAUD RATE
70DB 21CE73   01930          LD      HL,BDMSG2       ;POINT TO 2ND BD MSG
70DE CD1D72   01940          CALL    PRMSG           ;PRINT IT ON THE SCREEN
70E1 21E970   01950 KBLP     LD      HL,KBRT2        ;GET RETURN ADDRESS
70E4 E5       01960          PUSH    HL              ;PUSH IT ON THE STACK
70E5 2A1640   01970          LD      HL,(KBDVEC)     ;GET KEYBOARD ROUTINE VEC
70E8 E9       01980          JP      (HL)            ;CHECK FOR KEY PRESSED
70E9 B7       01990 KBRT2    OR      A               ;SET FLAGS
70EA 28F5     02000          JR      Z.KBLP          ;IF NONE, KEEP WAITING
70EC FE0D     02010          CP      CR              ;CHECK FOR RETURN
70EE 282D     02020          JR      Z.BDDONE        ;IF YES, DONE
70F0 FE41     02030          CP      'A'             ;IF CHARACTER < 'A'?
70F2 38ED     02040          JR      C,KBLP          ;IF YES, GET NEW CHAR.
70F4 FE49     02050          CP      'I'             ;IF CHARACTER >= 'I'?
70F6 30E9     02060          JR      NC,KBLP         ;IF YES, GET NEW CHAR.
70F8 F5       02070          PUSH    AF              ;SAVE CHARACTER
70F9 CDD872   02080          CALL    SCREEN          ;ECHO CHARACTER TO SCREEN
70FC F1       02090          POP     AF              ;RESTORE CHARACTER
70FD D641     02100          SUB     41H             ;GET TABLE OFFSET
70FF 327774   02110          LD      (BDRATE),A      ;SAVE NEW BAUD VALUE
7102 5F       02120          LD      E,A             ;PUT OFFSET INTO E REG
7103 3E0A     02130          LD      A,0AH           ;GET BYTE TO DISABLE
7105 D302     02140          OUT     (CRA),A         ; DUART TX AND RX
7107 1600     02150          LD      D,00            ;CLEAR D REGISTER
7109 214974   02160          LD      HL,BDTBL        ;POINT TO BAUD TABLE
710C 19       02170          ADD     HL,DE           ;POINT TO NEW BAUD BYTE
710D 7E       02180          LD      A,(HL)          ;GET NEW BAUD BYTE
710E D301     02190          OUT     (CSRA),A        ;WRITE VALUE TO DUART
7110 3E05     02200          LD      A,05H           ;GET NEW BYTE TO
7112 D302     02210          OUT     (CRA),A         ; RE-ENABLE DUART TX, RX
7114 213174   02220          LD      HL,BDMSG3       ;POINT TO BD MSG 3
7117 CD1D72   02230          CALL    PRMSG           ;PRINT ON SCREEN
711A CD2872   02240          CALL    PRBAUD          ;PRINT NEW BAUD RATE
711D 3E0D     02250 BDDONE   LD      A,CR            ;GET ASCII RETURN
```

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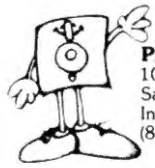

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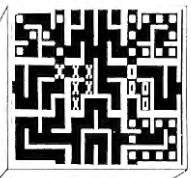

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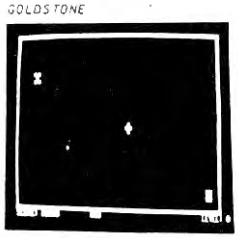

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```
711F CDD872   02260          CALL    SCREEN          ;PRINT ON SCREEN
7122 C37A70   02270          JP      LOOP            ;LOOP OVER
7125 FE34     02280 CHK34    CP      '4'             ;CHECK FOR NUMBER 4
7127 2008     02290          JR      NZ,CHK35        ;IF NOT, CHECK NEXT
7129 3E7F     02300          LD      A,DELETE        ;GET ASCII DELETE CHAR.
712B 328574   02310          LD      (BSDEL),A       ;SAVE IN BCKSPC/DEL LOC.
712E C37A70   02320          JP      LOOP            ;LOOP OVER
7131 FE35     02330 CHK35    CP      '5'             ;CHECK FOR NUMBER 5
7133 2008     02340          JR      NZ,CHK36        ;IF NOT, CHECK NEXT
7135 3E08     02350          LD      A,BS            ;GET ASCII BACKSPACE
7137 328574   02360          LD      (BSDEL),A       ;SAVE IN BCKSPC/DEL LOC.
713A C37A70   02370          JP      LOOP            ;LOOP OVER
713D FE36     02380 CHK36    CP      '6'             ;CHECK FOR NUMBER 6
713F 2004     02390          JR      NZ,CHK30        ;IF NOT, CHECK NEXT
7141 3E1A     02400          LD      A,1AH           ;GET CTRL-Z
7143 1831     02410          JR      NODOS           ;SEND IT OUT
7145 FE30     02420 CHK30    CP      '0'             ;NUMBER 0?
7147 C27A70   02430          JP      NZ,LOOP         ;IF NOT, LOOP OVER
714A AF       02440          XOR     A               ;GET NEW IMR VALUE (0)
714B D305     02450          OUT     (IMR),A         ;DISABLE DUART INTS
714D CDC901   02460          CALL    TRSCLS          ;CLEAR SCREEN
7150 2A7E74   02470          LD      HL,(INTVEC)     ;GET OLD INTERPT VECT
7153 221340   02480          LD      (INTLOC+1),HL   ;SAVE IN ORIGINAL PLACE
7156 C32D40   02490          JP      DOS             ;RETURN TO DOS
7159 78       02500 NRMCHR   LD      A,B             ;RESTORE CHARACTER
715A FE08     02510          CP      BS              ;BACKSPACE CHARACTER?
715C 2005     02520          JR      NZ,PROCED       ;IF NOT, CONTINUE
715E 3A8574   02530          LD      A,(BSDEL)       ;ELSE, GET PROPER CHAR.
7161 1813     02540          JR      NODOS           ;SEND THE CHARACTER
7163 FE1A     02550 PROCED   CP      1AH             ;CTRL-Z?
7165 CA7A70   02560          JP      Z,LOOP          ;IF YES, IGNORE
7168 FE01     02570          CP      01H             ;BREAK?
                                                     (CTRL-A)
716A 280F     02580          JR      Z,BREAK         ;IF YES, SEND BREAK
716C FE1F     02590          CP      1FH             ;CLEAR KEY PRESSED?
716E 2006     02600          JR      NZ,NODOS        ;IF NOT, SEND CHAR.
7170 328474   02610          LD      (CLRFLG),A      ;SET CLEAR FLAG
7173 C37A70   02620          JP      LOOP            ;LOOP OVER
7176 D303     02630 NODOS    OUT     (TXDA),A        ;ELSE, SEND CHARACTER
7178 C37A70   02640          JP      LOOP            ;LOOP AGAIN
717B F3       02650 BREAK    DI                      ;DISABLE INTERRUPTS
717C 3E60     02660          LD      A,60H           ;GET BREAK ON CMD
717E D302     02670          OUT     (CRA),A         ;TURN ON BREAK
7180 3A8274   02680          LD      A,(TMRFLG)      ;GET TIMER FLAG BYTE
7183 CB47     02690          BIT     0,A             ;IS BEEPER USING IT?
7185 2809     02700          JR      Z,BROK          ;IF NOT, SEND BREAK
7187 CBDF     02710          SET     3,A             ;BREAK IS WAITING
7189 328274   02720          LD      (TMRFLG),A      ;STORE NEW FLAG BYTE
718C FB       02730          EI                      ;RE-ENABLE INTERRUPTS
718D C37A70   02740          JP      LOOP            ;LOOP AGAIN
7190 CBCF     02750 BROK     SET     1,A             ;BREAK IS NOW USING
7192 328274   02760          LD      (TMRFLG),A      ;SAVE NEW FLAG BYTE
7195 DB0F     02770          IN      A,(STPTMR)      ;STOP THE TIMER
7197 FB       02780          EI                      ;ENABLE THE INTERRUPTS
7198 CD1F73   02790          CALL    TMRON           ;TURN ON THE TIMER
719B C37A70   02800          JP      LOOP            ;LOOP AGAIN
              02810 ;
719E F3       02820 CHKCHR   DI                      ;DISABLE INTERRUPTS
719F 2A7C74   02830          LD      HL,(BCOUNT)     ;GET BUFFER CHAR COUNT
71A2 7C       02840          LD      A,H             ;GET UPPER BYTE
71A3 B5       02850          OR      L               ;ZERO COUNT?
71A4 2002     02860          JR      NZ,GOTCHR       ;IF NOT, GOT A CHAR
71A6 FB       02870          EI                      ;ELSE, ENABLE INTERRUPTS
71A7 C9       02880          RET                     ;DONE - RETURN
71A8 2B       02890 GOTCHR   DEC     HL              ;DECREMENT COUNT
71A9 227C74   02900          LD      (BCOUNT),HL     ;STORE NEW COUNT VALUE
71AC 2A7874   02910          LD      HL,(BSTART)     ;GET START POINTER
71AF 7E       02920          LD      A,(HL)          ;GET BUFFER CHARACTER
71B0 CD0F72   02930          CALL    UPDATE          ;UPDATE POINTER
71B3 227874   02940          LD      (BSTART),HL     ;STORE NEW POINTER VALUE
71B6 FB       02950          EI                      ;ENABLE INTERRUPTS
71B7 47       02960          LD      B,A             ;SAVE CHARACTER
71B8 3A8374   02970          LD      A,(PRTFLG)      ;SEE IF SHOULD PRINT
71BB B7       02980          OR      A               ;SET FLAGS
71BC 78       02990          LD      A,B             ;GET CHARACTER BACK
71BD C4C371   03000          CALL    NZ,PRBUFF       ;IF NONZERO, PRINT IT
71C0 C3D872   03010          JP      SCREEN          ;PRINT CHAR. AND RETURN
              03020 ;
              03030 ;BUFFER CHARACTER FOR PRINTER SUBROUTINE:
71C3 FE20     03040 PRBUFF   CP      20H             ;IS CHAR. ABOVE 19H?
71C5 3007     03050          JR      NC,PROK         ;IF YES, CHAR. OK
71C7 FE0D     03060          CP      CR              ;CARRIAGE RETURN?
71C9 2803     03070          JR      Z,PROK          ;IF YES, OK
71CB FE0C     03080          CP      0CH             ;FORM FEED?
71CD C0       03090          RET     NZ              ;IF NOT, BAD CHAR.
71CE 21E803   03100 PROK     LD      HL,PRLEN        ;GET PRINTER BUFFER LEN.
71D1 ED5B8A74 03110          LD      DE,(PRCNT)      ;GET CURRENT BUFFER COUNT
71D5 B7       03120          OR      A               ;CLEAR CARRY
71D6 ED52     03130          SBC     HL,DE           ;GET DIFFERENCE
71D8 C8       03140          RET     Z               ;IF NO ROOM - DONE
71D9 13       03150          INC     DE              ;ELSE INCREMENT COUNT
71DA ED538A74 03160          LD      (PRCNT),DE      ;SAVE NEW COUNT
71DE 2A8674   03170          LD      HL,(PRSTRT)     ;GET START BUFR PNTR
71E1 77       03180          LD      (HL),A          ;SAVE CHARCTER
71E2 CD0172   03190          CALL    PRUPDT          ;UPDATE POINTER
71E5 228674   03200          LD      (PRSTRT),HL     ;SAVE NEW POINTER VALUE
71E8 C9       03210          RET                     ;DONE - RETURN
              03220 ;
              03230 ;CHECK FOR PRINTER BUFFER CHARACTER SUBROUTINE:
```

Listing continued

Listing continued

```
71E9 ED5B8A74 03240 PRCHK   LD      DE,(PRCNT)      ;GET CURRENT PRBUFR COUNT
71ED 7A       03250         LD      A,D             ;CHECK FOR ZERO COUNT
71EE B3       03260         OR      E               ;ZERO?
71EF C8       03270         RET     Z               ;IF YES, NO CHARS.
71F0 1B       03280         DEC     DE              ;ELSE, DECR. COUNT
71F1 ED538A74 03290         LD      (PRCNT),DE      ;SAVE NEW COUNT VALUE
71F5 2A8874   03300         LD      HL,(PREND)      ;GET END POINTER
71F8 7E       03310         LD      A,(HL)          ;GET CHARACTER
71F9 CD0172   03320         CALL    PRUPDT          ;UPDATE POINTER
71FC 228874   03330         LD      (PREND),HL      ;SAVE NEW END POINTER
71FF B7       03340         OR      A               ;CLEAR ZERO FLAG
7200 C9       03350         RET                     ;DONE - RETURN
              03360 ;
              03370 ;UPDATE PRINTER POINTER SUBROUTINE:
7201 23       03380 PRUPDT  INC     HL              ;INCREMENT POINTER
7202 EB       03390         EX      DE,HL           ;PUT INTO DE REG. PAIR
7203 217478   03400         LD      HL,PRBUFR+PRLEN ;GET END + 1
7206 B7       03410         OR      A               ;CLEAR CARRY
7207 ED52     03420         SBC     HL,DE           ;GET DIFFERENCE
7209 EB       03430         EX      DE,HL           ;PUT POINTER BACK INTO HL
720A C0       03440         RET     NZ              ;IF NOT SAME, VALUE OK
720B 218C74   03450         LD      HL,PRBUFR       ;ELSE, CHANGE POINTER
720E C9       03460         RET                     ;DONE - RETURN
              03470 ;
              03480 ;POINTER UPDATE SUBROUTINE:
720F 23       03490 UPDATE  INC     HL              ;INCREMENT POINTER VALUE
7210 EB       03500         EX      DE,HL           ;PUT CURRENT PTR INTO DE
7211 21DFFF   03510         LD      HL,BUFFER+BUFLEN
              03520                                 ;POINT PAST END OF BUFFER
7214 B7       03530         OR      A               ;CLEAR CARRY FLAG
7215 ED52     03540         SBC     HL,DE           ;COMPARE DE AND HL
7217 EB       03550         EX      DE,HL           ;PUT CURRENT PTR IN HL
7218 C0       03560         RET     NZ              ;IF NOT SAME, VALUE OK
7219 217478   03570         LD      HL,BUFFER       ;ELSE, UPDATE POINTER
721C C9       03580         RET                     ;DONE - RETURN
              03590 ;
              03600 ;PRINT MESSAGE ON SCREEN ROUTINE:
721D 7E       03610 PRMSG   LD      A,(HL)          ;GET CHARACTER
721E B7       03620         OR      A               ;ZERO CHARACTER?
721F C8       03630         RET     Z               ;IF YES, DONE
7220 E5       03640         PUSH    HL              ;ELSE, SAVE HL VALUE
7221 CDD872   03650         CALL    SCREEN          ;PRINT CHAR. ON SCREEN
7224 E1       03660         POP     HL              ;RESTORE HL VALUE
7225 23       03670         INC     HL              ;POINT TO NEXT CHAR.
7226 18F5     03680         JR      PRMSG           ;LOOP UNTIL DONE
              03690 ;
              03700 ;PRINT BAUD RATE ROUTINE:
7228 3A7774   03710 PRBAUD  LD      A,(BDRATE)      ;GET CURRENT BAUD BYTE
722B 215174   03720         LD      HL,BDTBL2       ;POINT TO BAUD TABLE 2
722E B7       03730         OR      A               ;CHECK FOR ZERO BYTE
722F 2806     03740         JR      Z,BDFND         ;IF YES, BAUD=110
7231 47       03750         LD      B,A             ;SAVE BYTE IN COUNTER
7232 CD3B72   03760 FNDLP   CALL    FND00N          ;POINT TO NEXT BAUD RATE
7235 10FB     03770         DJNZ    FNDLP           ;LOOP UNTIL CORECT BD FND
7237 CD1D72   03780 BDFND   CALL    PRMSG           ;PRINT BAUD ON SCREEN
723A C9       03790         RET                     ;DONE - RETURN
723B 7E       03800 FND00N  LD      A,(HL)          ;GET CURRENT CHARACTER
723C 23       03810         INC     HL              ;POINT TO NEXT CHAR.
723D B7       03820         OR      A               ;ZERO CHARACTER?
723E C8       03830         RET     Z               ;IF YES, DONE
723F 18FA     03840         JR      FND00N          ;ELSE, CHECK NEXT CHAR.
              03850 ;
              03860 ;RECEIVE CHAR INTERRUPT SERVICE ROUTINE:
7241 D9       03870 RXISR   EXX                     ;SAVE GP REGISTERS
7242 08       03880         EX      AF,AF'          ;SAVE ACC. AND FLAGS
7243 DB05     03890         IN      A,(ISR)         ;GET INT STATUS REG.
7245 E60A     03900         AND     0AH             ;CHECK FOR DUART INT
7247 2006     03910         JR      NZ,RXOK         ;IF YES, PROCESS IT
7249 3AE037   03920         LD      A,(INTCHK)      ;ELSE, KILL TRS INT
724C C3D472   03930         JP      RTADR           ;DONE - RETURN FROM INT
724F CB5F     03940 RXOK    BIT     3,A             ;CHECK FOR COUNTER INT
7251 284A     03950         JR      Z,RXOK2         ;IF NOT, CHECK RX INT
7253 DB0F     03960         IN      A,(STPTMR)      ;ELSE, STOP COUNTER
7255 3A8274   03970         LD      A,(TMRFLG)      ;GET TIMER FLAG BYTE
7258 CB47     03980         BIT     0,A             ;CHECK FOR BEEPER USE
725A 2821     03990         JR      Z,CHKB1         ;IF NOT, CHECK BREAK
725C 47       04000         LD      B,A             ;PUT FLAG BYTE INTO B REG
725D 3E10     04010         LD      A,10H           ;GET BELL BYTE
725F D30F     04020         OUT     (COPR),A        ;TURN BELL OFF
7261 78       04030         LD      A,B             ;GET FLAG BYTE
7262 CB87     04040         RES     0,A             ;CLEAR BELL USE BIT
7264 CB5F     04050         BIT     3,A             ;BREAK WAITING?
7266 2810     04060         JR      Z,NOBRWT        ;IF NOT, DONE
7268 CB9F     04070         RES     3,A             ;ELSE, WAIT NO LONGER
726A CBCF     04080         SET     1,A             ;BREAK USE BIT SET
726C 328274   04090         LD      (TMRFLG),A      ;SAVE NEW FLAG BYTE
726F 3E60     04100         LD      A,60H           ;GET BREAK ON BYTE
7271 D302     04110         OUT     (CRA),A         ;START BREAK
7273 CD1F73   04120         CALL    TMRON           ;START TIMER
7276 185C     04130         JR      RTADR           ;DONE - RETURN FROM INT
7278 328274   04140 NOBRWT  LD      (TMRFLG),A      ;SAVE NEW FLAG BYTE
727B 1857     04150         JR      RTADR           ;DONE - RETURN FROM INT
727D CB4F     04160 CHKB1   BIT     1,A             ;BREAK USING SET?
727F 2853     04170         JR      Z,RTADR         ;IF NOT, DONE - OOPS!
7281 47       04180         LD      B,A             ;SAVE FLAG BYTE IN B REG
7282 3E70     04190         LD      A,70H           ;GET BREAK STOP CMD
7284 D302     04200         OUT     (CRA),A         ;STOP BREAK
7286 78       04210         LD      A,B             ;GET FLAG BYTE BACK
7287 CB8F     04220         RES     1,A             ;CLEAR BREAK USE BIT
```

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7289 CB57      04230          BIT     2,A             ;BEEPER WAITING?
728B 28EB      04240          JR      Z,NOBRWT        ;IF NOT, DONE - RETURN
728D CB97      04250          RES     2,A             ;NO LONGER WAITING!
728F CBC7      04260          SET     0,A             ;BEEPER NOW USING
7291 328274    04270          LD      (TMRFLG),A      ;SAVE NEW FLAG BYTE
7294 3E10      04280          LD      A,10H           ;GET BEEPER MASK BYTE
7296 D30E      04290          OUT     (SOPR),A        ;TURN ON BEEPER
7298 CD1F73    04300          CALL    TMRON           ;TURN ON TIMER
729B 1837      04310          JR      RTADR           ;DONE - RETURN FROM INT
729D DB01      04320 RXOK2    IN      A,(SRA)         ;CHECK STATUS REGISTER
729F CB47      04330          BIT     RXBIT,A         ;CHECK FOR RX CHAR INPUT
72A1 2831      04340          JR      Z,RTADR         ;IF CLR, FALSE ALARM
72A3 DB0D      04350          IN      A,(INP)         ;GET INPUT PORT BYTE
72A5 E640      04360          AND     40H             ;CHECK BIT 6
72A7 2006      04370          JR      NZ,LEDON                ;IF SET, LED IS ON
72A9 3E40      04380          LD      A,40H           ;GET BIT 6 SET
72AB D30E      04390          OUT     (SOPR),A        ;TURN ON LED
72AD 1802      04400          JR      CONTX           ;CONTINUE BELOW
72AF D30F      04410 LEDON    OUT     (COPR),A        ;TURN OFF LED
72B1 ED5B7C74  04420 CONTX    LD      DE,(BCOUNT)     ;GET BUFFER COUNT
72B5 216B87    04430          LD      HL,BUFLEN       ;GET LENGTH OF BUFFER
72B8 B7        04440          OR      A               ;CLEAR CARRY FLAG
72B9 ED52      04450          SBC     HL,DE           ;COMPARE VALUES
72BB 2004      04460          JR      NZ,NRTADR       ;IF SAME, IGNORE CHAR.
72BD DB03      04470          IN      A,(RXDA)        ;GET CHARACTER - DISCARD
72BF 1813      04480          JR      RTADR           ;QUIT
72C1 13        04490 NRTADR   INC     DE              ;ELSE INCREMENT COUNT
72C2 ED537C74  04500          LD      (BCOUNT),DE     ;STORE NEW COUNT VALUE
72C6 DB03      04510          IN      A,(RXDA)        ;GET INPUT CHARACTER
72C8 E67F      04520          AND     7FH             ;CLEAR UPPER BIT
72CA 2A7A74    04530          LD      HL,(BEND)       ;GET BUF END POINTER
72CD 77        04540          LD      (HL),A          ;STORE CHARACTER IN BUF
72CE CD0F72    04550          CALL    UPDATE          ;UPDATE POINTER
72D1 227A74    04560          LD      (BEND),HL       ;STORE NEW POINTER VALUE
72D4 08        04570 RTADR    EX      AF,AF'          ;RESTORE ACC. AND FLAGS
72D5 D9        04580          EXX                     ;RESTORE GP REGISTERS
72D6 FB        04590          EI                      ;RE-ENABLE INTERRUPTS
72D7 C9        04600          RET                     ;DONE - RETURN FROM ISR
               04610 ;
72D8 FE0A      04620 SCREEN   CP      LF              ;CHECK FOR LINEFEED
72DA C8        04630          RET     Z               ;IF SO, IGNORE
72DB FE08      04640          CP      BS              ;CHECK FOR BACKSPACE
72DD 2014      04650          JR      NZ,NXT1         ;IF NOT, GO ON
72DF 2A8074    04660 BS2      LD      HL,(CURSOR)     ;ELSE, GET CURSOR POS.
72E2 3E20      04670          LD      A,SPACE         ;GET ASCII SPACE
72E4 77        04680          LD      (HL),A          ;REMOVE CURSOR ON CRT
72E5 2B        04690          DEC     HL              ;DECREMENT CURSOR POINTER
72E6 7C        04700          LD      A,H             ;GET HIGH PTR BYTE
72E7 FE3B      04710          CP      3BH             ;SEE IF OFF SCREEN
72E9 2001      04720          JR      NZ,FINE         ;IF NOT, OK
72EB 23        04730          INC     HL              ;ELSE, INCREMENT POINTER
72EC 3E5F      04740 FINE     LD      A,CRSCHR        ;GET CURSOR
72EE 77        04750          LD      (HL),A          ;PUT ON CRT
72EF 228074    04760          LD      (CURSOR),HL     ;SAVE NEW CURSOR POSITION
72F2 C9        04770          RET                     ;DONE - RETURN
72F3 FE7F      04780 NXT1     CP      DELETE          ;CHECK FOR DELETE
72F5 28E8      04790          JR      Z,BS2           ;IF YES, LIKE BACKSPACE
72F7 FE0C      04800          CP      0CH             ;CHECK FOR CLS CHAR.
72F9 CA7173    04810          JP      Z,CLS           ;IF YES, CLEAR SCREEN
72FC FE07      04820          CP      07H             ;CHECK FOR BELL CHAR.
72FE 202B      04830          JR      NZ,CHKRET       ;IF NOT, CHEK FOR RETN
7300 F3        04840          DI                      ;DISABLE INTERRUPTS
7301 3A8274    04850          LD      A,(TMRFLG)      ;GET TIMER FLAG BYTE
7304 CB4F      04860          BIT     1,A             ;BREAK USING TIMER?
7306 2807      04870          JR      Z,NOBRK         ;IF NOT, START BELL
7308 CBD7      04880          SET     2,A             ;ELSE, BELL WAITING
730A 328274    04890          LD      (TMRFLG),A      ;STORE NEW FLAG BYTE
730D FB        04900          EI                      ;RE-ENABLE INTERRUPTS
730E C9        04910          RET                     ;DONE - RETURN
730F CBC7      04920 NOBRK    SET     0,A             ;BEEPER NOW USING TIMER
7311 328274    04930          LD      (TMRFLG),A      ;SAVE NEW FLAG BYTE
7314 DB0F      04940          IN      A,(STPTMR)      ;STOP THE TIMER
7316 FB        04950          EI                      ;RE-ENABLE INTERRUPTS
7317 3E10      04960          LD      A,10H           ;TURN ON BELL
7319 D30E      04970          OUT     (SOPR),A        ;SEND TO DUART OUT PORT
731B CD1F73    04980          CALL    TMRON           ;TURN ON TIMER
731E C9        04990          RET                     ;DONE - RETURN
               05000 ;
731F 21FFFF    05010 TMRON    LD      HL,65535        ;GET .28 SEC COUNTER COUNT
7322 7D        05020          LD      A,L             ;GET LOW BYTE
7323 D307      05030          OUT     (CTLR),A        ;WRITE LOW BYTE
7325 7C        05040          LD      A,H             ;GET HIGH BYTE
7326 D306      05050          OUT     (CTUR),A        ;WRITE HIGH BYTE
7328 DB0E      05060          IN      A,(STTTMR)      ;START THE COUNTER
732A C9        05070          RET                     ;DONE - RETURN
732B FE0D      05080 CHKRET   CP      CR              ;CHECK FOR RETURN
732D 280B      05090          JR      Z,PROCRT        ;IF YES, PROCESS IT
732F FE20      05100          CP      20H             ;CHECK FOR INVALID CHAR.
7331 D8        05110          RET     C               ;IF LESS, INVALID - RTN
7332 2A8074    05120          LD      HL,(CURSOR)     ;ELSE, GET CURSOR POS.
7335 77        05130          LD      (HL),A          ;STORE CHAR. ON CRT
7336 CD4873    05140          CALL    UPDCRS          ;UPDATE CURSOR
7339 C9        05150          RET                     ;DONE - RETURN
733A 3E20      05160 PROCRT   LD      A,SPACE         ;GET ASCII SPACE CHAR.
733C 2A8074    05170          LD      HL,(CURSOR)     ;GET CURSOR POS.
733F 77        05180          LD      (HL),A          ;REMOVE CURSOR FROM CRT
7340 7D        05190          LD      A,L             ;GET LOW CURSOR BYTE
7341 F63F      05200          OR      3FH             ;GO TO END OF LINE
7343 6F        05210          LD      L,A             ;PUT BACK INTO POINTER
```
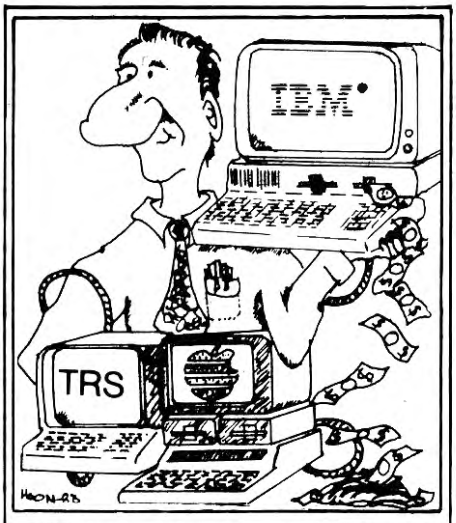

Listing continued



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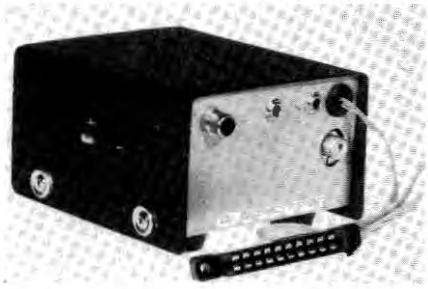

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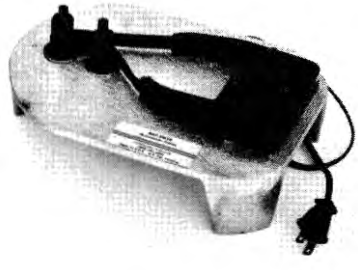

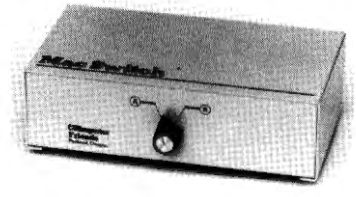

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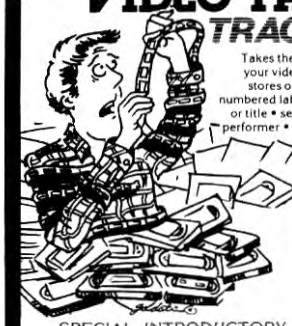

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Listing continued

```
7344 CD4873    05220          CALL    UPDCRS          ;UPDATE CURSOR
7347 C9        05230          RET                     ;DONE - RETURN
7348 23        05240 UPDCRS   INC     HL              ;POINT TO NEXT DSP LOC.
7349 7C        05250          LD      A,H             ;GET HIGH PTR BYTE
734A FE40      05260          CP      40H             ;OFF THE SCREEN?
734C 201C      05270          JR      NZ.UPDN         ;IF NOT, DONE
734E 11003C    05280          LD      DE,3C00H        ;ELSE, PREP. TO SCROLL
7351 21403C    05290          LD      HL,3C40H        ;SOURCE POINTER
7354 01C003    05300          LD      BC,1024-64      ;MOVE COUNTER
7357 EDB0      05310          LDIR                    ;SCROLL THE DISPLAY
7359 21C03F    05320          LD      HL,3FC0H        ;POINT TO BEG OF BOT ROW
735C 11C13F    05330          LD      DE,3FC1H        ;POINT TO NEXT LOC.
735F 013F00    05340          LD      BC,63           ;BEG ROW COUNT - 1
7362 3E20      05350          LD      A,SPACE         ;GET ASCII SPACE
7364 77        05360          LD      (HL),A          ;CLEAR FIRST LOC.
7365 EDB0      05370          LDIR                    ;CLEAR LINE
7367 21C03F    05380          LD      HL,3FC0H        ;GET NEW CURSOR POS.
736A 3E5F      05390 UPDN     LD      A,CRSCHR        ;GET CURSOR CHAR.
736C 77        05400          LD      (HL),A          ;PUT CHAR. ON CRT
736D 228074    05410          LD      (CURSOR),HL     ;SAVE NEW CURSOR POS.
7370 C9        05420          RET                     ;DONE - RETURN
               05430 ;
7371 21003C    05440 CLS      LD      HL,3C00H        ;POINT TO BEG OF CRT
7374 11013C    05450          LD      DE,3C01H        ;POINT TO NEXT LOC.
7377 01FF03    05460          LD      BC,1023         ;GET COUNT - 1
737A 3E20      05470          LD      A,SPACE         ;GET ASCII SPACE
737C 77        05480          LD      (HL),A          ;PUT IN FIRST LOC.
737D EDB0      05490          LDIR                    ;CLEAR SCREEN
737F 21003C    05500          LD      HL,3C00H        ;GET NEW CURSOR POS.
7382 228074    05510          LD      (CURSOR),HL     ;SAVE NEW POS.
7385 3E5F      05520          LD      A,CRSCHR        ;GET CURSOR CHAR.
7387 77        05530          LD      (HL),A          ;PUT ON CRT
7388 C9        05540          RET                     ;DONE - RETURN
               05550 ;
               05560 ;DEFINE MESSAGES:
7389 2A        05570 SIGMSG   DEFM    '** TRS-80 TERMINAL EMULATOR   V 1.0 **'
73AF 0D        05580          DEFB    0DH
73B0 0D        05590          DEFB    0DH
73B1 00        05600          DEFB    00H
73B2 0D        05610 BDMSG1   DEFB    0DH     ;CARRIAGE RETURN
73B3 2A        05620          DEFM    '**** CURRENT BAUD RATE IS '
73CD 00        05630          DEFB    00H     ;END OF MESSAGE BDMSG1
73CE 0D        05640 BDMSG2   DEFB    0DH     ;CARRIAGE RETURN
73CF 2A        05650          DEFM    '**** SELECT NEW BAUD RATE:'
73E9 0D        05660          DEFB    0DH     ;CARRIAGE RETURN
73EA 2A        05670          DEFM    '**** A=110  B=300  C=600  D=1200'
740A 0D        05680          DEFB    0DH     ;CARRIAGE RETURN
740B 2A        05690          DEFM    '**** E=2400  F=4800  G=9600  H=19200 '
7430 00        05700          DEFB    00H
7431 0D        05710 BDMSG3   DEFB    0DH
7432 2A        05720          DEFM    '**** NEW BAUD RATE IS '
7448 00        05730          DEFB    00H
               05740 ;
               05750 ;DEFINE TABLES:
7449 11        05760 BDTBL    DEFB    11H     ;110 BAUD
744A 44        05770          DEFB    44H     ;300 BAUD
744B 55        05780          DEFB    55H     ;600 BAUD
744C 66        05790          DEFB    66H     ;1200 BAUD
744D 88        05800          DEFB    88H     ;2400 BAUD
744E 99        05810          DEFB    99H     ;4800 BAUD
744F BB        05820          DEFB    0BBH    ;9600 BAUD
7450 CC        05830          DEFB    0CCH    ;19200 BAUD
7451 31        05840 BDTBL2   DEFM    '110'
7454 00        05850          DEFB    0
7455 33        05860          DEFM    '300'
7458 00        05870          DEFB    0
7459 36        05880          DEFM    '600'
745C 00        05890          DEFB    0
745D 31        05900          DEFM    '1200'
7461 00        05910          DEFB    0
7462 32        05920          DEFM    '2400'
7466 00        05930          DEFB    0
7467 34        05940          DEFM    '4800'
746B 00        05950          DEFB    0
746C 39        05960          DEFM    '9600'
7470 00        05970          DEFB    0
7471 31        05980          DEFM    '19200'
7476 00        05990          DEFB    0
               06000 ;
               06010 ;DEFINE STORAGE:
0001           06020 BDRATE   DEFS    1       ;CURRENT BAUD RATE BYTE
0002           06030 BSTART   DEFS    2       ;BUFFER START POINTER
0002           06040 BEND     DEFS    2       ;BUFFER END POINTER
0002           06050 BCOUNT   DEFS    2       ;BUFFER CHAR. COUNTER
0002           06060 INTVEC   DEFS    2       ;TRS-80 INT VEC STORAGE
0002           06070 CURSOR   DEFS    2       ;CURRENT CURSOR POSITION
0001           06080 TMRFLG   DEFS    1       ;TIMER USE FLAG
0001           06090 PRTFLG   DEFS    1       ;PRINTER OPERATION FLAG
0001           06100 CLRFLG   DEFS    1       ;CLEAR KEY PRESSED FLAG
0001           06110 BSDEL    DEFS    1       ;BACKSPACE/DELETE LOCATION
0002           06120 PRSTRT   DEFS    2       ;PRINT BUFFER START POINTER
0002           06130 PREND    DEFS    2       ;PRINT BUFFER END POINTER
0002           06140 PRCNT    DEFS    2       ;PRINT BUFFER COUNTER
03E8           06150 PRBUFR   DEFS    PRLEN   ;PRINT BUFFER
0000           06160 ENDLBL   DEFS    0       ;DUMMY LABEL
876B           06170 BUFLEN   EQU     TOPMEM-ENDLBL-20H       ;CHAR BUFR LEN.
876B           06180 BUFFER   DEFS    BUFLEN  ;INPUT CHARACTER BUFFER
               06190 ;
7000           06200          END     TERM
00000 TOTAL ERRORS
14200  TEXT AREA BYTES LEFT
```

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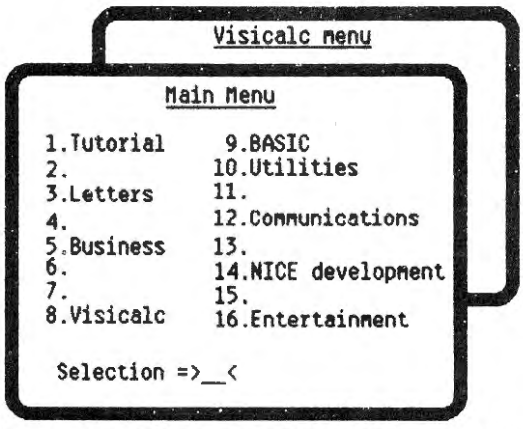

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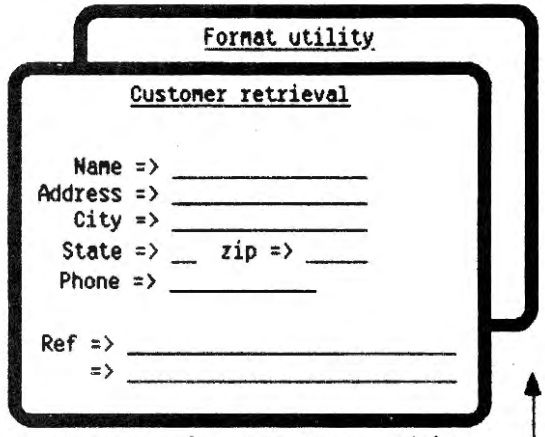

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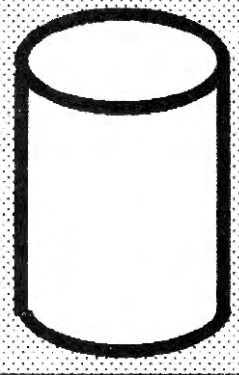

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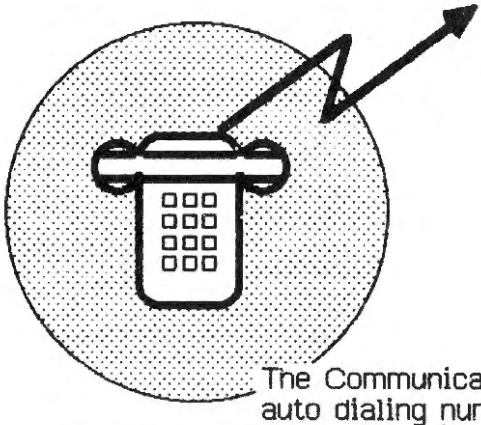

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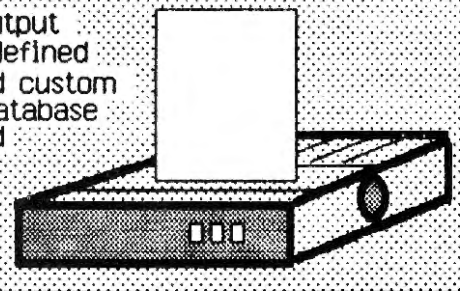

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Finding the Search Solution

by Joseph Trojak

In our December issue, we published "Finding the Search Solution," an article that discussed Mindex and Search, two Assembly-language programs that use signature screening techniques. We inadvertently omitted Program Listing 12; it appears below.—Eds.

Program Listing 12. MAP general routines.

```
00001       ;;GR/SRC.1.2
00002       ;Jun 21, 1983
00003       ;-----------------------------------------------------
00004       ;MAP GENERAL PURPOSE ROUTINES
00005       ;COPYRIGHT 1983, SOFTSHELL CORPORATION   ALL RIGHTS RESERVED
00006       ;-----------------------------------------------------
00007       GR      PSECT                   ;begin relocatable program section
00008       ;-----------------------------------------------------
00009                                       ;public routines
00010                                       ;-------------------------------
00011                   PUBLIC  APPEND      ;append one string to another
00012                   PUBLIC  BXDEC       ;binary to decimal conversion
00013                   PUBLIC  DECXB       ;decimal to binary conversion
00014                   PUBLIC  DLINE       ;draw dotted line width of screen
00015                   PUBLIC  DSPNBR      ;display 5 char ASCII no. right justified
00016                   PUBLIC  DSPNBRL     ;display 5 char ASCII no. left justified
00017                   PUBLIC  EATBNK      ;bypass leading blanks
00018                   PUBLIC  EATNBNK     ;bypass leading non-blank char
00019                   PUBLIC  ERROR       ;error display routine
00020                   PUBLIC  FSPEC       ;get cmd line file spec(s)
00021                   PUBLIC  GETMFN      ;get MAP file names (specs)
00022                   PUBLIC  LINE        ;draw line width of screen
00023                   PUBLIC  MUA10       ;multiply no. in A by 10
00024                   PUBLIC  MUHL10      ;multiply no. in HL by 10
00025                   PUBLIC  PACKFS      ;space compress file spec
00026                   PUBLIC  PARSEF      ;parse file spec
00027                   PUBLIC  REC0        ;fill buffer with 0's
00028                   PUBLIC  RECBL       ;fill buffer with blanks
00029                   PUBLIC  TAPENT      ;tap enter to continue routine
00030       ;-----------------------------------------------------
00031                                       ;public buffers
00032                                       ;-------------------------------
00033                   PUBLIC  TMPNAM,TMPEXT,TMPPSW,TMPDDR     ;temp file spec table
00034                   PUBLIC  SNAM,SEXT,SPSW,SDDR             ;src  file spec table
00035                   PUBLIC  INAM,IEXT,IPSW,IDDR             ;index file spec table
00036                   PUBLIC  ONAM,OEXT,OPSW,ODDR             ;output file spec table
00037       ;
00038       ;-----------------------------------------------------
00039                                       ;calls to MODII or MODII
00040                                       ;-------------------------------
00041                   EXTERN  KBLINE,KBLIN3,KBCHAR,KBWAIT,KEYIN,KBINIT
00042                   EXTERN  KBBRK
00043                   EXTERN  VDCLS,VDLINE,VDCHAR,VDINIT
00044                   EXTERN  HOME,BOTTOM.NEWLN
00045                   EXTERN  CURPOS,POSCUR
00046                   EXTERN  ERASEL,ERASES
00047                   EXTERN  DIVIDE,MULT
00048                   EXTERN  ERNDSP
00049                   EXTERN  JP2DOS,DOSCMD
00050                   EXTERN  PTFS            ;pts to file spec on cmd line
00051       ;-----------------------------------------------------
00052                                       ;MODII/III buffers and I/O parm
00053                                       ;-------------------------------
00054                   EXTERN  ARROWD,ARROWL,ARROWR,ARROWU,BRKKEY,SWIDTH,PENULN
00055       ;-----------------------------------------------------
00056                                       ;S3 buffers
00057                                       ;-------------------------------
00058                   EXTERN  CMDLFS          ;cmd line file spec (Y/N)
00059                   EXTERN  KEYBUF          ;key buffer (temp for file spec)
00060       ;-----------------------------------------------------
00061                                       ;GETMFN
00062                                       ;-------------------------------
00063                                       ;get MAP file spec's
00064                                       ;entry: HL->file spec buffer
00065                                       ;exit:  src, index and output
00066                                       ;       file tables are loaded
00067                                       ;       with file specs
00068                                       ;       Z=parse ok, NZ bad parse
00069                                       ;reg altered: AF,BC,DE,HL
00070                                       ;calls: PARSEF,APPEND
00071                                       ;
00072       GETMFN  CALL    PARSEF          ;parse first file name
00073               RET     NZ              ;abort if error while parsing
00074               PUSH    AF              ;save A (first char after file spec 1)
00075               PUSH    HL              ;save HL (first char after file spec 1)
00076               LD      HL,TMPNAM       ;move tmp file specs to source file specs
00077               LD      DE,SNAM
00078               CALL    APPEND          ;move source file name to SNAM
00079               LD      HL,TMPEXT
00080               LD      DE,SEXT
00081               CALL    APPEND          ;move source file ext to SEXT
00082               LD      HL,TMPPSW
00083               LD      DE,SPSW
00084               CALL    APPEND          ;move source file password to SPSW
00085               LD      HL,TMPDDR
00086               LD      DE,SDDR
00087               CALL    APPEND          ;move source file drive to SDDR
00088       ;.....................................................
00089                                       ;GTMF3
00090                                       ;.....................
00091                                       ;process index file spec
00092       GTMF3   LD      A,0DH           ;reset index file specs
00093               LD      (INAM),A
00094               LD      (IEXT),A
00095               LD      (IPSW),A
00096               LD      (IDDR),A
00097       ;
00098               POP     HL
00099               POP     AF
00100               CP      0DH
00101               JP      Z,GTMF3N        ;skip 2nd file spec if EOR
00102               CALL    PARSEF          ;get second file spec
00103               RET     NZ              ;abort if error
00104               PUSH    AF              ;save A (first char after file spec 2)
00105               PUSH    HL              ;save HL (first char after file spec 2)
00106                                       ;move temp file specs to index file specs
00107               LD      HL,TMPNAM
00108               LD      DE,INAM
00109               CALL    APPEND          ;move index file name to INAM
00110               LD      HL,TMPEXT
00111               LD      DE,IEXT
00112               CALL    APPEND          ;move index file ext to IEXT
00113               LD      HL,TMPPSW
00114               LD      DE,IPSW
00115               CALL    APPEND          ;move index file password to IPSW
00116               LD      HL,TMPDDR
00117               LD      DE,IDDR
00118               CALL    APPEND          ;move index file drive to IDDR
00119               POP     HL
00120               POP     AF
00121       ;.....................................................
00122                                       ;GTMF3N
00123                                       ;.....................
00124                                       ;fill in index file default values
00125       GTMF3N  PUSH    AF
00126               PUSH    HL
00127               LD      A,(INAM)
00128               CP      0DH
00129               JP      NZ,GTMF3X       ;skip if index file name entered
00130               LD      HL,SNAM
00131               LD      DE,INAM
00132               CALL    APPEND          ;copy source name to index name
00133       ;
00134       GTMF3X  LD      A,(IEXT)
00135               CP      0DH
00136               JP      NZ,GTMF3P       ;skip if index file ext entered
00137               LD      HL,MAPEXT
00138               LD      DE,IEXT
00139               CALL    APPEND          ;put "MAP" in index file extension
00140       ;
00141       GTMF3P  LD      A,(IPSW)
00142               CP      0DH
00143               JP      NZ,GTMF3D       ;skip if index file psw entered
00144               LD      HL,SPSW
00145               LD      DE,IPSW
00146               CALL    APPEND          ;copy source psw to index psw
00147       ;
00148       GTMF3D  LD      A,(IDDR)
00149               CP      0DH
00150               JP      NZ,GTMF5        ;skip if output file drive entered
00151               LD      HL,SDDR
00152               LD      DE,IDDR
00153               CALL    APPEND          ;copy source dr to index dr
00154       ;.....................................................
00155                                       ;GTMF5
00156                                       ;.....................
00157                                       ;process output file spec
00158       GTMF5   NOP
00159               LD      A,0DH           ;reset output file specs
00160               LD      (ONAM),A
00161               LD      (OEXT),A
00162               LD      (OPSW),A
00163               LD      (ODDR),A
00164       ;
00165               POP     HL
00166               POP     AF
00167               CP      0DH
00168               JP      Z,GTMF5N                ;skip 3rd file spec if EOR
00169               CALL    PARSEF          ;get third file spec
00170               RET     NZ              ;abort if error
00171               PUSH    AF              ;save A (first char after file spec 3)
00172               PUSH    HL              ;save HL (first char after file spec 3)
00173       ;
00174                                       ;move temp file specs to output file specs
00175               LD      HL,TMPNAM
00176               LD      DE,ONAM
00177               CALL    APPEND          ;move output file name to ONAM
00178               LD      HL,TMPEXT
00179               LD      DE,OEXT
00180               CALL    APPEND          ;move output file ext to OEXT
00181               LD      HL,TMPPSW
00182               LD      DE,OPSW
00183               CALL    APPEND          ;move output file password to OPSW
00184               LD      HL,TMPDDR
00185               LD      DE,ODDR
00186               CALL    APPEND          ;move output file drive to ODDR
00187               POP     HL
00188               POP     AF
00189       ;.....................................................
00190                                       ;GTMF5N
00191                                       ;.....................
00192                                       ;fill in output file default values
00193       GTMF5N  PUSH    AF
00194               PUSH    HL
00195               LD      A,(ONAM)
00196               CP      0DH
00197               JP      NZ,GTMF5X       ;skip if output file name entered
00198               LD      HL,SNAM
00199               LD      DE,ONAM
00200               CALL    APPEND          ;copy source name to index name
00201       ;
00202       GTMF5X  LD      A,(OEXT)
00203               CP      0DH
00204               JP      NZ,GTMF5P       ;skip if output file ext entered
00205               LD      HL,OUTEXT
00206               LD      DE,OEXT
00207               CALL    APPEND          ;put "OUT" in output file extension
00208       ;
00209       GTMF5P  LD      A,(OPSW)
00210               CP      0DH
00211               JP      NZ,GTMF5D       ;skip if output file psw entered
00212               LD      HL,SPSW
00213               LD      DE,OPSW
00214               CALL    APPEND          ;copy source psw to output psw
00215       ;
00216       GTMF5D  LD      A,(ODDR)
00217               CP      0DH
00218               JP      NZ,GTMF7        ;skip if output file drive entered
00219               LD      HL,SDDR
00220               LD      DE,ODDR
00221               CALL    APPEND          ;copy source dr to output dr
00222       ;.....................................................
00223                                       ;GTMF7
00224                                       ;.....................
00225                                       ;end of routine
00226       GTMF7   POP     HL
00227               POP     AF
00228               CP      A               ;Z (set = syntax ok)
00229               RET
00230       ;-----------------------------------------------------
00231       MAPEXT  DEFM    'MAP'           ;index file extension
00232               DEFB    0DH
00233       OUTEXT  DEFM    'OUT'           ;output file extension
00234               DEFB    0DH
00235       ;...................
00236       SNAM    DEFS    9               ;source file name
00237       SEXT    DEFS    4               ;source file extension
00238       SPSW    DEFS    9               ;source file password
00239       SDDR    DEFS    2               ;source file drive
00240       INAM    DEFS    9               ;index file name
00241       IEXT    DEFS    4               ;index file extension
00242       IPSW    DEFS    9               ;index file password
00243       IDDR    DEFS    2               ;index file drive
00244       ONAM    DEFS    9               ;output file name
00245       OEXT    DEFS    4               ;output file extension
00246       OPSW    DEFS    9               ;output file password
00247       ODDR    DEFS    2               ;output file drive
00248       ;-----------------------------------------------------
00249                                       ;PARSEF
00250                                       ;-------------------------------
00251                                       ;parse file spec
00252                                       ;entry: HL->file spec
00253                                       ;exit:  Z=parse ok, NZ=bad parse
00254                                       ;       temp file spec table is
00255                                       ;       loaded with file spec
00256                                       ;reg alteredL AF,BC,DE,HL
00257                                       ;calls: EATBNK
00258                                       ;exit pts: PRSOK,PRSERR
00259                                       ;
00260       PARSEF  LD      A,0DH           ;reset temp file spec buffers
00261               LD      (TMPNAM),A
00262               LD      (TMPEXT),A
00263               LD      (TMPPSW),A
00264               LD      (TMPDDR),A
00265       ;
00266       PRSNAM  LD      DE,TMPNAM       ;.....................parse name
00267               LD      C,8
00268               CALL    EATBNK          ;remove leading blanks
00269       PRSLP1  LD      A,(HL)
00270               CP      '/'             ;? ext
00271               JR      Z,PRSEXT
00272               CP      '.'             ;? password
00273               JR      Z,PRSPSW
00274               CP      ':'             ;? disk drive
00275               JP      Z,PRSDDR
```

Listing 12 continued

Listing 12 continued

```
00276             CP      ' '             ;? blank
00277             JP      Z,PRSBNK
00278             CP      ','             ;? comma
00279             JP      Z,PRSCOM
00280             CP      0DH             ;? EOR
00281             JP      Z,PRS0DH
00282             CP      ';'             ;? semicolon
00283             JP      Z,PRSEMI
00284             LD      (DE),A          ;move to temp name buffer
00285             LD      A,0
00286             CP      C
00287             JP      Z,PRSERR        ;error if name >8 char
00288             DEC     C
00289             INC     HL
00290             INC     DE
00291             JR      PRSLP1
00292     ;
00293     PRSEXT  LD      A,0DH           ;.....................parse ext
00294             LD      (DE),A
00295             LD      DE,TMPEXT
00296             INC     HL              ;pt to char after '/'
00297             LD      C,3
00298     PRSLP2  LD      A,(HL)
00299             CP      '.'             ;? pasword
00300             JR      Z,PRSPSW
00301             CP      ':'             ;? disk drive
00302             JR      Z,PRSDDR
00303             CP      ' '             ;? blank
00304             JP      Z,PRSBNK
00305             CP      ','             ;? comma
00306             JP      Z,PRSCOM
00307             CP      0DH             ;? EOR
00308             JP      Z,PRS0DH
00309             CP      ';'             ;? semicolon
00310             JP      Z,PRSEMI
00311             LD      (DE),A          ;move to temp ext buffer
00312             LD      A,0
00313             CP      C
00314             JP      Z,PRSERR        ;error if ext > 3 char
00315             DEC     C
00316             INC     HL
00317             INC     DE
00318             JR      PRSLP2
00319     ;
00320     PRSPSW  LD      A,0DH           ;.....................parse password
00321             LD      (DE),A
00322             INC     HL              ;pt to char after '.'
00323             LD      DE,TMPPSW
00324             LD      C,8
00325     PRSLP3  LD      A,(HL)
00326             CP      ':'             ;? disk drive
00327             JR      Z,PRSDDR
00328             CP      ' '             ;?  blank
00329             JR      Z,PRSBNK
00330             CP      ','             ;? comma
00331             JR      Z,PRSCOM
00332             CP      0DH             ;? EOR
00333             JR      Z,PRS0DH
00334             CP      ';'             ;? semicolon
00335             JR      Z,PRSEMI
00336             LD      (DE),A
00337             LD      A,0
00338             CP      C
00339             JP      Z,PRSERR        ;error if password > 8
00340             DEC     C
00341             INC     HL
00342             INC     DE
00343             JR      PRSLP3
00344     ;
00345     PRSDDR  LD      A,0DH           ;.....................parse drive
00346             LD      (DE),A
00347             INC     HL
00348             LD      DE,TMPDDR
00349             LD      C,1
00350     PRSLP4  LD      A,(HL)
00351             CP      ' '             ;? blank
00352             JR      Z,PRSBNK
00353             CP      ','             ;? comma
00354             JR      Z,PRSCOM
00355             CP      0DH             ;? EOR
00356             JR      Z,PRS0DH
00357             CP      ';'             ;? semicolon
00358             JR      Z,PRSEMI
00359             LD      (DE),A
00360             LD      A,0
00361             CP      C
00362             JR      Z,PRSERR        ;error if drive > 1
00363             DEC     C
00364             INC     HL
00365             INC     DE
00366             JR      PRSLP4
00367     ;
00368     PRSBNK  LD      A,0DH           ;blanks encountered
00369             LD      (DE),A
00370             CALL    EATBNK          ;skip trailing blanks
00371             LD      A,(HL)
00372             CP      0DH
00373             JR      Z,PRS0DH
00374             CP      ','             ;did comma terminate blanks?
00375             JR      NZ,PRSOK        ;if not continue
00376             INC     HL              ;else bump HL and then continue
00377             CALL    EATBNK          ;skip any trailing blanks
00378             JR      PRSOK
00379     PRSCOM  INC     HL              ;next char past comma
00380             LD      A,0DH
00381             LD      (DE),A
00382             CALL    EATBNK          ;skip trailing blanks past comma
00383             JR      PRSOK
00384     PRSEMI  NOP                     ;semicolon encountered
00385             LD      A,0DH
00386             LD      (DE),A
00387             LD      A,';'           ;return with ';' in A
00388             JR      PRSOK
00389     PRS0DH  LD      A,0DH
00390             LD      (DE),A
00391     PRSOK   CP      A               ;Z (set)
00392             RET                     ;returns A=(HL) - always non-blank
00393     ;
00394     PRSERR  LD      A,1             ;error while parsing file spec
00395             CP      0               ;NZ (reset)
00396             RET
00397     ;-----------------------------------------------------------------
00398     TMPNAM  DEFS    9               ;temp storage for file name
00399     TMPEXT  DEFS    4               ;temp storage for extension
00400     TMPPSW  DEFS    9               ;temp storage for password
00401     TMPDDR  DEFS    2               ;temp storage for disk drive
00402     ;-----------------------------------------------------------------
00403                                     ;PACKFS
00404                                     ;-------------------------------
00405                                     ;pack file spec
00406                                     ;entry: HL->file spec table
00407                                     ;       DE->packed string buffer
00408                                     ;reg altered: AF,DE,HL
00409                                     ;calls: APPEND
00410                                     ;exit pts: PACK06
00411                                     ;
00412     PACKFS  LD      (STOFS),HL      ;store HL
00413             CALL    APPEND          ;append file name
00414             PUSH    DE
00415             LD      HL,(STOFS)
00416             LD      DE,9
00417             ADD     HL,DE           ;HL -> ext
00418             POP     DE
00419             LD      A,0DH
00420             CP      (HL)
00421             JR      Z,PACK02        ;skip in null record
00422             LD      A,'/'           ;append file ext delimiter
00423             LD      (DE),A
00424             INC     DE
00425             LD      A,0DH
00426             LD      (DE),A
00427             CALL    APPEND          ;append file extension
00428     PACK02  PUSH    DE
00429             LD      HL,(STOFS)
00430             LD      DE,13
00431             ADD     HL,DE           ;HL -> password
00432             POP     DE
00433             LD      A,0DH
00434             CP      (HL)
00435             JR      Z,PACK04        ;skip if null record
00436             LD      A,'.'
00437             LD      (DE),A          ;append password delimiter
00438             INC     DE
00439             LD      A,0DH
00440             LD      (DE),A
00441             CALL    APPEND          ;append password
00442     PACK04  PUSH    DE
00443             LD      HL,(STOFS)
00444             LD      DE,22
00445             ADD     HL,DE           ;HL -> disk drive
00446             POP     DE
00447             LD      A,0DH
00448             CP      (HL)
00449             JR      Z,PACK06        ;skip if null record
00450             LD      A,':'
00451             LD      (DE),A          ;append drive delimiter
00452             INC     DE
00453             LD      A,0DH
00454             LD      (DE),A
00455             CALL    APPEND          ;append drive no.
00456     PACK06  RET                     ;packing complete
00457     ;
00458     STOFS   DEFW    0               ;start of file spec's
00459     ;-----------------------------------------------------------------
00460                                     ;EATBNK
00461                                     ;-------------------------------
00462     EATBNK  LD      A,' '           ;eats blanks in string
00463                                     ;entry: HL->start of string
00464                                     ;exit:  HL->first non-blank char in string
00465                                     ;reg altered: AF,HL
00466     ETBKLP  CP      (HL)            ;char = " "?
00467             JR      NZ,ETBKED       ;jp to end of routine if blank
00468             INC     HL              ;get next char
00469             JR      ETBKLP          ;loop
00470     ETBKED  LD      A,(HL)          ;first char after blanks
00471             RET
00472     ;-----------------------------------------------------------------
00473                                     ;EATNBNK
00474                                     ;-------------------------------
00475     EATNBNK NOP                     ;eats non-blank char in string
00476                                     ;string must end with 0DH
00477                                     ;entry: HL-> start of string
00478                                     ;exit:  HL->first blank or 0DH in string
00479                                     ;       A = first non-blank char
00480                                     ;reg altered: AF,HL
00481     ETNBKLP LD      A,(HL)          ;load char into A
00482             CP      ' '             ;char = " "?
00483             JR      Z,ETNBKED       ;jp to end of routine if blank
00484             CP      0DH             ;char = EOR?
00485             JR      Z,ETNBKED       ;jp to end of routine if EOR
00486             INC     HL              ;get next char
00487             JR      ETNBKLP         ;loop
00488     ETNBKED RET                     ;A = (HL)
00489     ;-----------------------------------------------------------------
00490                                     ;APPEND
00491                                     ;-------------------------------
00492     ;APPEND                         ;appends one string to another
00493                                     ;both strings must have EOR (03 or 0DH)
00494                                     ;entry: HL-> string to append
00495                                     ;       DE->EOR at end of destination string
00496                                     ;exit:  HL->EOR of source string
00497                                     ;       DE->EOR of destination string
00498                                     ;reg altered: AF,DE,HL
00499     APPEND  LD      A,(HL)          ;load A with source char
00500             LD      (DE),A          ;move char to destination string
00501             CP      0DH             ;char = EOR?
00502             JR      Z,APP08         ;jp to end if EOR
00503             CP      3               ;char = EOR?
00504             JR      Z,APP08         ;jp to end if EOR
00505             INC     HL              ;get next char
00506             INC     DE              ;position to next destination char
00507             JR      APPEND          ;loop
00508     APP08   RET
00509     ;-----------------------------------------------------------------
00510                                     ;RECBL, REC0 and RECA
00511                                     ;-------------------------------
00512                                     ;load a 256 char buffer with one char type
00513                                     ;entry points: RECBL, REC0 or RECA
00514                                     ;RECBL: fill with blanks
00515                                     ;REC0:  fill with 0's
00516                                     ;RECA:  fill with char in A register
00517                                     ;entry: HL->start of buffer
00518                                     ;exit:
00519                                     ;reg altered: A, BC, DE, HL
00520     RECBL   LD      A,' '           ;fill with blanks
00521             JR      RECA            ;jp to fill routine
00522     REC0    LD      A,0             ;fill with 0's
00523     RECA    LD      (HL),A          ;load fill char into A
00524     REC04   PUSH    HL
00525             POP     DE              ;DE=HL
00526             INC     DE              ;DE=HL+1
00527             LD      BC,255          ;fill next 255 bytes
00528             LDIR                    ;move (HL) to (HL+1 = DE)
00529             RET
00530     ;-----------------------------------------------------------------
00531                                     ;TAPENT
00532                                     ;-------------------------------
00533                                     ;'Tap enter key' routine
00534                                     ;entry: no parm
00535                                     ;exit:  no parm
00536                                     ;reg altered: AF,DE,HL
00537                                     ;calls: VDLINE,KBWAIT
00538     TAPENT  LD      HL,TAP          ;display "Tap enter key" msg
00539             CALL    VDLINE
00540     TAPKBW  CALL    KBWAIT          ;wait until key pressed
00541             CP      0DH             ;? <enter>
00542             JP      NZ.TAPKBW       ;loop if not <enter>
00543             RET
00544     TAP     DEFM    'Tap enter key to continue'
00545             DEFB    3
00546     ;-----------------------------------------------------------------
00547                                     ;ERROR
00548                                     ;-------------------------------
00549                                     ;fatal system error dsp routine
00550                                     ;entry: A=system error code
00551                                     ;exit:  jp to TRSDOS
00552     ERROR   PUSH    AF              ;save error code in A
00553             LD      HL,ERR01        ;dsp "ERROR" msg
00554             CALL    VDLINE
00555             LD      A,0DH
00556             CALL    VDCHAR          ;new line
00557             POP     AF              ;restore error code in A
00558             CALL    ERRDSP          ;display system error msg
00559             CALL    TAPENT          ;tap <enter> to continue
00560             JP      JP2DOS          ;jp to system
00561     ERR01   DEFM    'ERROR'
00562             DEFB    0DH
00563     ;-----------------------------------------------------------------
00564                                     ;BXDEC
00565                                     ;-------------------------------
00566                                     ;bin (unsigned) to dec conversion
00567                                     ;entry: HL contains no.
00568                                     ;exit:  HL->DECBUF (no. in ASCII)
00569                                     ;reg altered: AF,BC.DE,HL,IX.IY
00570                                     ;calls: none
00571                                     ;exit pt: BXJP7
00572     BXDEC   LD      IX,DECBUF
00573             LD      IY,P10TAB       ;point to conversion table
00574             LD      C,0             ;zero digit count
00575     BXLP0   XOR     A               ;zero A
00576             INC     C               ;inc digit count
00577             LD      E,(IY+0)
```

Listing 12 continued

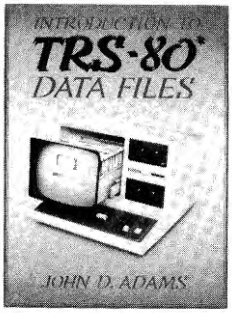
Listing 12 continued

```
00578                   LD      D,(IY+1)
00579           BXLP1   OR      A               ;clear carry
00580                   SBC     HL,DE
00581                   JP      C,BXJP1
00582                   INC     A
00583                   JR      BXLP1           ;loop
00584           BXJP1   ADD     HL,DE
00585                   ADD     A,48
00586                   LD      (IX+0),A
00587                   INC     IX
00588                   INC     IY
00589                   INC     IY
00590                   LD      A,5
00591                   CP      C
00592                   JR      NZ,BXLP0
00593                                           ;conversion complete
00594                                           ;now blank out leading 0's
00595                   LD      HL,DECBUF       ;pt to char buffer
00596                   LD      A,'0'
00597           BXJP3   CP      (HL)
00598                   JR      NZ,BXJP5        ;exit from loop if char not 0
00599                   LD      (HL),' '        ;replace 0 with blank
00600                   INC     HL              ;pt to next char
00601                   JR      BXJP3           ;loop
00602           BXJP5   LD      HL,DECBUFE
00603                   LD      A,' '
00604                   CP      (HL)            ;check if last char blank
00605                   JR      NZ,BXJP7
00606                   LD      (HL),'0'        ;if last char blank, replace with 0
00607           BXJP7   LD      HL,DECBUF       ;HL->DECBUF on exit
00608                   RET
00609           P10TAB  DEFW    10000
00610                   DEFW    1000
00611                   DEFW    100
00612                   DEFW    10
00613           P10TABE DEFW    1
00614           DECBUF  DEFS    4
00615           DECBUFE DEFB    0
00616                   DEFB    3
00617           ;---------------------------------------------------------------
00618           *//////////////////
00619           DECXB   NOP                     ;1-5 char ASCII dec to bin conver
00620                                           ;entry HL->5 char buffer
00621                                           ;no. string ends with 0DH
00622                                           ;exit (HL) has binary no.
00623                                           ;Z valid. NZ not valid
00624           ;
00625                   LD      DE,0
00626                   LD      (SUM),DE        ;initialize
00627                   LD      C,0
00628           DECXB2  LD      A,(HL)
00629                   CP      0DH
00630                   JP      Z,DECXB3
00631                   INC     HL
00632                   INC     C
00633                   JP      DECXB2
00634           ;
00635           DECXB3  NOP
00636                   LD      A,0             ;check for null record
00637                   CP      C
00638                   JP      Z,DECXB0
00639           ;
00640                   LD      IY,P10TABE
00641                   DEC     HL
00642                   PUSH    HL
00643                   POP     IX              ;IX -> last char of string
00644                   LD      B,1             ;digit count right to left
00645           ;
00646           DECXB4  NOP                     ;loop
00647                   LD      A,0
00648                   CP      C
00649                   JP      Z,DECXB7
00650           ;
00651                   LD      A,(IX+0)        ;get next digit
00652                   CP      ' '
00653                   JP      Z,DECXB7
00654                   CP      58
00655                   JP      P,DECXB9
00656                   CP      48
00657                   JP      M,DECXB9
00658                   SUB     48              ;A now has binary value
00659           ;////
00660                   PUSH    AF              ;check for no. >65535

00661                   LD      A,5
00662                   CP      B
00663                   JP      NZ,DECXB5
00664           ;
00665                   POP     AF              ;5th digit routine
00666                   CP      6
00667                   JP      M,DECXB6        ;5th digit <6
00668                   JP      NZ,DECXB9       ;5th digit >6
00669                   LD      HL,5535         ;5th digit =6. check if no>65535
00670                   LD      DE,(SUM)
00671                   OR      A
00672                   SBC     HL,DE
00673                   JP      C,DECXB9
00674                   JP      DECXB6          ;no. ok
00675           ;////
00676           DECXB5  POP     AF
00677           ;////
00678           DECXB6  LD      L,(IY+0)
00679                   LD      H,(IY+1)
00680                   CALL    MULT
00681                   LD      DE,(SUM)
00682                   ADD     HL,DE
00683                   LD      (SUM),HL
00684           ;
00685                   DEC     IY
00686                   DEC     IY
00687                   DEC     IX
00688                   DEC     C
00689                   INC     B
00690                   JP      DECXB4
00691           ;
00692           DECXB7  NOP                     ;conversion complete
00693                   LD      HL,(SUM)
00694                   SET     0,A             ;set Z (1)
00695                   RET
00696           DECXB0  NOP                     ;null entry
00697           DECXB9  LD      HL,0            ;error in conversion
00698                   SET     1,A             ;reset Z (0)
00699                   RET
00700           SUM     DEFW    0
00701           *//////////////////////
00702           ;---------------------------------------------------------------
00703           ;DECXB                           decimal to bin conversion
00704                                           ;no. ends with 0DH or blank
00705                                           ;entry HL->start of string
00706                                           ;exit: valid (HL)=bin no., A = set 0
00707                                           ;      invalid (HL)=0, A = set 1
00708                                           ;calls: MUHL10
00709                                           ;destroys: A,D,E,H,L
00710           DECXB   CALL    EATBNK
00711                   LD      A,(HL)          ;get digit
00712                   CP      0DH             ;null string?
00713                   JR      Z,DECXBB2       ;abort if null
00714                                           ;initialize sum
00715                   LD      DE,0
00716                   LD      (SUM),DE        ;zero running sum
00717           DECXBL  LD      A,(HL)          ;get digit

00718                   PUSH    HL              ;save string pos
00719                   CP      48
00720                   JP      M,DECXBB        ;char < 0
00721                   CP      58
00722                   JP      P,DECXBB        ;char > 9
00723                   SUB     48              ;convert to bin
00724                   LD      D,0
00725                   LD      E,A             ;bin value to DE
00726                   LD      HL,(SUM)        ;running sum to HL
00727                   ADD     HL,DE           ;add binary val to sum
00728                   JP      C,DECXBB        ;sum > FFFFH
00729                   LD      (SUM),HL
00730           ;
00731                   POP     HL
00732                   INC     HL              ;pt to next char
00733                   PUSH    HL
00734                   LD      A,(HL)
00735                   CP      0DH             ;EOR?
00736                   JR      Z,DECXBE        ;exit on EOR
00737                   CP      ' '             ;blank in string?
00738                   JR      Z,DECXBE        ;exit if non-leading blank
00739                   LD      HL,(SUM)
00740                   LD      DE,6554
00741                   OR      A
00742                   SBC     HL,DE
00743                   JP      P,DECXBB        ;over flow will occur
00744                   LD      HL,(SUM)
00745                   CALL    MUHL10
00746                   LD      (SUM),HL
00747           ;
00748                   POP     HL
00749                   JR      DECXBL          ;loop
00750           DECXBE  POP     HL              ;restore stack
00751                   LD      HL,(SUM)        ;valid no., move sum to HL
00752                   SET     0,A             ;set Z (1)
00753                   RET
00754           DECXBB  POP     HL              ;restore stack
00755           DECXBB2 LD      HL,0            ;invalid no. so set = 0
00756                   SET     1,A             ;reset Z (0)
00757                   RET
00758           SUM     DEFW    0               ;running sum
00759           ;---------------------------------------------------------------
00760                                           ;MUA10 and MUHL10
00761                                           ;-----------------------------
00762                                           ;entry: A or HL contains no.
00763                                           ;exit:  HL contains product
00764                                           ;reg altered; AF,DE,HL
00765           MUA10   LD      H,0             ;mult # in A by 10
00766                   LD      L,A             ;move A to HL
00767           MUHL10  ADD     HL,HL           ;mult # in HL by 10
00768                   LD      D,H
00769                   LD      E,L             ;HL&DE contain 2*no.
00770                   ADD     HL,HL           ;HL contains 4*no.
00771                   ADD     HL,HL           ;HL contains 8*no.
00772                   ADD     HL,DE           ;8*no. + 2*no.
00773                   RET
00774           ;---------------------------------------------------------------
00775                                           ;DSPNBR
00776                                           ;-----------------------------
00777                                           ;display bin no. as decimal no.
00778                                           ;dsp at current cursor position
00779                                           ;entry: (HL) = no.
00780                                           ;reg altered: HL
00781           DSPNBR  PUSH    AF
00782                   PUSH    BC
00783                   PUSH    DE
00784                   PUSH    IX
00785                   PUSH    IY
00786                   CALL    BXDEC           ;convert bin to dec, HL->dec no. string
00787                   CALL    VDLINE          ;dsp no. at current cursor position
00788                   POP     IY
00789                   POP     IX
00790                   POP     DE
00791                   POP     BC
00792                   POP     AF
00793                   RET
00794           ;---------------------------------------------------------------
00795                                           ;DSPNBRL
00796                                           ;-----------------------------
00797                                           ;dsp bin no. as left justified dec no.
00798                                           ;entry: (HL) = no.
00799                                           ;reg altered: HL
00800           DSPNBRL PUSH    AF
00801                   PUSH    BC
00802                   PUSH    DE
00803                   PUSH    IX
00804                   PUSH    IY
00805                   CALL    BXDEC           ;convert bin to dec, HL->dec no. string
00806                   CALL    EATBNK          ;remove leading blanks
00807                                           ;HL->first non-blank char in no.
00808                   CALL    VDLINE          ;dsp no. at current cursor position
00809           DPNRE   POP     IY
00810                   POP     IX
00811                   POP     DE
00812                   POP     BC
00813                   POP     AF
00814                   RET
00815           ;---------------------------------------------------------------
00816                                           ;DLINE
00817                                           ;-----------------------------
00818           DLINE   PUSH    DE              ;draws dotted line for width of screen
00819                   PUSH    BC              ;saves DE and BC registers
00820                   LD      A,'.'
00821                   CALL    LINE            ;display line
00822                   POP     BC
00823                   POP     DE
00824                   RET
00825           ;---------------------------------------------------------------
00826                                           ;LINE
00827                                           ;-----------------------------
00828                                           ;draws line for with of screen
00829                                           ;entry: A=char for line
00830                                           ;reg altered: AF,C,DE
00831           LINE    LD      (LCHAR),A
00832                   LD      C,SWIDTH        ;C = width of screen
00833           LINE2   LD      A,(LCHAR)       ;place char in A
00834                   CALL    VDCHAR          ;dsp A
00835                   DEC     C
00836                   LD      A,0
00837                   CP      C               ;end of line?
00838                   JR      NZ,LINE2        ;loop until end of line
00839                   RET
00840           LCHAR   DEFB    ' '             ;character to be displayed
00841           ;---------------------------------------------------------------
00842                                           ;FSPEC
00843                                           ;-----------------------------
00844           FSPEC   CALL    PTFS            ;get file spec cmd line
00845                                           ;PTFS is different for Mod II and III
00846                                           ;HL ->file spec after cmd
00847                   LD      DE,KEYBUF
00848                   CALL    APPEND          ;move file spec's to KEYBUF
00849                   LD      A,'N'
00850                   LD      (CMDLFS),A      ;set to no
00851                   LD      A,(KEYBUF)      ;get first char of KEYBUF
00852                   CP      0DH             ;is 1st char of KEYBUF = EOR?
00853                   RET     Z               ;return if null entry after cmd
00854                   LD      A,'Y'
00855                   LD      (CMDLFS),A      ;file spec after cmd
00856                   RET
00857           ;---------------------------------------------------------------
00858                   END
```

BOOKS

Wayne Green Books

BOOKS

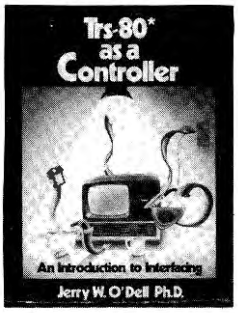


Introduction to TRS-80 Data Files

Learn by doing with this guide to writing a data base manager. This book, with its accompanying software, takes you through a simple mailing list program to teach you about sequential and then random access files. The construction of a DBM and the techniques for moving data to and from disks are discussed. ***Book and TRS-80 disk*** *$24.97 BK7398 approx. 144 pp.*

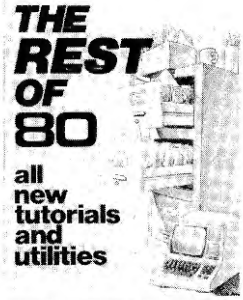
Inside Your Computer

Find out what goes on inside your TRS-80. Inside Your Computer *explains microcomputer circuits and how they work. Topics include chips, interpreters, circuits, machine language, binary numbers, algorithms, ASCII code, software, and what they all mean to the computer. Includes many photographs and schematics.* ***$12.97 BK7390 108 pp.***



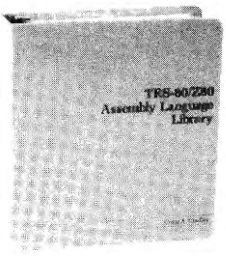
TRS-80 as a Controller

Learn to control outside devices with a TRS-80. This book is an introduction to interfacing, with simple, inexpensive projects. Applications include controlling lights and switches, building a small computer, and suggestions for more complex projects. The book applies to the Model III and, with minor conversions, to the Model I. ***$12.97 BK7394 192 pp.***



The Rest of 80

Get the 80 Micro *articles so good we put them in a book. These 31 never-before-published tutorials and utilities were hand-picked for Model I and Model III users. You'll get graphics sorts, renumbering, Pascal tutorials, and more. Both BASIC and assembly-language programs are included. Complete listings are given, with photographs, schematics, and examples.* ***$9.97 BK7392 232 pp.***

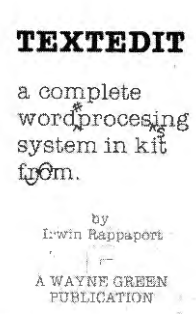


TRS-80/Z80 Assembly Language Library

Learn to use assembly language on the Model I to its full capacity. Two TRSDOS-compatible disks are included, with programs worth many times the book's cost. You'll learn about TRS-80 hardware and software, general Z80 routines, and TRS-80 utility programs. Examples show you how to apply the information to your everyday programming. Model III conversions are given. $4.50 shipping and handling. ***$34.97 BK7395 355 pp. Disks included***

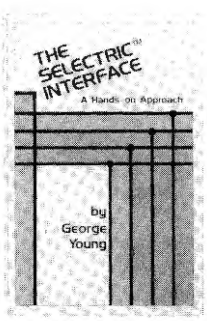
Computer Carnival

For the Models I and III. These sixty programs for beginners will entertain and educate. Children will find mazes, word games, graphics, puzzles, and quizzes. Card games, logic tests, word and number quizzes, and letter guesses make Computer Carnival *a learning experience. The* Carnival Companion *cassette of all sixty programs is also available.* ***Computer Carnival and Carnival Companion*** *$24.97 CC7389* ***Computer Carnival*** *$16.97 BK7389 218 pp.* ***Carnival Companion*** *$9.97 TP7389*



TEXTEDIT

Build your own word processor with the TEXTEDIT kit. This Disk BASIC system is built in modules, so you can modify them or use only the parts you need. Features include complete editing, search, replace, and count, and upper/lowercase typing on an unmodified Model I. Model III users need the TRSDOS CONVERT utility to use the disk. TEXTEDIT is compatible with any major DOS. It operates with one drive; two drives or copy utility needed to transfer programs to system disk. ***Book and disk package $24.97 CC7387***



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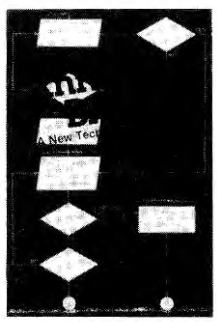
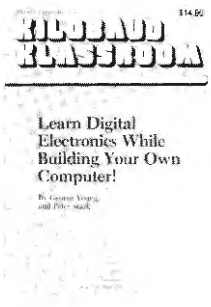
You can turn an IBM Selectric I/O writer into a letter-quality printer for your TRS-80. The Selectric Interface *gives you the programs and step-by-step instructions you need for Selectric models 2740, 2980, and Dura 1041. With slight modification, the instructions will also work for other chips.* ***$12.97 BK7388 124 pp.***



Annotated BASIC, vol. 1 and 2

This two-volume set teaches you the hows and whys of BASIC programming. TRS-80 Level II programs are taken apart and described in detail. Each program is accompanied by documentation, program annotation, BASIC concepts and definitions, and a flowchart. ***Volume 1*** *$10.95 BK7384 160 pp.* ***Volume 2*** *$10.95 BK7385 125 pp.*



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80 micro's SECOND ANNUAL READER'S CHOICE AWARDS

Like a receding wave, the deluge of Reader's Choice ballots has ebbed to a dribble. No more stacks of ballots waiting to be punched in on Monday mornings. No more smoke rising from the vents of the Model III. From the beleaguered editorial and technical staff of *80 Micro*, here are the results.

We counted fewer write-ins this year, no doubt due to our decision to expand the number of nominees and increase the number of categories to 38. Only three write-ins placed this year: SuperScripsit (how could we have left it out?), Donkey King, and GEAP Dotwriter.

Radio Shack, a natural heavy in the balloting, took 21 categories and placed 35 times overall. Among the finalists for Model I/III disk operating systems, Radio Shack is noticeably absent.

Heaviest response was for Model I/III disk operating systems, word processors, and utilities. Again this year, the first place winners are NEWDOS/80, Scripsit, and Super Utility Plus, respectively.

Each category includes the three top finishers, except in the case of ties or where we could determine no clear third place winner. Although we made no provision for the protest vote, we should mention that there were few. These ranged from blank ballots to a few dirty words (except for Tim Schuyler, of Chico, CA, who taped his ballot to a brick).

A special thanks goes to David Walonick for his efforts in compiling this year's ballots, and thanks to the many readers who mailed in ballots. The results speak for themselves. ■

Model I/III

Accounting
1. Maxi Cras (Adventure International)
2. Accounts Payable (RS)
3. Datagraph (Micro Software Systems)

Business
1. VisiCalc (VisiCorp)
2. Tallymaster (Prosoft)

Data Base Management
1. Profile III Plus (RS)
2. AIDS-III (Softrends)
3. Profile (RS)
   Maxi Manager (Adventure International)

Data Communications
1. Omniterm (Lindbergh Systems)
2. Modem 80 (Alternate Source)
3. Videotext Communications Package (RS)

Disk Operating Systems
1. NEWDOS/80 (Apparat)
2. DOSPLUS (Micro-Systems Software)
3. LDOS 5.1 (Logical Systems)

Education
1. Typing Tutor (Microsoft)
2. K-8 Math with Student Management (RS)
3. Typing Teacher (Instant Software)

Engineering
1. Active Filter Design (Howard W. Sams & Co.)

2. Surface Plot (Micro Labs)
3. Plotting Graphs for Video Display (Howard W. Sams & Co.)

Games
1. Flight Simulator (Sublogic Group)
2. Scarfman (Cornsoft Group)
3. Star Fighter (Adventure International)

Graphics
1. Powerdraw (Powersoft Products)
2. Powerdot (Powersoft Products)
3. GEAP Dotwriter (JF Consulting)

Home/Personal Management
1. Budget Management (RS)
2. Super-Log II (Micro-80)
3. Stockpak (RS)

Music
1. Orchestra-90 (Software Affair)
2. Orchestra-85 (Software Affair)
3. Fanfare (Software Affair)

Spelling Checkers
1. Electric Webster (Cornucopia Software)
2. Scripsit Dictionary (RS)
3. Hexspell (Hexagon Systems)

Utilities
1. Super Utility Plus (Powersoft Products)
2. EDTASM (RS)
3. Editor/Assembler (Series I) (RS)

Word Processors
1. Scripsit (RS)
2. Newscript (Prosoft)
3. SuperScripsit (RS)

Model II/12/16

Accounting
1. Accounts Receivable (RS)
2. Payroll (RS)
   Accounts Payable (RS)
3. Payroll (Taranto & Associates)

Business
1. VisiCalc (VisiCorp)
2. General Ledger (RS)
3. AR/INV (The Software Terminal)

Data Base Management
1. Profile II (RS)
2. AIDS-III (Meta-Tech)
3. Q-Pro 4 (Quick-N-Easi Products)

Data Communications
1. Videotex (RS)
2. Omniterm (Lindbergh Systems)
3. ST80-III (Small Business Systems Group)

Disk Operating Systems
1. TRSDOS (RS)
2. DOSPLUS II (Powersoft Products)
3. CP/M (Digital Research)

Education
1. NutriCalc (PCD Systems)
   Microtyping (Hayden)
2. Instant Mathematical Programming (PCD Systems)
3. Random Access Volume II Advanced File Handling (D.S.C. Publishing)

Engineering
1. Critical Path Project Management (McClintock Corp.)
   Solar Collector F-Chart Calculation (McClintock Corp.)
2. Duct Design (McClintock Corp.)
3. Finite Element Analysis (McClintock Corp.)

Games
1. Adventure (Adventure International)
2. Sargon II (Hayden)
3. Starship/1 (two/sixteen magazine)

Home/Personal Management
1. Powermail (Powersoft Products)
2. Supertax (Rockware Data Group)
   Home Budget (Howe Software)
3. Mailer (PCD Systems)

Spelling Checkers
1. Scripsit Dictionary (RS)
2. Grammatik (Aspen Software)

Utilities
1. Editor/Assembler (RS)
2. Profile Archive (RS)
3. 3D Plotter (Maxtek)
   Development Package (Racet Computes)

Word Processors
1. Scripsit 2.0 (RS)
2. WordStar (Micro Pro)
3. Electric Pencil (Michael Shrayer)

Color Computer

Accounting
1. Single Entry General Ledger (Universal Data Research)
   General Ledger (Universal Data Research)
2. Payroll (Universal Data Research)
3. Inventory II (Universal Data Research)

Business
1. Spectaculator (RS)
2. Personal Finance (RS)
3. Graphic Software (Kern Publications)

Data Base Management
1. Data Base Manager (Universal Data Research)
2. TIMS (Sugar Software)
3. C.C. File (Trans Tek)

Data Communications
1. COLORCOM/E (Eigen Systems)
2. Super Color Terminal (Nelson Software)
3. Microtext (The Micro Works)

Disk Operating Systems
1. TRSDOS (RS)
2. FLEX/FMate (RS) (Data Comp)

Education
1. Color LOGO (RS)
2. Typing Tutor (RS)
3. Advanced Graphics (RS)

Games
1. Zaxxon (Datasoft)
2. Donkey King (Tom Mix Software)
3. ROM-Save (B. Erickson Software)

Graphics
1. Art Gallery (RS)
2. MPP Graphics (Superior Graphics Software)
3. Images II (RS)

Home/Personal Management
1. Color File (RS)
2. The Color Accountant (Programmer's Institute)
3. Audio Spectrum Analysis (RS)

Spelling Checkers
1. Spell'N Fix (Star-Kits)
2. Spell-Rite (Eigen Systems)

Utilities
1. EDTASM+ (RS)
2. Diagnostic ROM (RS)

Word Processors
1. Telewriter-64 (Cognitec)
2. Color Scripsit (RS)
3. Super Color Writer II (Nelson Software)

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FUN HOUSE

Something for Everyone

by Richard Ramella

```
100 REM * SPDWRD * TRS-80
110 REM * FUN HOUSE * JAN. '84 * RICHARD RAMELLA
120 REM * WORKS ON ALL MODELS
130 CLEAR 500
140 CLS
150 INPUT "TYPE THE SECRET SENTENCE";A$
160 CLS
170 PRINT "GUESSER, TAP ENTER"
180 INPUT X
190 FOR A=1 TO LEN(A$)
200 B$=MID$(A$,A,1)
210 IF B$<>"A" AND B$<>"E" AND B$<>"I" AND B$<>"O" AND B$<>"U" T
HEN PRINT B$;
220 NEXT A
230 PRINT
240 INPUT "GUESSER, WHAT'S THE ANSWER";X$
250 IF X$<>A$ THEN PRINT "NO, IT WAS": PRINT A$ ELSE PRINT "RIGH
T !!"
260 END
```

Speedword.

```
100 REM * DAYS ALIVE ! * TRS-80
110 REM * FUN HOUSE * JAN. '84 * RICHARD RAMELLA
120 REM * WORKS ON ALL MODELS
130 CLS
140 PRINT "LET'S SEE HOW MANY DAYS"
150 PRINT "YOU'VE BEEN ALIVE..."
160 INPUT "WHEN READY TO GO, TAP ENTER";X
170 CLS
180 PRINT "NOW WE NEED YOUR BIRTHDATE."
190 PRINT "ENTER MONTH, DAY, YEAR SEPARATED BY COMMAS."
200 PRINT "EXAMPLE: MAY 1, 1963 WOULD BE 5,1,63"
210 INPUT MO,DA,YR
220 GOSUB 340
230 J=K
240 CLS
250 INPUT "NOW ENTER TODAY'S DATE IN SAME STYLE";MO,DA,YR
260 CLS
270 GOSUB 340
280 DA=K-J
290 PRINT "YOUR LIFE IS NOW"
300 PRINT DA;"GREAT DAYS LONG."
310 FOR T=1 TO 1000
320 NEXT T
330 END
340 IF MO=1 OR MO=2 THEN YR=YR-1: MO=MO+13: GOTO 360
350 MO=MO+1
360 K=365*YR+INT(.25*YR)+INT(30.600994*MO)+DA
370 RETURN
380 END
```

Days Alive!.

On New Year's Day there are only two kinds of people—those who watch football games and those who don't. If you don't, come to the 1984 celebration here in the Fun House. As always, I admit all the kids first. If any room is left after that, we might squeeze in a few adults.

I invite everyone with a TRS-80 *anything* to this celebration. The four programs this month should work on any TRS-80 that you haven't recently dipped in molasses. In truth, I have to rule out Model I, Level I users, but I don't think anyone seriously uses Level I anymore.

We're going to try some games and activities that might tell you some things you don't know about yourself. Spdwrd, which is short for speedword, is a game for at least two players. Days Alive! tells you how many

The Key Box

All TRS-80 Models
4K RAM, Cassette Basic
32K RAM, Disk Basic
Color Basic

days have passed since you were born.

Using the figure discovered in Days Alive, you can run A Week of Birthdays and find out the day of the week on which you were born—or when anything else happened. Last is Guess Your Name, in which the computer doggedly tries to find out who you are and does so with great success as long as you give straight answers to its yes/no questions.

As you enter the party room, I must ask you not to blow any horns or clack any clackers. I was up last night celebrating the New Year till nearly 10:30 p.m. and need a little quiet today.

SPDWRD

Player 1 leaves the room or at least turns away from the computer screen. Player 2 types in a secret sentence of fewer than 250 characters, then taps the enter key.

Player 1 returns and taps the enter key. The secret sentence appears on the screen with all vowels left out. Player 2 studies this result and tries to type the sentence as it was originally entered. The TRS-80 recognizes success.

After they argue about the fairness of the tricky secret sentence entered by Player 1, the two players exchange roles.

That's all there is to it, but that's enough. You'll be surprised how giggly some statements become without vowels.

Days Alive!

On some days I am totally uninterested in knowing how many thousands of days I've been alive. I can't even remem-

```
100 REM * A WEEK OF BIRTHDAYS * TRS-80
110 REM * FUN HOUSE * JAN. '84 * RICHARD RAMELLA
120 REM * WORKS ON ALL MODELS
130 CLS
140 DATA SUNDAY,MONDAY,TUESDAY,WEDNESDAY,THURSDAY,FRIDAY,SATURDA
Y
150 FOR A=1 TO 7
160 READ A$(A)
170 NEXT A
180 INPUT "TYPE TODAY'S DAY OF WEEK";Z$
190 FOR G=1 TO 7
200 IF A$(G)=Z$ THEN C=G: GOTO 230
210 NEXT G
220 PRINT "DID YOU NOT ENTER A DAY OF THE WEEK?": GOTO 180
230 CLS
240 INPUT "HOW MANY DAYS HAVE YOU LIVED";X
250 IF X>364 THEN X=X-364: GOTO 250
260 IF X<8 THEN 290
270 X=X-7
280 GOTO 260
290 FOR D=X TO 1 STEP -1
300 C=C-1
310 IF C=0 THEN C=7
320 NEXT D
330 PRINT "YOU WERE BORN ON A ";A$(C)
340 PRINT
350 ON C GOTO 420,360,370,380,390,400,410
360 PRINT "MONDAY'S CHILD IS FAIR OF FACE.": END
370 PRINT "TUESDAY'S CHILD IS FULL OF GRACE": END
380 PRINT "WEDNESDAY'S CHILD IS FULL OF WOE": END
390 PRINT "THURSDAY'S CHILD HAS TO FAR TO GO.": END
400 PRINT "FRIDAY'S CHILD IS LOVING AND GIVING": END
410 PRINT "SATURDAY'S CHILD WORKS HARD FOR ITS LIVING.": END
420 PRINT "THE CHILD THAT'S BORN ON THE SABBATH DAY"
430 PRINT "IS BONNY AND BLITHE, AND GOOD AND GAY": END
440 END
```

A Week of Birthdays.

Guess Your Name.

```
100 REM * GUESS YOUR NAME *
110 REM * FUN HOUSE * JAN '84 * RICHARD RAMELLA
120 REM * WORKS ON ALL MODELS
130 CLS
140 CLEAR 200
150 A$="ABCDEFGHIJKLMNOPQRSTUVWXYZ"
160 PRINT "I CAN GUESS YOUR FIRST NAME."
170 PRINT "I WANT ONE CLUE ONLY."
180 PRINT "THEN ANSWER MY QUESTIONS --"
190 PRINT "Y FOR YES, N FOR NO."
200 INPUT "TAP ENTER TO CONTINUE";X
210 CLS
220 PRINT "NOW FOR THAT CLUE. ENTER"
230 INPUT "NUMBER OF LETTERS IN FIRST NAME";Z
240 IF Z<1 THEN CLS: GOTO 230
250 DIM XX(Z)
260 QQ=Z
270 IF Z>30 THEN PRINT "YOU FIB. I QUIT.": END
280 DIM N$(Z)
290 IF Z>11 THEN PRINT "I SENSE EXAGGERATION, BUT I WILL (SIGH)
TRY ANYWAY."
300 FOR A=1 TO Z
310 N$(A)="-"
320 NEXT A
330 IF LEN(A$)=0 THEN 820
340 A=RND(LEN(A$))
350 REM *** MODEL 100 FOLKS, MAKE LINE ABOVE READ: 340 A=1+INT(R
ND(1)*LEN)A$))
360 Z$=MID$(A$,A,1)
370 IF A=1 THEN A$=RIGHT$(A$,LEN(A$)-1): GOTO 400
380 IF A=LEN(A$) THEN A$=LEFT$(A$,LEN(A$)-1): GOTO 400
390 A$=LEFT$(A$,A-1)+RIGHT$(A$,LEN(A$)-A)
400 PRINT "IS LETTER * ";Z$;" * IN IT"
410 GOSUB 470
420 IF B$="Y" THEN GOSUB 500
430 IF B$="N" THEN 330
440 IF B$="Y" THEN PRINT "IS THERE ANOTHER ";Z$;" IN IT?": GOSUB
 470
450 IF B$="Y" THEN GOSUB 500: GOTO 440
```

Listing continued

Listing continued

```
460 GOTO 330
470 INPUT "Y-N";B$
480 IF B$<>"Y" AND B$<>"N" THEN CLS: GOTO 470
490 RETURN
500 A=RND(Z)
510 REM *** MODEL 100 FOLKS, MAKE LINE ABOVE READ: 500 A=1+INT(R
ND(1)*Z)
520 CLS
530 IF N$(A)<>"-" OR XX(A)<>0 THEN 500
540 N$(A)=Z$
550 XX(A)=1
560 IF QQ=1 THEN 690
570 PRINT "IS IT IN THE RIGHT PLACE?"
580 FOR C=1 TO Z
590 PRINT N$(C);
600 NEXT C
610 PRINT
620 GOSUB 470
630 IF B$="Y" THEN QO=QQ-1: FOR V=1 TO Z: XX(V)=0: NEXT: RETURN
640 HH=HH+1
650 IF HH=QQ THEN 750
660 N$(A)="-"
670 HH=0
680 GOTO 500
690 PRINT "NO DOUBT ABOUT IT. YOUR NAME"
700 PRINT "IS ";
710 FOR A=1 TO Z
720 PRINT N$(A);
730 NEXT
740 END
750 PRINT "UH-OH, YOU SAID LETTER ";N$(A)
760 PRINT "WAS IN YOUR FIRST NAME,"
770 PRINT "BUT YOU SAID NO WHEN I"
780 PRINT "TRIED ALL EMPTY SPACES."
790 PRINT
800 PRINT "LET'S TRY AGAIN FROM THE START."
810 END
820 PRINT "WHOOPS, ALL LETTERS ARE GONE"
830 PRINT "AND I HAVEN'T GUESSED. THAT"
840 PRINT "MEANS YOU, ER... SAID A LETTER"
850 PRINT "WASN'T IN OUR NAME AND IT WAS."
860 GOTO 790
870 END
```

ber what happened on most of those days.

However, I've found that kids enjoy knowing this interesting total of their lives. I hope a lot of people with 2,000–5,000 days of experience get to try this program.

It works simply. Just do what the computer says and no harm will come to you. When you see the prompt NOW WE NEED YOUR BIRTHDATE. ENTER MONTH, DAY, YEAR SEPARATED BY COMMAS, remember that you only need the final two numbers of your birth year.

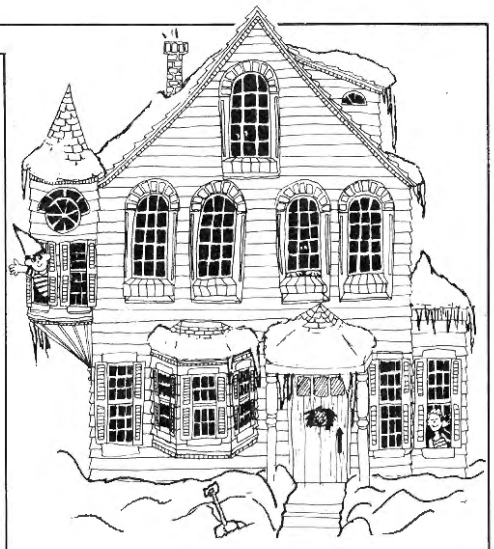
If you were born on January 16, 1972, you type 1,16,72. In this system, January is the first month of a year, and December is the twelfth month. You can figure out the numbers for the others.

Next, the program asks you to enter today's date. If you are trying this program on New Year's Day, the answer is 1,1,84.

With that, the lightning-quick computer goes to work and tells you the number of days you've had in your life.

Days Alive only works for birthdays in the 20th century. Any Fun House reader born in the 19th century (or earlier) can send me his or her birth date. I'll figure out the total on an abacus and mail back the answer.

Remember how many days you've lived. You need that total to make the next program run.



A Week of Birthdays

"Monday's child is fair of face..." begins an old nursery rhyme. I can never remember what comes after that. Is Tuesday's child gone without a trace? a winner of the race? tied up in lace? solving the case?

I solved the problem by looking up the old poem. I did it because some people like to find out the day of the week on which they were born to determine what qualities or fate they have, based on the rhyme.

I'd say it's a bunch of hooey, except I'm a Saturday's child and I do work hard for my living, so....

Run the program, please. It asks you to give two answers. The first prompt is TYPE THE DAY OF THE WEEK. Type it out fully, using no abbreviations. Use all capital letters.

If you don't know the day of the week, ask your little brother who hates school and always knows how many days until Friday.

Next, answer the question, HOW MANY DAYS HAVE YOU LIVED? If you don't know the answer, go directly back to Days Alive and find

7400

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SN7423N	16	.59
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SN7426N	14	.29
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SN7428N	14	.59
SN7430N	14	.25
SN7432N	14	.29
SN7437N	14	.25
SN7438N	14	.29
SN7439N	14	.59
SN7440N	14	.19
SN7441N	16	.89
SN7442N	16	.45
SN7443N	16	1.25
SN7444N	16	1.25
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SN7453N	14	.19
SN7454N	14	.19
SN7459N	14	.25
SN7460N	14	.39
SN7470N	14	.29
SN7472N	**14**	**.29**
SN7473N	14	.35
SN7474N	14	.35
SN7475N	16	.45
SN7476N	16	.35
SN7479N	14	4.95
SN7480N	14	.89
SN7482N	14	1.49
SN7483N	16	.59
SN7485N	16	.59
SN7486N	14	.35
SN7489N	16	2.25
SN7490N	14	.39
SN7491N	14	.79
SN7492N	14	.39
SN7493N	14	.39
SN7494N	14	.89
SN7495N	14	.49
SN7496N	16	.49
SN7497N	16	3.25
SN74100N	24	1.95
SN74104N	14	1.19
SN74105N	14	1.19
SN74107N	**14**	**.29**
SN74109N	**16**	**.39**
SN74116N	24	1.49
SN74121N	14	.39
SN74122N	14	.69
SN74123N	16	.49
SN74125N	14	.45
SN74126N	14	.45
SN74132N	14	.49
SN74136N	14	.69
SN74141N	16	.89
SN74142N	16	3.95
SN74143N	24	3.95
SN74144N	24	3.95
SN74145N	16	.59
SN74147N	16	1.49
SN74148N	16	1.19
SN74150N	24	1.19
SN74151N	16	.59
SN74152N	14	.59
SN74153N	16	.59
SN74154N	24	1.25
SN74155N	**16**	**.59**
SN74156N	16	.59
SN74157N	**16**	**.59**
SN74160N	16	.69
SN74161N	16	.69
SN74162N	16	.69
SN74163N	16	.69
SN74164N	14	.69
SN74165N	16	.69
SN74166N	16	.89
SN74167N	16	2.95
SN74170N	16	1.95
SN74172N	24	4.95
SN74173N	16	.69
SN74174N	16	.69
SN74175N	16	.69
SN74176N	14	.69
SN74177N	14	.69
SN74179N	16	1.49
SN74180N	14	.69
SN74181N	24	1.95
SN74182N	16	1.19
SN74184N	16	2.49
SN74185N	16	2.49
SN74190N	16	.69
SN74191N	16	.69
SN74192N	16	.69
SN74193N	16	.69
SN74194N	16	.69
SN74195N	16	.69
SN74196N	14	.89
SN74197N	14	.89
SN74198N	24	1.19
SN74199N	24	1.19
SN74221N	16	1.19
SN74251N	16	.79
SN74276N	20	2.49
SN74279N	16	.79
SN74283N	16	1.49
SN74284N	24	4.95
SN74285N	16	2.95
SN74365N	16	.55
SN74366N	16	.55
SN74367N	16	.55
SN74368N	16	.55
SN74390N	16	1.49
SN74393N	14	1.49

74LS

74LS00	14	.25
74LS01	14	.25
74LS02	14	.29
74LS03	14	.25
74LS04	14	.35
74LS05	14	.29
74LS08	14	.29
74LS09	14	.29
74LS10	14	.29
74LS11	14	.35
74LS12	14	.35
74LS13	14	.59
74LS14	14	.59
74LS15	14	.35
74LS20	14	.29
74LS21	14	.29
74LS22	**14**	**.29**
74LS26	14	.29
74LS27	14	.29
74LS28	14	.35
74LS30	14	.29
74LS32	14	.39
74LS33	14	.55
74LS37	14	.35
74LS38	14	.35
74LS40	14	.29
74LS42	16	.55
74LS47	16	.75
74LS48	16	.75
74LS49	16	.75
74LS51	14	.29
74LS54	14	.25
74LS55	14	.29
74LS73	14	.39
74LS74	14	.49
74LS75	16	.39
74LS76	16	.39
74LS78	14	.39
74LS83	16	.65
74LS85	16	.89
74LS86	14	.39
74LS90	14	.55
74LS93	16	.79
74LS107	14	.39
74LS109	16	.39
74LS112	16	.39
74LS113	14	.39
74LS114	16	.39
74LS122	14	.49
74LS123	16	.89
74LS125	14	.59
74LS126	14	.49
74LS132	14	.59
74LS133	16	.59
74LS136	14	.39
74LS138	16	.89
74LS139	16	.79
74LS151	16	.59
74LS153	16	.59
74LS154	24	1.29
74LS155	16	.89
74LS156	16	.69
74LS157	16	.89
74LS160	16	.69
74LS161	16	.69
74LS162	16	.69
74LS163	16	.69
74LS164	14	.69
74LS165	16	1.19
74LS168	16	1.19
74LS169	16	1.19
74LS170	16	1.49
74LS173	16	.69
74LS174	16	.69
74LS175	16	.69
74LS181	24	2.95
74LS190	16	.89
74LS191	16	.89
74LS192	16	.79
74LS193	16	.79
74LS194	16	.69
74LS195	16	.69
74LS107	14	.79
74LS221	16	.89
74LS240	20	1.09
74LS241	20	1.09
74LS242	14	1.09
74LS243	14	.89
74LS244	20	1.49
74LS245	20	1.49
74LS247	16	1.09
74LS248	16	1.09
74LS249	16	1.09
74LS251	16	.59
74LS253	16	.59
74LS257	16	.59
74LS258	16	.59
74LS260	14	.59
74LS266	14	.69
74LS273	20	1.49
74LS279	16	.49
74LS283	16	.69
74LS290	14	.89
74LS293	14	.79
74LS298	16	.89
74LS352	16	1.29
74LS353	16	1.29
74LS365	16	.49
74LS366	16	.49
74LS367	16	.49
74LS368	16	.49
74LS373	20	1.49
74LS374	20	1.49
74LS375	16	.69
74LS386	14	.45
74LS393	14	1.19
74LS399	16	1.49
81LS97	20	1.49
81LS98	20	1.49

74S/PROMS*

74S00	14	.35
74S02	14	.35
74S03	14	.35
74S04	14	.45
74S05	14	.45
74S08	14	.39
74S09	14	.39
74S10	14	.35
74S11	14	.35
74S15	14	.35
74S20	14	.35
74S22	14	.35
74S30	14	.35
74S32	14	.45
74S38	14	.89
74S40	14	.39
74S51	14	.35
74S64	14	.39
74S65	14	.39
74S74	14	.55
74S85	16	2.49
74S86	14	.55
74S112	16	.55
74S113	14	.55
74S114	14	.55
74S133	16	.45
74S134	16	.50
74S135	16	.89
74S136	14	1.39
74S138	16	.89
74S139	16	.89
74S140	14	.55
74S151	16	.99
74S153	16	.99
74S157	16	.99
74S158	16	.99
74S180	16	2.49
74S174	16	1.19
74S175	16	1.19
74S188*	16	1.49
74S194	16	1.49
74S195	16	1.49
74S196	14	1.49
74S240	20	2.25
74S241	20	2.25
74S242	14	2.49
74S243	14	2.49
74S244	20	2.49
74S251	16	1.19
74S253	16	1.19
74S257	16	1.19
74S258	16	1.19
74S260	14	1.19
74S280	14	1.95
74S287*	16	1.95
74S288*	16	1.95
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CD4007	14	.29
CD4009	**16**	**.59**
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CD4011	14	.29
CD4012	14	.29
CD4013	14	.39
CD4014	16	1.19
CD4015	**16**	**.39**
CD4016	14	.49
CD4017	16	1.19
CD4018	16	.99
CD4019	16	.59
CD4020	16	1.19
CD4021	14	1.19
CD4022	16	1.19
CD4023	14	.29
CD4024	14	.69
CD4025	14	.23
CD4026	16	2.49
CD4027	16	.45
CD4028	16	.69
CD4029	16	1.29
CD4030	14	.39
CD4034	24	2.49
CD4035	16	1.49
(More in Catalog)		
CD4040	16	1.19
CD4041	14	1.19
CD4042	16	.89
CD4043	16	.79
CD4044	16	.79
CD4046	16	1.19
CD4047	14	1.29
CD4048	16	.59
CD4049	**16**	**.39**
CD4050	16	.39
CD4051	16	.99
CD4052	16	.99
CD4053	16	.99
CD4056	16	2.95
CD4059	24	7.95
CD4060	16	1.49
CD4066	14	.59
CD4068	14	.39
CD4069	14	.29
CD4070	14	.39
CD4071	14	.29
CD4072	14	.29
CD4073	14	.29
CD4075	14	.29
CD4076	16	1.19
CD4078	14	.49
CD4081	**14**	**.29**
CD4082	14	.29
CD4093	14	.49
CD4098	16	1.95
CD4506	16	1.19
CD4507	14	1.19
CD4508	24	3.95
CD4510	16	1.29
CD4511	16	1.19
CD4512	16	1.19
CD4514	24	2.49
CD4515	24	2.49
CD4516	16	1.19
CD4518	16	1.19
CD4519	16	.59
CD4520	16	1.19
CD4526	16	1.49
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CD4529	16	1.69
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CD4723	16	1.19
CD4724	16	1.19
MC14409	16	13.95
MC14410	16	13.95
MC14411	24	11.95
MC14412	16	13.95
MC14419	16	7.95
MC14433	24	13.95
MC14538	16	1.19
MC14541	14	1.19

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MICROPROCESSOR CHIPS

Part No.	**Pins	Function	Price
CDP1802	40	CPU	$2.95
MC6500/2	40	MPU w/Clock	5.95
MC6502B	40	MPU w/Clock at 3MHz	9.95
MC6802CP	40	MPU w/Clock and RAM	7.95
6809	40	CPU—8-bit (Internal Clock) 1MHz	14.95
INS8035N-6	40	MPU—8-bit (6MHz)	5.95
INS8039N	40	CPU-Sgl. chip 8-bit (128bits RAM)	5.95
INS8040N-6	40	CPU (256 bytes RAM)	9.95
INS8070N	40	CPU (64 bytes RAM)	29.95
INS8073N	40	CPU w/Basic Micro Interpreter	29.95
F8065A	40	CPU	4.95
8086	40	CPU 16-bit 5MHz	24.95
8088	40	CPU 8/16-bit	29.95
8155	40	HMOS RAM I/O Port-Timer	6.95
8748	40	HMOS EPROM MPU	24.95

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Z80	40	CPU (MK3880N)(780C) 2MHz $3.95
Z80-CTC	28	Counter Timer Circuit 3.95
Z80-DART	40	Dual Asynchronous Rec./Trans. 10.95
Z80-DMA	40	Direct Memory Access Circuit 9.95
Z80-PIO	40	Parallel I/O Interface Controller 3.95
Z80-S10/0	40	Serial I/O (TxCB and RxCB Bonded) 12.95
Z80-S10/1	40	Serial I/O (Lacks DTRB) 12.95
Z80-S10/2	40	Serial I/O (Lacks SYNCB) 12.95
Z80-S10/9	40	Serial I/O 12.95
Z80A	40	CPU (MK3880N-4)(780C-1) 4MHz 4.49
Z80A-CTC	28	Counter Timer Circuit 4.95
Z80A-DART	40	Dual Asynchronous Rec./Trans. 9.95
Z80A-DMA	40	Direct Memory Access Circuit 12.95
Z80A-PIO	40	Parallel I/O Interface Controller 3.95
Z80A-S10/0	40	Serial I/O (TxCB and RxCB bonded) 12.95
Z80A-S10/1	40	Serial I/O (Lacks DTRB) 12.95
Z80A-S10/2	40	Serial I/O (Lacks SYNCB) 12.95
Z80A-S10/9	40	Serial I/O 12.95
Z80B	40	CPU (MK3880N-6) 6MHz 9.95
Z80B-CTC	28	Counter Timer Circuit 12.95
Z80B-DART	40	Dual Asynch. Receiver/Transmitter 19.95
Z80B-PIO	40	Parallel I/O Interface Controller 12.95
Z8001	48	CPU Segmented 44.95
Z8002	40	CPU Non-Segmented 34.95
Z8030	40	Serial Comm. Controller 44.95
Z8036	40	Counter/Timer & Parallel I/O Unit 29.95

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MC6520	40	Peripheral Inter. Adapter 4.95
MC6800	40	MPU 2.95
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4027	**16**	**4096x1 (250ns)**	**2.49**
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2LS00	16	256x1 (80ns) L.P.	9.95
7489	16	16x4 (50ns) 3101	2.25
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1702A	24	256xB (1us)	4.95
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2708-5	24	1024x8 (550ns) SM00246	2.95
TMS2516	24	2048x8 (450ns) 2716	5.95
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TMS573	18	1024x4 PROM T.S. (82S137)	4.95
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DAC1022	16	10-bit D/A Conv. (0.20% Lin.) 5.95
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16 pin LP	.19	.17	.16
18 pin LP	.26	.24	.23
20 pin LP	.30	.27	.25
22 pin LP	.31	.28	.26
24 pin LP	.33	.30	.28
28 pin LP	.40	.37	.35
36 pin LP	.46	.42	.39
40 pin LP	.49	.46	.43

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16 pin SG	.47	.43	.41
18 pin SG	.53	.49	.47
24 pin SG	.69	.65	.61
28 pin SG	.81	.76	.72

out. And in the future don't read so fast!

Then the computer tells you the day of the week on which you were born. If you have any doubt, simply consult a perpetual calendar.

Guess Your Name

At our house we have a dog that will fetch sticks all day long. The computer is like that dog in the way it handles the problem you give it in Guess Your Name.

It keeps trying without losing interest until it guesses your name. In return, you must truthfully answer its yes or no questions and be patient with it.

The program works with a series of prompts. You answer each one and tap the enter key.

The program first asks you to enter the number of letters in the name it will guess. It gets huffy if you claim that your first name has more than 30 letters in it.

At this point, the program starts trying out letters and asking if each is in your name. If you answer yes to this, the computer shows a row of dashes representing the unknown letters in the name and tries the letter in different positions.

When a letter is in the right place, answer yes. Example: Your name is Carl. The computer asks, IS LETTER *R* IN IT? You answer yes.

The computer then asks, IS IT IN THE RIGHT PLACE? and displays this: --R-. The R is in the right position, so Carl answers yes. Ruth, of course, would say no. And so it goes until the computer succeeds.

Sometimes I wonder how that rascally computer does it! ■

If you have trouble making any Fun House program work, write me with your problem, sending a listing of the program as it is in your computer or a note telling me the error messages you get and what seems to be wrong. Enclose a self-addressed envelope with a 20-cent stamp, or with coin of your nation equal to the stamps on the outgoing letter. Send all this to me, Richard Ramella, 1493 Mt. View Ave., Chico, CA 95926.

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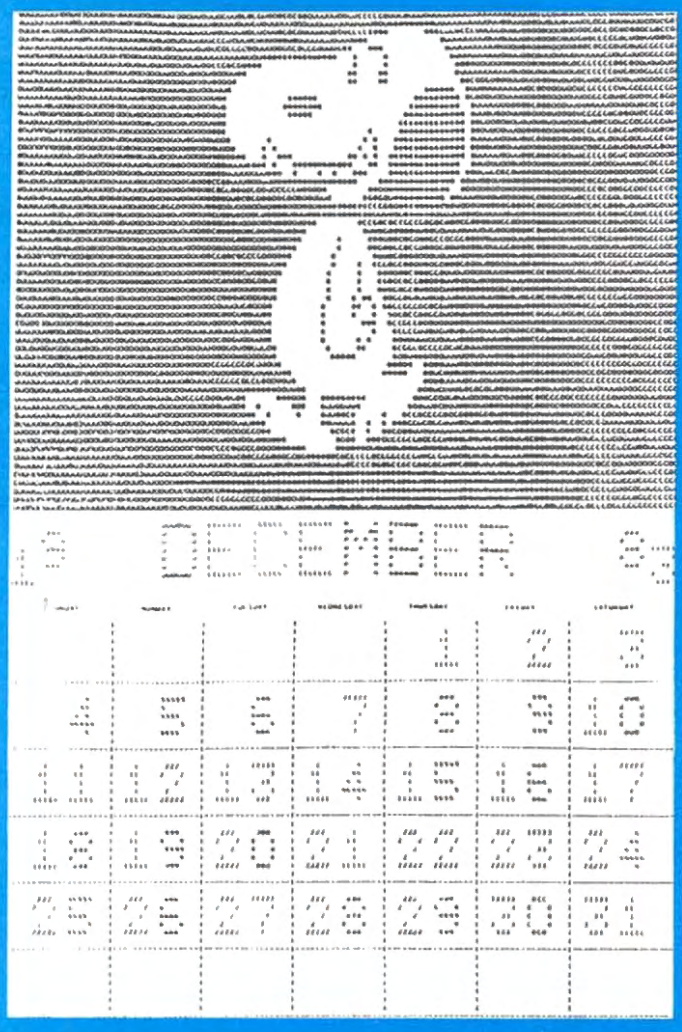

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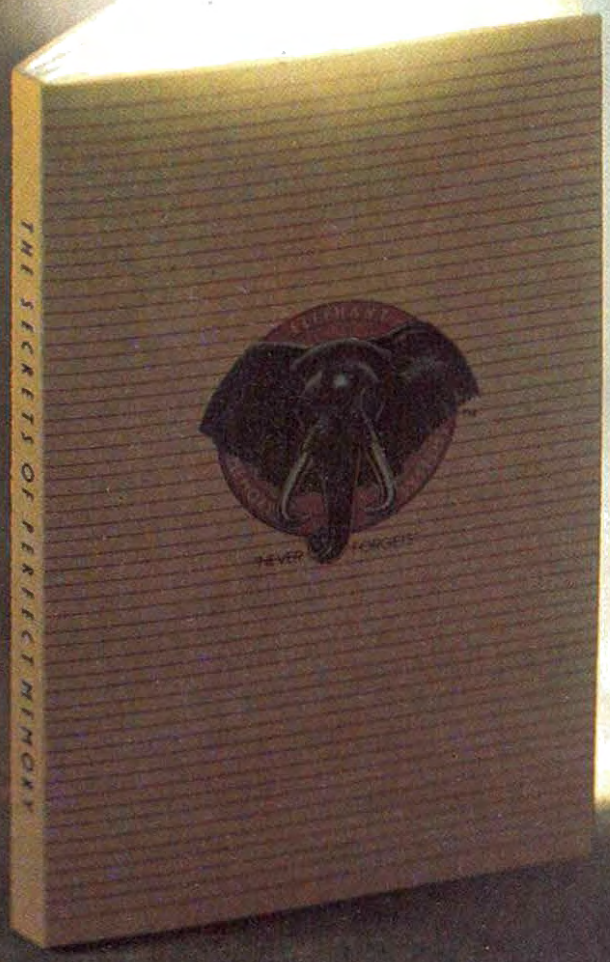

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The GAMER'S CAFE

by Rodney Gambicus

The Mercedes project

Never disable Break," Mercedes was saying. "The whole point of *WarGames* is that you should never disable Break."

Max and I were standing in the back of Kresge Auditorium on the MIT campus, crowded among the people auditing Mercedes' class in freshman Basic. First-term teaching fellows don't usually attract 450 students.

"Amazing. I thought I knew all about the Print statement," Bill Gates said beside me.

"She didn't just correct my homework assignment. She wrote a whole multi-tasking window routine in the margin," Scott Adams murmured. Ten guys in IBM blue suits nodded attentively behind him, and Steve Wozniak was about to say something when there was a mad scramble to see what Mercedes was writing on the chalkboard.

After class, we dragged Mercedes away from her pupils—"Geez, correcting papers," she sighed. "It's worse than judging the one-line contest"—and had lunch at Quincy Market. Max keeps getting turned down for a Visa card, but I had some money left over from our visit to Peterborough.

"So how's everyone at *80 Micro*?" Mercedes asked with her mouth full. Pizza, lemonade, and chocolate chip cookies. What a combination.

"The editors are putting entries on the Big Board," I said. "Amy Campbell for Fury, and Rob Mitchell for Arex."

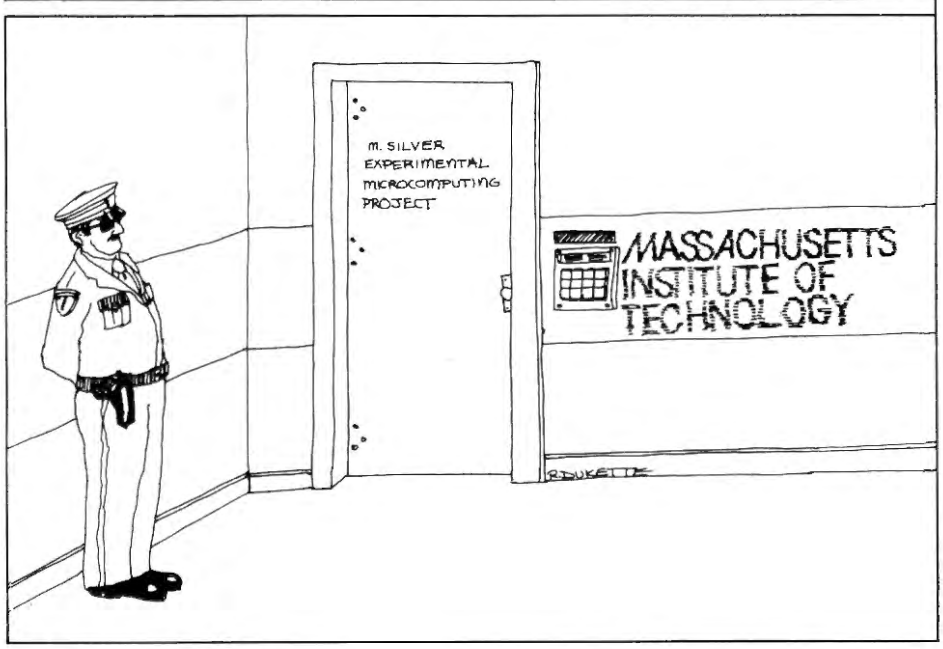
"Pencil pushers," Max muttered. "I could beat them."

"And they don't have the copy of Deathmaze we thought they had," I continued. "What are we going to do about all these letters asking for help?"

" 'How do I get to level 5? I've been known to mutter "Inverted telephone" in my sleep! I'm going crazy!' " Mercedes read. "Bill McGrath, Philadelphia, PA."

"And we've got letters about Asylum II and some other adventures," I said.

"Ask readers who've solved them to write in and become Gamer's Cafe consultants," Mercedes suggested. "You guys are going to need a data base you can call on."



"Helping adventurers," Max groused. "I'm against the whole idea."

"Did you ever find the safe in Deadline, Max?" Mercedes asked sweetly.

Max snarled and bit into his pizza.

"You know, I missed you guys," Mercedes said.

* * * * *

Back at MIT, Mercedes led us past seven security checks and into the basement of the Lincoln Laboratory. "This Ph.D. project is really neat," she beamed. "The only time I ever got to try any hardware work with you guys was changing a tire."

"What exactly are you doing?" I asked, looking askance at what appeared to be a graphite pile. "Your postcard said you'd borrowed a Model 4 from your dad's Radio Shack dealership."

"It's just an upgrade," she said, punching a combination on buttons beside a vault door. "The professors here liked it when I started doing 80-column software stuff with SilverDOS 6.66, and we started talking about whether 8-bit machines were obsolete and what you could do with a Z80A-based system—"

Here Max and I stopped to gape at the object in the middle of the room ahead, even as Mercedes nimbly stepped over the three-foot-diameter cables attached to it. We'd never seen a Model 4 vibrating and hovering a few inches above the table.

"—so a bunch of us started working on the Mercedes Mach 4," she continued. "Don't touch anything, will you?"

* * * * *

"A 3,000 MHz clock speed," I mumbled.

"Yeah, but it doesn't have a Model III mode," Max pointed out. "Wouldn't boot my Bable Terror disk."

"CRAM," I recalled. "Catalytic Random Atomic Memory."

"Wouldn't give back my Bable Ter-

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ror disk, either," Max continued. "Nothing left but the write-protect tab."

"One duodecagigabyte," I said dazedly.

"Shall we look at the mail? Max Marble of Chantilly, VA, writes 'I am not, I repeat, not any relation to Mad Max.' That Cousin Marble. Always such a kidder."

Mercedes had gone off for a meeting with her advisor, and Max was trying to talk me out of my stupor over the Mach 4.

"Everything's expensive in Brisbane, Australia," he read. "Mike Bach says that a Model 100 without modem is $1,099 and a copy of *80 Micro* is $6.70. No wonder Alan Bond spent so much to win the America's Cup."

" 'Just an upgrade,' " I repeated. " 'It's just an upgrade.' "

"Speaking of which, here's an upgrade to Defense Command from Paul Jacoby of Burnsville, MN," Max noted. "You load the game—I guess he has the tape version—and respond to the second *? with /6681. Then, from Ready, you enter FOR P=28000 TO 28090: POKE P,129: NEXT: SYSTEM and press enter. Respond to the *? prompt with /18750 and you're back in the game.

"That Cousin Marble. Always such a kidder."

"This changes the aliens," he read. "Except for the ones that look like T-shirts, they become long rods that reach about halfway down the screen. You have to shoot either straight up the center of the rod or just to the right of it, and be careful not to get between two aliens going opposite directions. And don't stay directly under the Evil Flagship when you hit it.

"Paul says you can replace the 129 with 130 or 131, or, 'for masochists only,' 128," Max finished.

* * * * *

"That 128 is for masochists only," I

The Big Board

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*Expert mode: 339,080 (David Smith, Kingwood, TX).

Gamer's Cafe readers are invited to submit their high scores, preferably with screen photos, for these and other Model I/III/4 games. Sorry, but we are no longer accepting entries for Color Computer games and, due to known bugs or ridiculously high scores, the following: Alien Defense, Armored Patrol, Bounceoids, Dig Out, Eliminator, Galaxy Invasion, Liberator, Paddle Pinball, Scarfman, Skyscraper, and Strike Force.

muttered, pulling the van off Route 128 ("America's Technology Highway") and looking for another place to park the Cafe. We'd done brisk business in the Wang Laboratories parking lot at lunch hour, but some security guy had chased us away into the traffic. Four lanes of people looking for a Burger King.

It was our second day in Boston; Mercedes had canceled her office hours and we were discussing our immediate future.

"I think you should hang around here for a while," she said. "I'm supposed to teach Assembly language next and do a couple of graduate seminars, and I have to stay and work on the Mach 4. The physics and engineering departments are going to help with the storage."

"What do you have in there, anyway?" I asked. "Double-density drives? Quad-density drives?"

"My advisor calls them 'warp drives,' " Mercedes shrugged.

"I can imagine," Max said. "Denser than a black hole."

"Don't be ridiculous," Mercedes said. "A light gray hole, maybe. The lab says they should cause only minor sidereal effects in the immediate vicinity of the machine—"

"Getting back to business," I said, "we probably should wait a while before going on the road again. Give players one more month to write us before we take all those games with scores people say are impossible off the Big Board. Cosmic Fighter, Penetrator, Missile Attack, Space Warp, Venture."

"Do you know how to get off Storrow Drive, Rodney?" Mercedes asked. "We've gone under the Arthur Fiedler Footbridge four times."

At that moment, the radio went dead and I jammed on the brakes as a traffic light ahead turned blank. Within seconds, horns were honking and people were leaning out of apartment windows, shouting "Another blackout!"

"Geez!" Mercedes smacked her seat angrily. "This is the second time they've booted the Mach 4 without my being there. I've *told* them we won't have enough power until we launch Silversat and get the solar panels working. And the microwave transmitter—"

"I think we should stay in Boston for a little while," Max told me.

"I'm not sure it'll be safe," I said. ■

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by Amee Eisenberg

It's a Load 80 year

January, the start of a new year; the Romans symbolized it with the two-faced god, Janus. He looks forward and backward simultaneously, and epitomizes my feelings at this time of year. It is a time to reevaluate the past, then plan for the future.

Looking over my Load 80 collection for 1983, I realize what a blockbuster year it was. From psychological testing tools to stock market analysis programs, we've run them all.

An overview of the highlights has to include the TRS-80 version of Turtle Graphics that ran in February (TURTLE/BAS). This teaching tool lets the youngest of programmers draw on the screen, save his creation, and recall it later.

March was something to roar about—not only did we have the data base management program that won our Reader's Choice Award (AIDS III/BAS), we also featured a LISP compiler (LISP/BAS) that lets you explore this exciting language. (LISP is currently the language of choice among Artificial Intelligence researchers.)

April rounded out your data base manager with subsystems for sorting (MERGE3/BAS), formatting and printing (MAPS3/BAS), and calculating (CALCS3/BAS). And let me remind you about MINICALC/BAS, the spreadsheet program we ran in May.

August was fun and games. Arcade-type games, adventure games, two-player games, and solitaire games; any way you like to play it, Load 80 had it.

But in September, we got back down to business. Featured that month was a communications terminal package for your Model III/4. The six programs comprising UTERM make your micro a terminal for talking to the big data bases.

But enough, you know what you liked this year. My goal was always (and continues to be) to put together a product containing the most interesting, most functional, and most fun programs run in each month's *80 Micro*. I hope you enjoyed them.

Welcome to New Subscribers

Load 80 cassettes and disks are not like any other software you can buy because they contain a wider variety of programs. But all the programs do not necessarily run on your computer. The popularity of the TRS-80 encouraged us to make Load 80 support over a half dozen disk operating systems (DOSes), a gaggle of editor/assemblers, and three models of computer (I, III, and 4). This means I can't put together a ready-to-run product (though I try).

You must determine, by reading the Key Box that accompanies each article, whether the program is appropriate for your machine. Sometimes a little manipulation will make a program run on your system. I try to inform you of these changes in my column. In the coming months, I'll try to cover the hows and whys of converting programs from one machine to another.

Before you decide that a program doesn't work, read the article thoroughly. Because our programs are written by our readers, the error-trapping routines aren't always as sophisticated as those in commercial programs. If this is the case, the article tells you how to avoid crashing the program. If you have serious problems, call or write me (if you include your phone number, I'll call you).

We Aim to Please

I am constantly looking for ways to make our product serve you better. Changes this past year include better documentation, a new transfer utility for Load 80 disks, and supplying our machine-language programs in assembled, ready-to-run format. Sometimes, I'm limited in what I can do by the software I have available. For instance, source code provided to me from an EDTASM Disk editor/assembler can't be written to tape. If you're inconvenienced by this, write to me and I'll try to make some special arrangement.

Plans for the future? The title program that appears each month will expand to include information about the programs, instead of just the copyright. Of course, we'll keep abreast of the TRS-80 market, and you may see some changes in our documentation. And as always, we want to provide our subscribers with the best software and support possible. ■

Article	Page	Cassette File Spec	Disk File Spec	Comments
Side A				
		A	TITLE/BAS	Basic
Touch or Sound Typer	88	B	TOSTYPER/BAS	Basic
Dot Talk	94	C	BRAILLE/BAS	Basic
The Taxman Cometh	100	D	TAXMAN/BAS	Basic
Tape It Easy	112	E	DATAPE/BAS	Basic
Tape It Easy	112	F	TAPE16/BAS	Basic
Side B				
Tape It Easy	112	G	TAPE32/BAS	Basic
Tape It Easy	112	H	TAPE48/BAS	Basic
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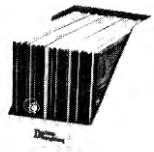

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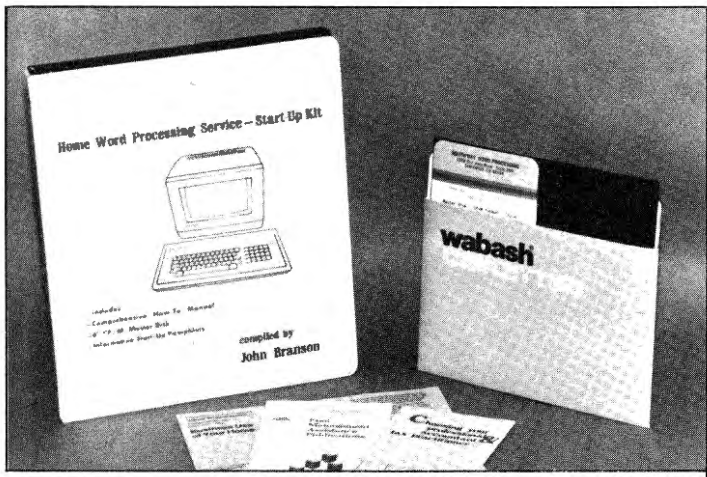
NEW PRODUCTS

edited by S.F. Tomajczyk



Let your word processing program pay your bills.

Starting Your Own Business

Use your computer and your typing skills to make money with the Home Word Processing Service Start-Up Kit. This informational package describes in detail how to start your own word processing service. It includes a comprehensive manual and several pamphlets, in addition to the software. This software gives you sample start-up, marketing, and operating plans that you can implement in your venture.

Priced at $29.95, the Word Processing Start-Up Kit comes with a full money-back guarantee and is sold by South Bay Word Processing at 1558 Oro Vista Road, Suite 290, San Diego, CA 92154, 619-575-8381.

Reader Service ✓ 571

Logical Upgrade

The Norcom TC-III is a new replacement logic board assembly for the Model I that provides you with full Model III performance. It features dual-density floppy disk controller, 48K RAM, optional on-board RS-232, parallel printer port, and dual speed cassette I/O. It also has reverse video character set, on-board audio driver for a speaker, and high readability character font.

All known software and accessories for the Model III will run on the TC-III, including machine-language programs. And all cassette, disk, printer, and I/O bus connectors match those on the Model III. The Norcom TC-III costs $399 and requires installation. The RS-232 option, fully assembled, costs $50. Both are sold by Northern Technology Corporation, 2350 Brickvale Drive, Elk Grove, IL 60007, 312-860-1772.

Reader Service ✓ 565

Dual Processor Option

The 8088 Dual Processor Option (DPO) is a 16-bit CPU board for your Model II, 12, or 16. It lets you run MS-DOS, CP/M-86, CP/M Plus, Xenix, CP/M 2.2, RM/COS, MP/M II, and Concurrent CP/M-86 on your computer system.

The DPO card contains an Intel 8088 microprocessor for its CPU. The 8088 provides the 16-bit addressing capability, processing power and instruction set of the 8086 while supporting the I/O requirements of the 8-bit bus architecture found in your TRS-80.

Although the DPO card by itself is a single processor unit, when installed in your TRS-80, the combination of this card and the existing Z80 CPU results in a dual processor environment.

The standard 8088 DPO comes with 128K of RAM that you can upgrade to 256K. The DPO resides in one slot in your TRS-80 motherboard and coexists with the resident Z80 board. It can also coexist with Radio Shack's optional high resolution graphics and MC68000 upgrade boards.

Prices range from $999 for a 5 MHz DPO board with 128K RAM to $1,649 for an 8 MHz DPO board with 256K RAM. Support for the Radio Shack 8 Megabyte and 12 Megabyte hard disks, including a back-up/restore utility program, is an available option. For further information, contact Veritas Technology Inc., 2375 Zanker Road, Suite 245, San Jose, CA 95131, 408-263-0646.

Reader Service ✓ 556

File Scrambler

Protect your financial projections, R&D reports, and bidding proposals from prying eyes with Super Encryptor, a file scrambling program that operates under MS-DOS and CP/M. The program makes your user files unreadable to anyone without the correct password. Several levels of security are available, with the highest level requiring from an expert programmer hours of mainframe computer time to have even a chance at cracking the password.

Super Encryptor retails for $49.95 from Obsidian Computer Systems, 236 North Santa Cruz Ave., Suite 243, Los Gatos, CA 95030, 408-395-7900.

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The Superguard AC Line Filter/Transient Surge Suppressor is designed to protect your computer, audio equipment, and data from ac line noise, transients, and high-voltage surges. The unit eliminates EMI/RFI common and differential mode noise to 70 decibels, and high voltage and energy spikes to 70 joules (6,500 amps; 780,000 watts).

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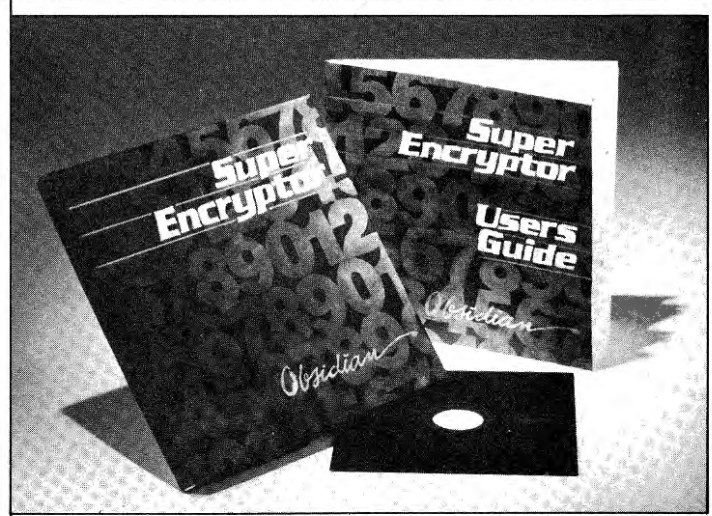

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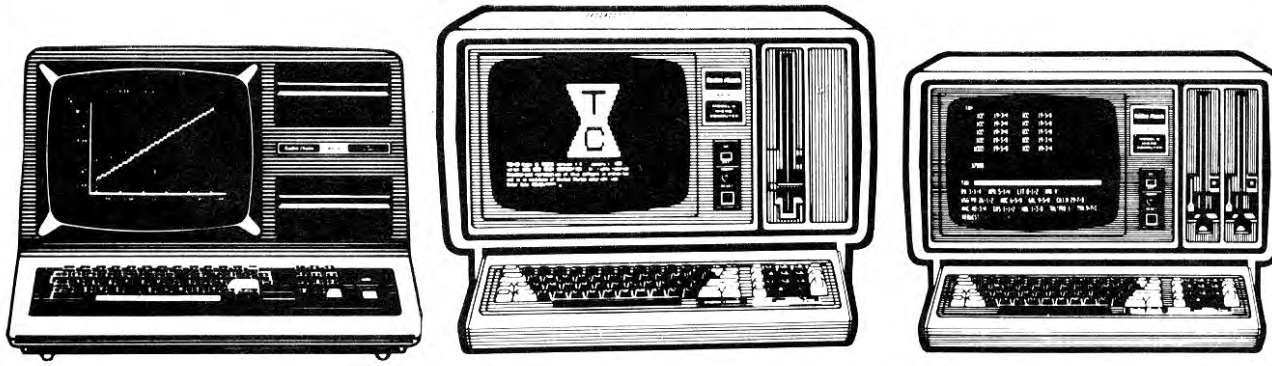

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The Superguard is priced at $249 from PMC Industries Inc., 9353 Activity Road, San Diego, CA 92126, 619-695-3520.

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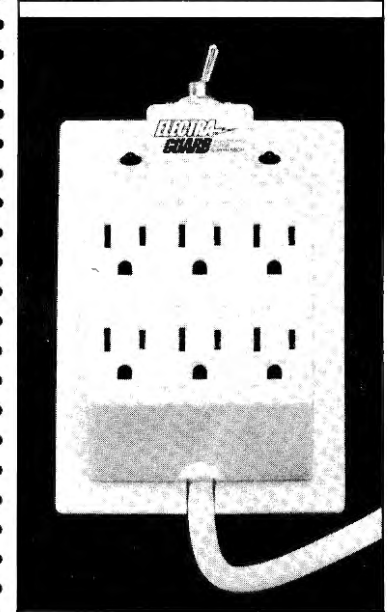

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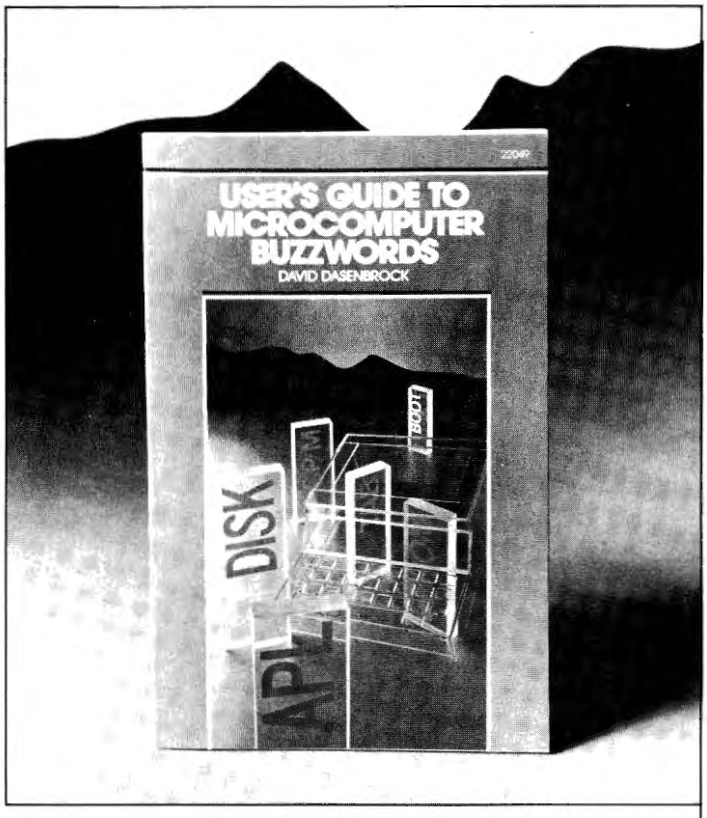
If you write programs that sort, search, sample, shuffle, or plot lines, you can get the corresponding algorithms instantly from the Basic Algorithms Micro Chart. The two-sided, 8½- by 11-inch reference chart is made of credit-card plastic and lists



Hackers and beepers: Now you can understand what they're saying.

useful algorithms in minimal Basic, including four ways to sort. Each entry includes the algorithm's function, advantages, speed, and method of operation.

The program cores are designed for easy translation into other languages, including Assembly language. If you are involved in graphics, a 3 by 5 dot matrix character set is also included on the card in both visual and encoded forms.

These reference cards cost $5.95 each plus $1 for postage from Micro Logic Corp., P.O. Box 174, 100 Second St., Hackensack, NJ 07602, 201-342-6518.

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Say What?

Demystify your child's computer jargon, or pick up a few new phrases yourself with the *User's Guide to Microcomputer Buzzwords* by David H. Dasenbrock. This book is written for people who don't necessarily care what happens inside a computer, but who want to be able to communicate with people who do.

This guide gives you the origins and meanings of hundreds of computer terms. Dasenbrock covers everything from "abort" to "Z80" in clear, concise language accompanied by photos, line drawings and charts.

This illustrated guide sells for $9.95 from Howard W. Sams & Co. Inc., 4300 West 62nd St., Indianapolis, IN 46268, 317-298-5400.

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- With an Autodial modem let **COLORCOM/E** Make your calls for you at 3:00 A.M. when rates are cheap. Then read the results with your morning coffee.

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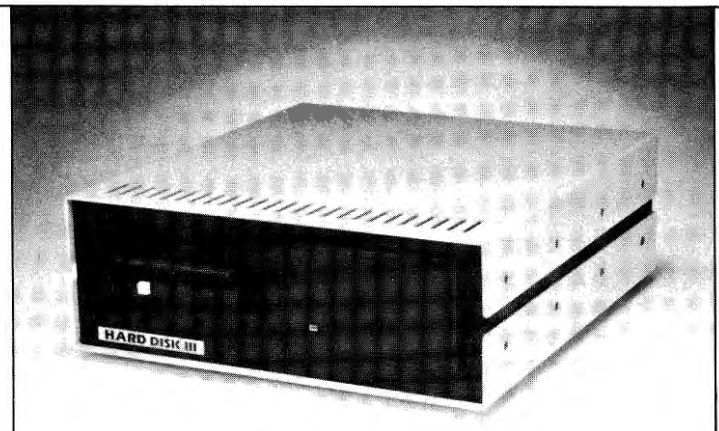
be unscrambled with the same keys that scrambled them in the first place. For extra protection, you can encrypt a file more than once.

Encryption is useful when you send private files by electronic mail. And it is far better than using passwords. Secure costs $49.95 and is available from computer dealers nationwide. For the name of your local dealer, contact Wordmovers Inc., 15818 Hawthorne Blvd., Lawndale, CA 90260, 213-542-7351.

Reader Service ✓ 567

Hard Disk III

The VR Data Hard Disk III is a 5¼-inch Winchester disk subsystem that's compatible with your Model I, III, or 4. It is available in single- or dual-drive configurations, and provides you with storage capabilities of 5 to 30 or more megabytes.



VR Data's Hard Disk III: a powerful subsystem for your computer.

The Hard Disk III features an intelligent disk controller with an on-board microprocessor that provides your computer with a high level command set (e.g., read sector, write sector, format drive, etc.). Its power supply runs on 50 or 60 Hz and is jumper selectable for 115- or 230-volt operation.

The vital statistics of the Hard Disk III 5 Mbyte system include 345/435 TPI, 3,600 rpm, 612 tracks, 3 microsecond track-to-track access time, 8.3 microsecond average latency, 15 microsecond head settling, and 8,000 hours mean time between failure. It measures 14 inches wide by 15 inches deep by 5½ inches high.

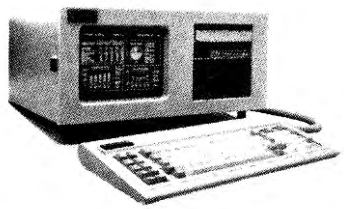
Prices start at $995 for the 5 Mbyte subsystem, including case, power supply, cables, and mounting hardware fully assembled, tested, and burned in. For further information, contact VR Data, 777 Henderson Blvd., Folcroft, PA 19032, 800-345-8102, 215-461-5300. Adapters, which include all hardware and software to run your TRS-80, are priced at $150 and up.

Reader Service ✓ 576

Continued on p. 242

COOSOL COMPUTER PRODUCTS

COLUMBIA DATA MPC



- COLUMBIA System Includes: IBM COMPATIBLE Dual Floppies, 128K RAM, Two RS-232 Serial ports, Centronic Printer port, IBM Compatible Keyboard, Hi-Res Color Graphics Card, Green or Amber Monitor and more with $3,000 Software bundle. COLUMBIA LOW TOTAL PRICE .... CALL

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- EPSON MX-100, 80, & F/T w/GRAFTRAX + ... CALL
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- NEC 3550 ..... CALL
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- NEC PC8023A-C..... $449

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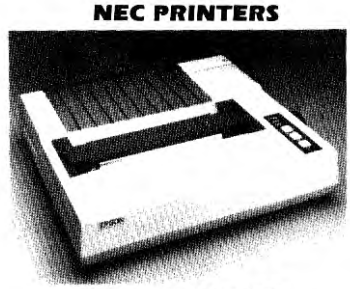

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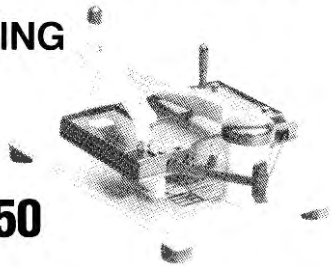

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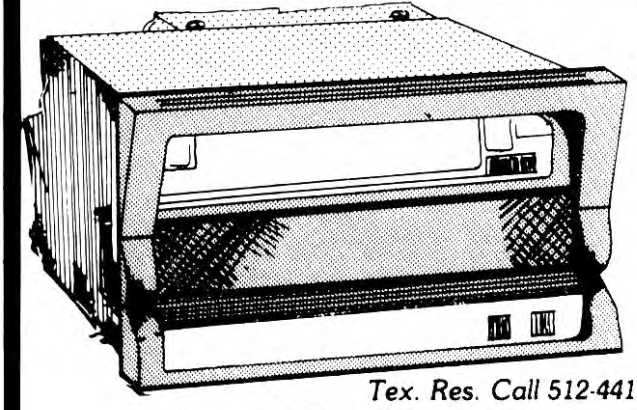

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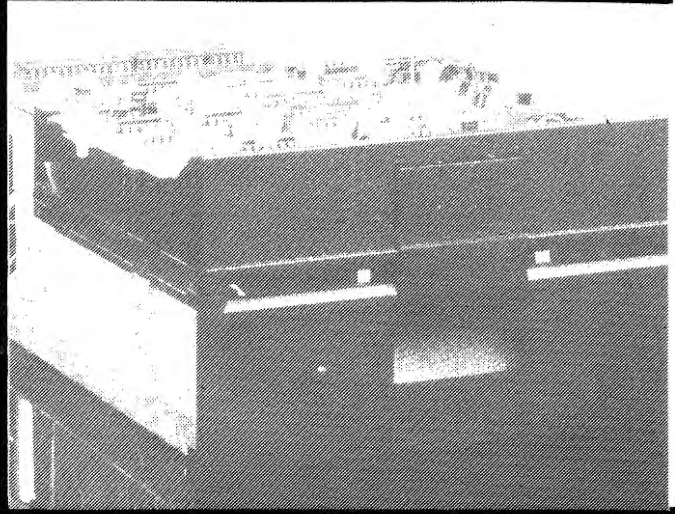

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Continued from p. 238

Model 4 Accountant

Model 4 owners will be pleased to learn that the Peachtree Series 4 accounting software is now available for your system. It consists of a General Ledger, Accounts Payable, and Accounts Receivable.

The General Ledger supports 99 departments, master and subsidiary accounts, optional departmental income statements, automatic posting of transactions from the AR and AP, and user-defined financial reports.

Accounts Payable features cash requirements forecast by due date, aging reports, control reports for audit trails, and distribution of each invoice to up to eight general ledger accounts. The Accounts Receivable supports balance forward, open credit reconciliation, printing of statements and invoices, and detail or summary aging reports.

The Peachtree Series 4 package costs $495 for the floppy disk version and $595 for the hard disk version, both from Compu-Systems Software, 212 Skylark Court, Norman, OK 73069, 405-377-8570.

Reader Service ✓ 580

Subroutine Library

Save hours of programming and debugging time on your Model II, 12, or 16 with USS: Universal Subroutine System from Ramona Enterprises (1133 Taft St., Rockville, MD 20850, 301-340-8100). USS is a Basic language library of over 200 subroutines that perform over 2,000 different operations.

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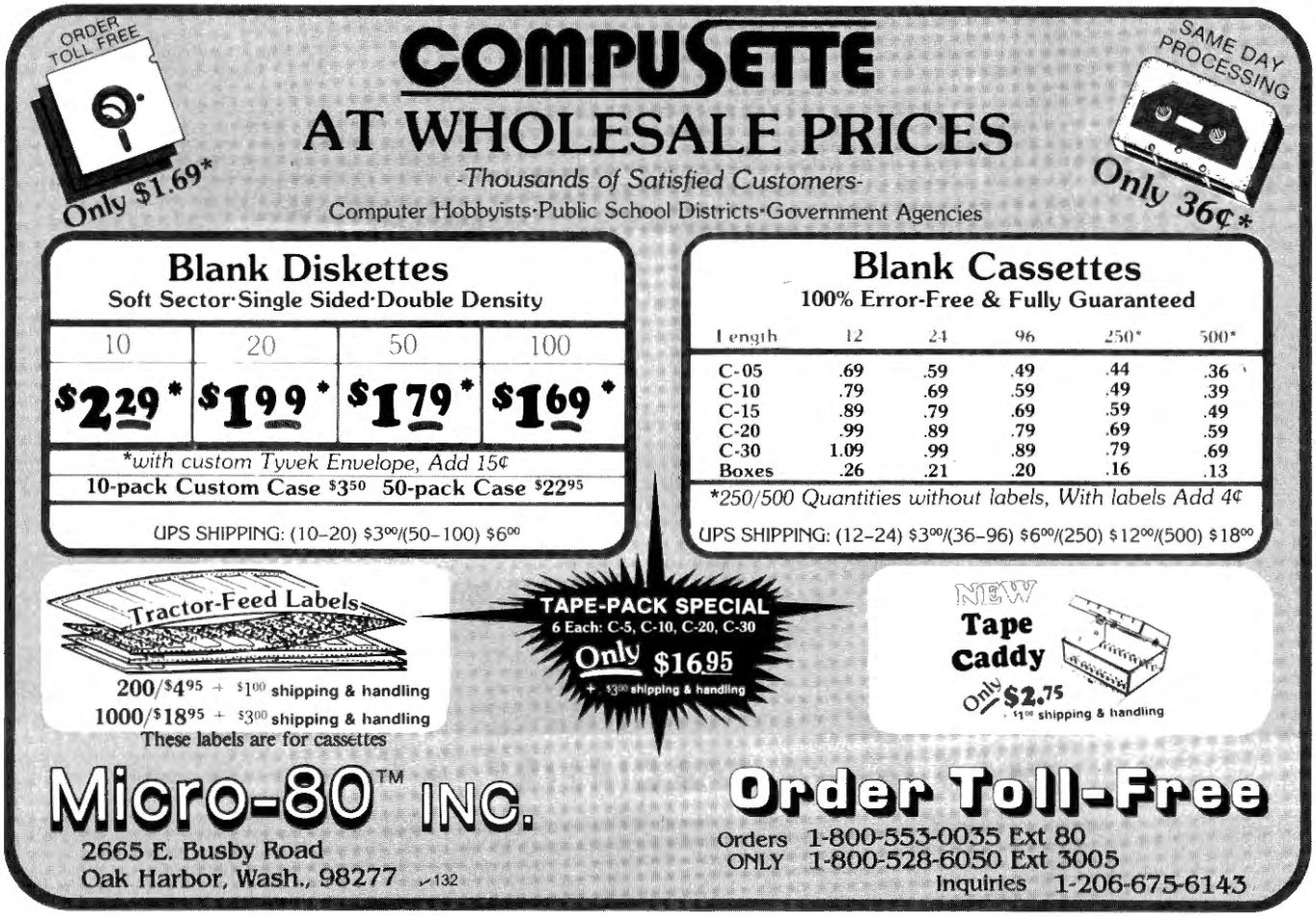
Reader Service ✓ 559

Be Your Own Boss

Everyone has thought of going into business for himself at one time or another. Now you can do it and put your computer knowledge to use with help from John Zarrella's book, *High-Tech Consulting*. This 167-page paperback gives you essential information on how to establish yourself as a paid computer consultant.

Zarella describes the qualifications you need to become a successful consultant and discusses finding work, setting up a consulting busi-



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for the TRS-80 from Micro-Mega

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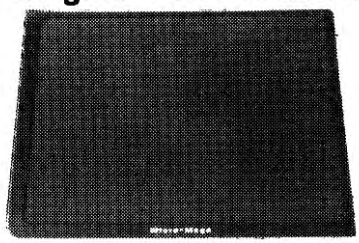

The eye-pleasing Green-Screen fits over the front of your TRS-80 Video Display and gives you improved contrast with reduced glare. You get bright luminous green characters and graphics like those featured by more expensive CRT units.

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(Specify whether for Model I, Model III, or Model IV)

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TRS-80

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ness, the consultant lifestyle, interfacing with clients, setting rates, and collecting payments.

High-Tech Consulting costs $18.95 from Microcomputer Applications, 827 Missouri St., Fairfield, CA 94533, 707-422-1622, 707-422-1465. Also available is the *Consultant's Log*, a 32-page monthly recordkeeping logbook. Each log contains space for you to record mileage, time spent on each consulting project, and entertainment expenses for a complete month.

Reader Service ✓ 563

Label Your Chip

In the past you've had to hunt around with a magnifying glass to identify such things as Reset, VCC, VMA, Clock, or any of the 64 pins that make up your 68000's pin configuration. Now you can rest your eyes by labeling your 68000 microprocessor chip with labels from Computer System Associates Inc. (7562 Trade St., San Diego, CA 92121, 714-566-3911).

The labels attach directly to the 68000 and line up perfectly with the 16-bit chip's pin-out arrangement. They are clearly numbered and marked with respect to each pin's function. The labels cost $13 for a pack of 10.

Reader Service ✓ 557

Inside Super Utility Plus

There's no need to second guess how to properly use Super Utility Plus 3.0 anymore, now that *Inside Super Utility Plus Series 3.0* is available. This guide delves into the intricacies of Super Utility Plus written from the viewpoint of a user, Paul Wiener.

The book describes many of the things that may not be immediately clear to you, explains why you might want to do certain things with Super Utility Plus, how to do them, and details a step-by-step procedure for rescuing disks. There is also a special section for handling various kinds of NEWDOS80 problems as well.

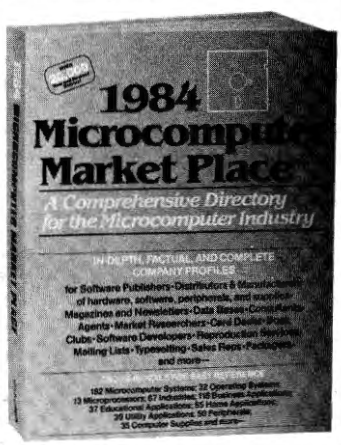
Inside Super Utility Plus does not replace the user's manual, but rather expands on it. It sells for $19.95 from Powersoft Products, 11500 Stemmons Expressway, Suite 125, Dallas, TX 75229, 214-484-2976.

Reader Service ✓ 560

Anything and Everything

You can have the entire computer market in your hand with The Microcomputer Market Place from Dekotek. This comprehensive directory contains in-depth company profiles of over 2,000 software publishers; 175 distributors; 100 data base publishers; 750 manufacturers of systems, peripherals, and supplies; and 400 specialty listings that include consultants, agents, market research companies, duplicating services, and more.

Cross-Indexes give easy reference to microcomputers, peripherals, micropro-



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26-3029 O Drive Color Computer II	$ 399.95	$ 310.00
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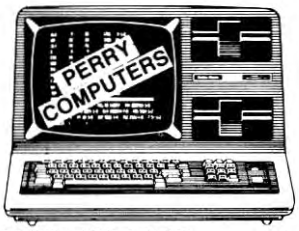

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cessors, operating systems, and computer supplies. The indexes also let you locate software companies by application areas, and, as a bonus, a month-by-month calendar of 165 industry meetings and exhibits is listed with relevant information.

The 1984 Microcomputer Market Place costs $75 per copy from Dekotek Inc., 2248 Broadway, New York, NY 10024, 212-799-6602.

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Model 4 CP/M

Model 4 owners, relax. CP/M 2.2 is now available for your microcomputer. This operating system requires either 64K or 128K of RAM, and features a configuration program for 35-, 40-, 77-, and 80-track single- or double-sided drives and a Format utility that builds over 52 different disk formats. One special feature of interest is an Interchange utility that reads, writes, or copies over 20 popular disk formats including IBM, Kaypro, Osborne, and Xerox.

Other features include full utilization of the function keys, 4 MHz clock speed, ADM-3A emulation, and reverse video. The manufacturer compressed the system code to occupy only the first two tracks of the disk, leaving 170K for data storage.

The CP/M 2.2 operating system costs $199 complete with all utilities and a 300-page user's manual from Montezuma Micro, Redbird Airport Hangar #8, Dallas, TX 75232, 800-527-0347 (US), 800-442-1310 (TX).

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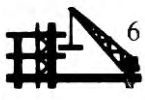

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This comprehensive book costs $20 plus $1 shipping from Misosys, P.O. Box 4848, Alexandria, VA 22303, 703-960-2998 (9 a.m.–6 p.m. M–F).

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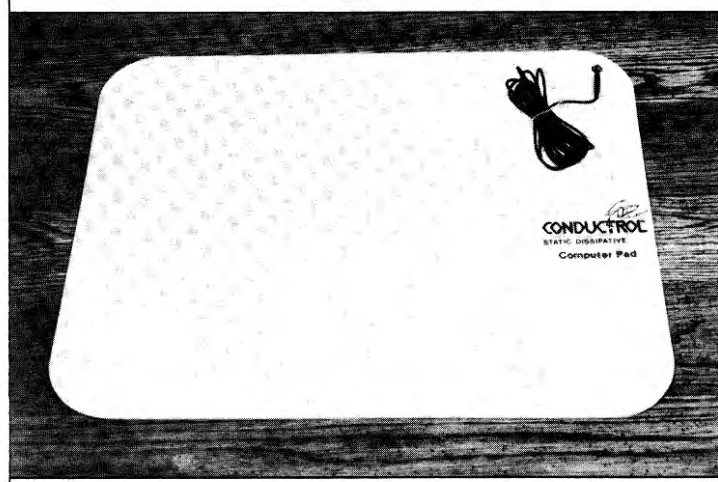

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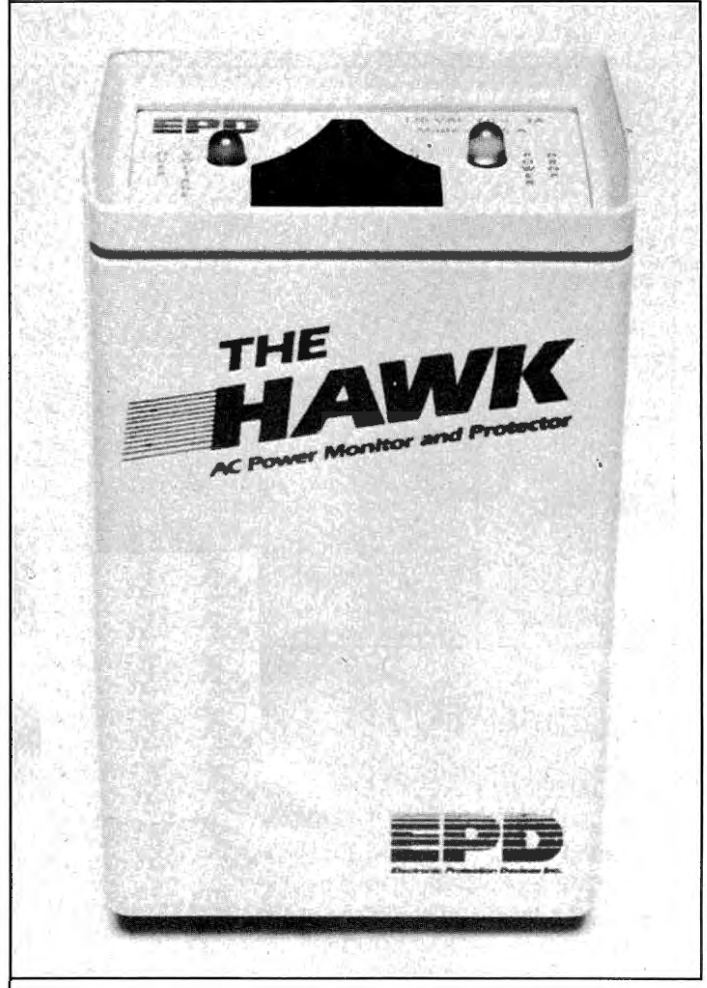

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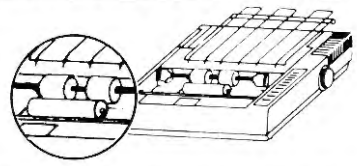

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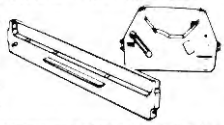

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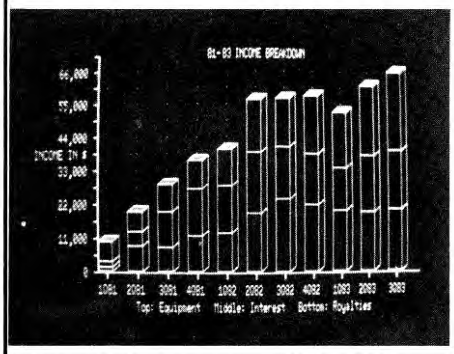
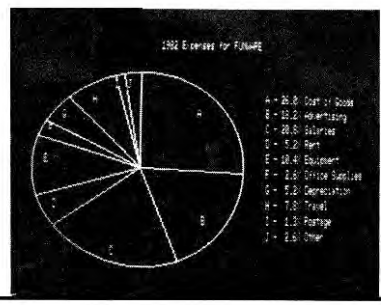
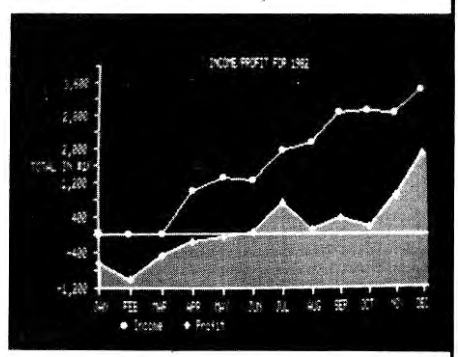


Powerful Graphics. BIZGRAPH is a self-prompting business graphing program designed to work exclusively with Grafyx Solution. Micro-Labs' Grafyx Solution is a plug-in, clip on board which gives you 98,304 points in a 512 × 192 matrix. That's sixteen times as many points as a standard Model III! Improve your business with clear, accurate graphs. Perfect for managers, small businessmen and analysts. The BIZGRAPH package can display Line Graph, Bar Chart, Pie Chart, Area Plot, Histogram Plot, and Scatter Plot. Data can be entered from the keyboard or disk files - including VisiCalc*.

Quality Grafyx. Select graph type, enter data or file name, s lect options, and a graph is quickly displayed in amazingly fine detail. Multiple data sets can be combined on one graph. Another unique eature is the ability to display the hi-res screen along with the normal text and low-res screen.

Versatile Grafyx. BIZGRAPH is a flexible program providing automatic





labeling of X and Y axis points using 85 characters/line. Forecasting future trends is possible using line fitting, quadratic, and third order linear regression analysis. Data smoothing using moving averages is also possible. The finished graph can be saved on disk or printed on any of 20 popular printers.

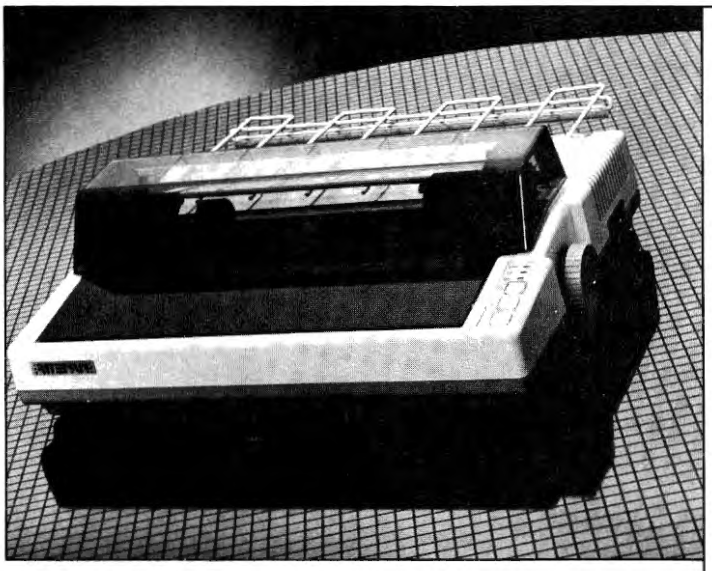
The Grafyx Solution package is shipped from stock and includes the board, 44 programs, and a 54 page manual all for $299.95. The BIZGRAPH program, sample graphs, and manual is $98. Shipping is free on pre-paid or COD orders. (Tx. res. add 5% sales tax.)

*VisiCalc/Registered TM VisiCorp

✓ 464

VISA MasterCard **MICRO-LABS, INC.** 214-235-0915
902 Pinecrest, Richardson, Texas 75080

✓ See List of Advertisers on Page 227



Take it with you: the Riteman printer with standard tractor feed and cover.

tection Devices Inc., 217 Bear Hill Road, PO Box 673, Waltham, MA 02254, 617-891-6602, 800-343-1813.

Reader Service ✓ 570

Look to the Stars

The Greeks and Romans used to look to the stars for guidance and revelations. Ancient mariners depended on the stars for navigation. Now you, too, can look to the stars for fun and recreation with help from the Astronomy Pac. This program enables you to identify and locate any star or constellation in the night sky.

The Astronomy Pac generates its own almanac data and contains detailed information on 58 of the most prominent stars. This lets you print the location of these stars for any time until the year 2000 from any location on earth. Astronomy Pac's star identification program determines the star and constellation you should observe after you enter the time, date, your approximate position, and the star's height and azimuth.

This astronomy program comes complete with software, instructions, astrolab, compass, and H.A. Rey's book, *The Stars*. It is ideal for both beginner and advanced astronomer. The Astronomy Pac costs $59.95 for Model I, III, or 4 cassette, and is sold by Celestial Software, 3010 Warrington Ave., Lakeland, FL 33803, 813-686-3311.

Reader Service ✓ 581

Briefcase-Sized Printer

The problem with most portable computers is that you have to wait until you get back to your home or office to print your notes and letters. All that changes with the Riteman printer. It's a high-quality dot-matrix printer that fits into a briefcase. It measures approximately 3 by 10½ by 14 inches, and weighs 11 pounds.

The Riteman printer prints 120 characters per second in its bidirectional mode, and comes with automatic friction feed. Its high-quality ribbon cassette is guaranteed for one million impressions. Other features include a tractor feed unit with a custom-smoked plexiglass cover, printing starting at one inch from the top of the page, and upper-/lowercase characters with descenders.

Available with Centronics-parallel interface, the Riteman printer is priced at $499 from Inforunner, 1621 Stanford St., Santa Monica, CA 90404, 213-453-8731.

Reader Service ✓ 558

It's a Smal World After All

Previously available to only OEM hardware or software distributors, Smal-LDOS is now available to all you hackers at less than half the price of the full LDOS system. This sophisticated operating system contains all of the popular LDOS commands. The system includes several functions, such as job control language, keyboard type-ahead, and a printer forms controller. The package also includes an advanced version of Disk Basic (LBASIC) for the serious programmer.

Smal-LDOS is available for the Models I, III, and 4 for $59. Contact Logical Systems Inc. for further information at 8970 North 55th St., P.O. Box 23956, Milwaukee, WI 53223, 414-355-5454.

Reader Service ✓ 561

Lock 'em Up!

Protect your floppy disks from unauthorized use with the MDT070, a locking storage system for 5¼-inch magnetic media. It safely stores up to 70 disks. The MDT070 features a locking hinged lid, two built-in carrying handles, and interior disk dividers. The rugged tray is injection

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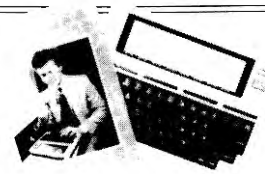
Dealer inquiries invited

The Perfect Companion For Your New Portable Computer



There's a new and exciting computer on the block — Radio Shack's TRS-80* Model 100 Portable Computer. It promises to be one of the most significant advances in personal computing of the 1980's!

And, now, there's a new and just-as-exciting magazine specifically devoted to your Portable Computer. It is called **PCM—The Portable Computing Magazine**, and it is published by the same people who bring you the most popular Color Computer magazine in the world — **the Rainbow**.

PCM—The Portable Computing Magazine sells for $3 per copy and $28 a year by subscription. If, after seeing your first issue, you find it is not for you, just let us know. We'll happily, cheerfully and immediately refund your entire subscription payment. We're that confident that you'll love PCM. After all, it is **The Portable Computing Magazine!**

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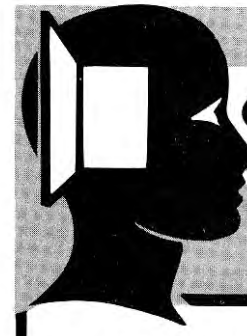

CopyArt II

WILL CHANGE THE WAY YOU THINK ABOUT YOUR TRS-80!

THE MOST POWERFUL WORD PROCESSOR AND ALL PURPOSE COMPUTER PROGRAM AVAILABLE FOR THE TRS-80.

LOOK AT ALL THESE FEATURES

1. **INSERT** characters, words, lines, paragraphs or other files.
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3. **COLUMNS.** CopyArt II can be instructed to print your text from one to six columns. Super easy to use! No complicated commands. Great for doing newsletters, magazine layouts etc. NO MORE CUT AND PASTE!
4. **SORTING.** Sort lines of text by any field. Sorts up to 650 items in less then 7 seconds. Sort indices, table of contents, names, words or whatever in descending or ascending order. Used with CopyArt's math function it is great for small Inventories, Receivables, Payables etc.
5. Screen widths from 32-255 characters wide. Screen widths can be changed to allow formatting your text as you want.
6. **MATH.** Built in MATH function for doing calculations on columns or rows. Used with the SORT command, CopyArt II can do a small inventory of 200-300 items, or keep track of small receivables or payables, general ledgers or home financial reports. Super floating point precision up to 32 digits!
7. *GRAPHICS. CopyArt has a built in graphics program that allows inserting graphics within your text. Drawings, graphs, illustrations, cartoons etc. may be used within newsletters or company reports. Graphics commands include: Plot between points, Circles, Squares, Fill, Erase, Draw, Move, Pixel cursor controls and more.
8. *GRAPHIC CHARACTERS. CopyArt has a built in graphics character generator. Used for typesetting large letters from 3 to 25 times normal size! Yes, you can even print characters down the page as well as across. Black on white or white on black.
9. **JUSTIFICATION** is fully supported. *Proportional spaced justify is supported.
10. *SUPER or SUB-SCRIPT.
11. UNDERLINING.
12. BOLDFACTING.
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14. HELP. Help is available for all the commands at the touch of a key while using the word processor. Super for training inexperienced secretaries. Great reminder for experienced people as well. MENU DRIVEN Help for over 45 commands.

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SIMUTEK COMPUTER PRODUCTS INC., 4897 E. SPEEDWAY BLVD., TUCSON, AZ 85712, (602) 323-9391
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TRS-80 and Scripsit are TM of Radio Shack a Tandy corp.
***Indicates printer must have capability to do function.**

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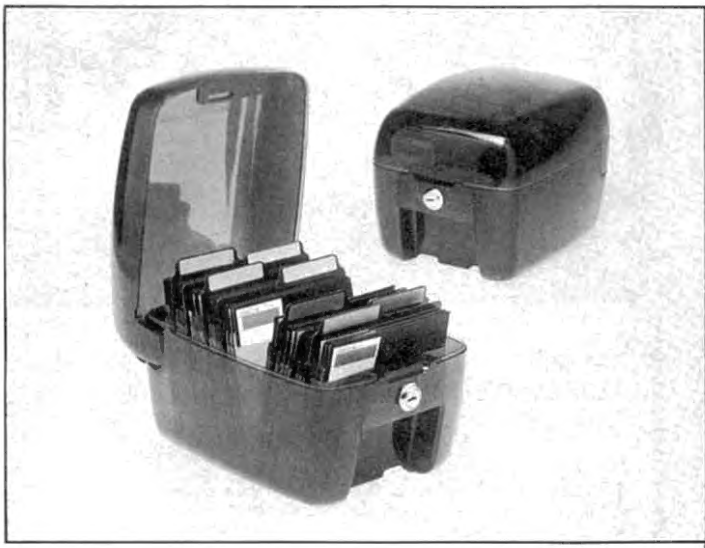


Keep your disks under lock and key with the MDT070.

molded of high-impact plastic for maximum protection of your valuable data.

The MDT070 has a suggested retail price of $24.95 from Ring King Visibles Inc., 2210 Second Ave., P.O. Box 599, Muscatine, IA 52761, 319-263-8144.

Reader Service ✓ 566

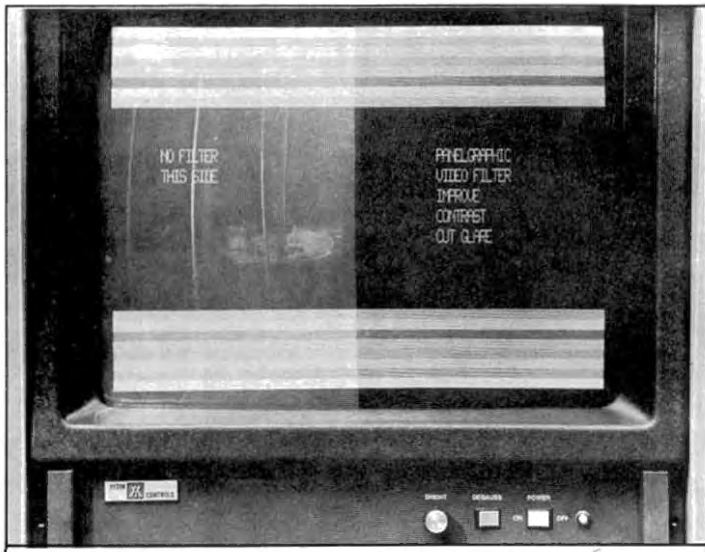
Cutting Through the Glare

There's nothing worse than not being able to see your monitor screen because of glare. You can't escape it, no matter how you turn your head or move the monitor. Well, now you can fight the glare with Panelgraphic Video Filters.

These transparent neutral-gray thermoformed filter panels increase the ratio of the luminance of the excited phosphor to the background without sacrificing your display resolution. Also, a coating of Vueguard 901-AG is applied to the filter to reduce glare. This coating is steel-wool abrasion and chemical resistant. A special transparent coating on the rear of the filter prevents Newton rings.

Available in a wide variety of colors including green and amber, the video filters cost $21.56 for a 5-inch filter; $25.75 for 25 inches; $31.90 for 12–15 inches; $44.03 for 19 inches; and $51.38 for 21 and 25 inches. For additional information, contact Panelgraphic Corp., 10 Henderson Drive, West Caldwell, NJ 07006, 201-227-1500.

Reader Service ✓ 582



You can see the difference that Panelgraphic Video filters make in cutting annoying glare.

Hardwood and Hardware

Once you've bought a printer, your next move is to find a suitable printer stand. Woodtec makes a hardwood-veneered, all-wood printer and monitor stand for your system. They glue the joints for extra strength and resistance to vibration.

The stands are available in walnut, teak, or oak finish stains and come completely assembled for your immediate use. Prices start at $38.95 for a 16½-inch wide stand for the MX-80 or FX-80 printers, and $40.95 for the 24½-inch wide printer stand. Monitor stand prices start at $44.95 for their 11- by 9½- by 21-inch stand.

For further information, contact Woodtec, 320 West Maple, Box 445, Arkansas City, KS 67005, 316-442-7000.

Reader Service ✓ 573

Hardwood veneer, all wood printer stand from Woodtec.

Pocket Manager

PocketPert is a graphics project manager program that runs on both the Radio Shack PC-2 and Sharp PC-1500 pocket computers. It depicts the interrelationships of the tasks in your project by graphing PERT and GANTT charts.

To use, you simply enter the data describing the best, worst, and expected completion times for each of up to 25 tasks in your project. The program takes over and calculates the critical path and draws the charts on the computer's four-color pen plotter. The critical path through the project is identified and drawn in a different color. The program calculates slack times and 50 percent and 95 percent expected completion times.

PocketPert costs $29.95 on tape cassette from PocketIn-

DISnDATa

The Only Disassembler That Even Tracks Down DATA!!!

- Outputs: instead of the meaningless "equivalent",

```
" H37F7  DEFM 'Cass? '          " AB25  LD   B,E
         DEFB 03H       "               LD   H,C
                                        LD   (HL),E
                                        LD   (HL),E
                                        CCF
                                        JR   NZ,$+5    ", etc.
```

- **AUTOMATICALLY** identifies such data areas.
- Outputs fully-labeled Radio Shack* or APPARAT** EDTASM*-format code to display, printer, cassette, or disk. (Printer output fully paginated.)
- Relocates itself to any desired RAM area, up or down by as little as one byte or as many as required.
- Loads programs from cassette or disk and displays entry points.
- Runs on TRS-80 Model I (Level II), Model III, or Model 4 (in Model III mode), 16K or more, cassette or disk.

#1354-12 (Model I/III cassette, Version 2) $34.95
#1354-22 (Model III/4 diskette, TRSDOS* format, Version 2) $39.95

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- Copies virtually **all** formats of cassette files!!!
- **AUTOMATICALLY** senses input cassette density!!! (Model III)
- Allows Mod. III user selection of output density, each file.

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For the TRS-80

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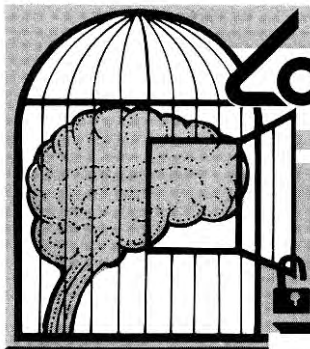

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17. SPELLING checkers like the 74,000 word Scripsit Dictionary work great with CopyArt II.
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20. HEADERS and FOOTERS. You can even put graphics within headers for super page layouts.
21. PAGE NUMBERING. Page numbers can appear at the top or bottom of the page.
22. DOS COMMANDS from within the editor. Kill files, check free space or get directories easily.
23. CUSTOMIZED PRINTER driver. Since your printer has features that other printers don't, CopyArt II will be supplied with the printer driver of your choice below. Each printer driver is custom made to provide you with commands for each of your printer's fine capabilities. If you have more than one printer, order other printer drivers for only $19.95 each. Printer drivers are available for:

- Radio Shack LP IV, V, VI, VII, VIII and Daisy Wheel II
- Epson MX-80, MX-80/FT, MX-100 with or without graftrax.
- Okidata Microline 80, 82a, 83a and 84
- NEC 8023
- Smith Corona Daisy Wheel TP-1
- Brother Daisy Wheel
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- PMC Printer
- Centronics 737, 739
- Diablo 620

OTHERS COMING SOON. Call if you don't see your printer!

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25. MAILIST/MAILMERGE INCLUDED. CopyArt II comes with a mailist program that stores over 2,000 names on a MOD III diskette. These names can be sorted by any field and have a special field for your code. You can make PERSONALIZED FORM LETTERS that will take the following codes from the mailist and insert them in your text. FIELDS INCLUDE: Mr. or Ms., Last name, First name, Business name, City, State, up to 9 digit ZIP code and your own special 2 character code. ANY OF THESE fields can be inserted within your form letter wherever you want. You can print form letters or mailing labels to all the people on your list or to specific codes only. CopyArt makes it easy.

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MULTI-USER SOFTWARE

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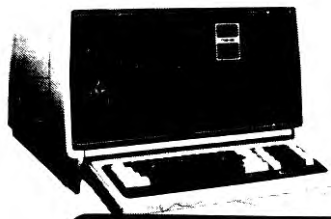

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↙248

NEW PRODUCTS

fo Corp., P.O. Box 152, Beaverton, OR 97075, 503-649-8145.

Reader Service ↙ 554

¿Hablas Español?

Now you can do word processing on your Model I or III in Spanish with Computer Software Curriculum's new Spanish language character generator chip. The computer accesses Spanish characters only when you need them; otherwise, your normal character set appears without any special program loading.

Installation is simple and requires no soldering if you own a keyboard that has been modified for upper-/lowercase. However, if your keyboard still has its original character set, the installation procedure requires some minor soldering.

The Spanish language character chip costs $99 for the Model I and $79 for the Model III from Computer Software Curriculum, 1604 Limestone Trail, Fort Worth, TX 76134, 817-293-2282. In addition to this chip, you can order new character chips in any language within the constraints of the CPU. Write for further information.

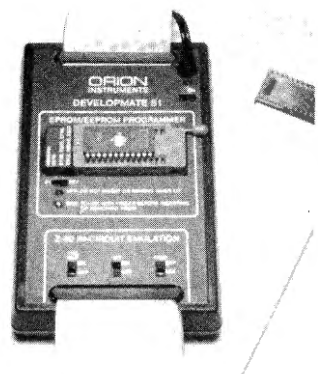
Reader Service ↙ 578

The Lazy Writing Method

Lazy Writer, a popular word processing program from AlphaBit Communications Inc. (13349 Michigan Ave., Dearborn, MI 48126, 313-581-2896), is now avail-

CONVERT YOUR TRS-80 MODEL I, III, OR 4 INTO A

DEVELOPMENT SYSTEM



Now you can develop Z-80 based, stand-alone devices such as games, robots, instruments and peripheral controllers, by using your TRS-80 as a development system. The DEVELOPMATE plugs into the expansion connector of your TRS-80 and adds **PROM PROGRAMMING** and **IN-CIRCUIT-EMULATION** capabilities to your system (with or without expansion interface).

Complete instructions and sample schematics are included to help you design your own simple stand-alone microcomputer systems. THESE SYSTEMS CAN BE AS SIMPLE AS FOUR ICs: one TTL circuit for clock and reset, a Z-80, an EPROM, and one peripheral interface chip.

When the In-Circuit-Emulation cable is plugged into the Z-80 socket of your stand-alone system, the system becomes a part of your TRS-80: You can use the full power of your editor/assembler's debug and trace program to check out both the hardware and the software. Simple test loops can be used to check out the hardware, then the system program can be run to debug the logic of your stand-alone device.

Since the program is kept in TRS-80 RAM, changes can be made quickly and easily. When your stand-alone device works as desired, you use the Developmate's PROM PROGRAMMER to copy the program into a PROM. With this PROM, and a Z-80 in place of the emulation cable, your stand-alone device will work by itself.

The DEVELOPMATE is extremely compact: Both the PROM programmer and the In-Circuit-Emulator are in one small plastic box only 3.2" x 5.4". A line-plug mounted power supply is included. The PROM programmer has a "personality module" which defines the voltages and connections of the PROM so that future devices can be accommodated. However, the system comes with a "universal" personality module which handles 2758, 2508 (8K), 2716, 2516 (16K), 2532 (32K), as well as the new electrically alterable 2816 and 48016 (16K EEPROMs).

The COMPLETE DEVELOPMATE 81, for Model I, with software, power supply, emulation cable, TRS-80 cable, and "universal" personality module $329

DEVELOPMATE 83, Model III/4 version, same as above $329
PM2 PERSONALITY MODULE for 2732A EPROM $15
PM3 PERSONALITY MODULE for 2764 EPROM $15

ORION Instruments ↙151

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able for your Model 4. It takes full advantage of the Model 4's 24- by 80-character display. Text created with this version is compatible with text created on the 16- by 64-character version on the Models I and III.

The Model 4 version costs $175 for new buyers, and comes with two complete sets of programs: one to use on any Model III operating system, the other for TRSDOS 6.0. Current Lazy Writer users can buy the new Model 4 programs for $39.95.

AlphaBit also makes a special version of Lazy Writer for the Lobo MAX-80, which also has the 24- by 80-character display. It operates under the LDOS operating system. Prices are the same as listed above.

Reader Service ✓ 568

DIFFERENT TRACK

A clean computer is a happy computer.

Crummy Keyboard?

Take a look at your computer keyboard. See all that dust and lint between the keys? Don't try to wipe it away with a dust cloth; that won't do the job. Instead, grab hold of the Mini-Vac and suck it all up! The Mini-Vac is a lightweight, quality constructed vacuum cleaner that removes minute particles of dust and debris from hidden or hard-to-reach areas.

The Mini-Vac comes with two interchangeable wands, two fine bristle brushes, and a cloth vacuum bag. It can be either ac or dc powered. It's perfect for cleaning your camera, computer equipment, tape deck, turntable, and other equipment.

This compact and portable vacuum costs $29.95 with a 90-day guarantee from Mini-Vac Inc., P.O. Box 3981, Glendale, CA 91201, 213-244-6777.

Reader Service ✓ 572

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WILL CHANGE THE WAY YOU THINK ABOUT YOUR TRS-80!

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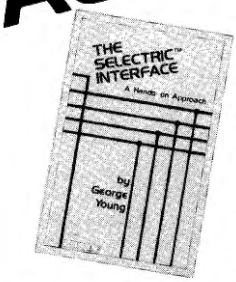

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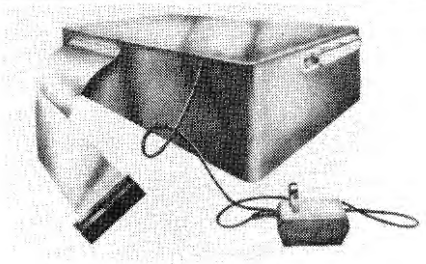

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Nelson	"Making Labels."	A/83:240		III	Producing custom labels in Basic.
Nestor	"Service with a Smile."	7/83:240		II, 12, 16	Learn Basic programming while keeping customer records up-to-date.
Perelman	"Investment Advisor."	A/83:564		II, 16	Determines the profit margin of an investment.
Plyer	"Project Assessment Technique."	9/83:128		I, III	Calculates the rate of return and plans business alternatives.
Ring	"Chart Maker."	3/83:354		I, III	A bar-graph program to help you bring those figures into focus.
Salkind	"Selling Your Software."	1/83:104			How to put your program on the market.
Sprouse	"Mailing List Compiler."	1/83:126	5/83:27	CoCo	Color Computer mailing list program.
Thornton	"Bars and Stripes Forever."	11/83:104		III	A look at industrial bar codes, with three popular styles for your III.
Thornton	"Check-Out UPCs."	11/83:114		I, III	How to create and print UPC codes.
Trojak	"Finding the Search Solution."	12/83:110		II, III	Search text files faster with signature screening.
Welcher	"Reservation Cancellation."	3/83:276		I, III	Makes a travel agent's work easier.

C•NOTES

Author	Title	Issue:Page	Debug	Model	Annotation
Balonis	"Winning Numbers."	11/83:270		100	A program that increases your chances of winning the lottery.
Balonis	"Program Length."	12/83:246		100	A utility program that computes program length in order to manage memory space.
Barbier	"Nothing's Perfect."	8/83:209		100	A closer look at the Model 100.
Barbier	"Uploading Text to WordStar."	8/83:210		100	Transferring text files to WordStar.
Cloutier	"Disassembler."	9/83:283		100	A disassembler for the Model 100.
Deininger	"Remote Robot."	11/83:269		100	A program that controls Radio Shack's radio-controlled robot.
Dixon	"Itinerary 100."	7/83:173		100	Keeps your day organized.
Dixon	"Foxfighter."	8/83:200		100	Clear the sky of air-mines suspended over a city.
Dixon	"Mighty Write."	10/83:266		100	A word processing program for the Model 100.
Dixon	"Cram 100"	10/83:283		100	An exciting line-action game.
Eisenberg	"Monitor 100."	7/83:178		100	Taking a look inside your Model 100.

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INSTANT ASSEMBLER

The Instant Assembler is a powerful assembly language development system for the TRS-80. If you are already an assembly language programmer, its unique design will greatly increase your productivity. If you are just getting started, there is no better assembler to help you learn machine language programming. Some of its unique features are immediate assembly, which detects syntax errors as source is entered, and a compact source format that allows you to write programs nearly three times as large as other assemblers in the same amount of memory. It will assemble to disk, tape, or directly to memory for immediate debugging with the built-in debugger, and also produces relocatable code modules that can be saved on disk or tape and linked together in memory for large or modular assemblies. You can quickly switch from assembler to debugger without losing your source. The built-in debugger will step though your programs one instruction at a time, showing each disassembled instruction and its effect on the registers and memory. It will load or save both conventional source files and its own condensed source format.

The Instant Assembler package includes six separate programs. The assembler itself includes the editor and built-in debugger. The **Linking Loader** is included in several versions for different memory sizes. A stand-alone version of the debugger (**MicroMind**) is also included. **MicroMind** can be relocated in memory and has commands to single-step, set breakpoints, display or alter registers or memory, find bytes or words, disassemble to screen or printer, convert between hex and decimal numbers, and write SYSTEM tapes. The Instant Assembler comes with a comprehensive 65 page instruction manual with many examples.

Specify Model I or Model III. TAPE INTASM 2.1 ..... $39.95 on tape
Specify Model I or Model III. DISK INTASM 2.1 ..... $49.95 on disk

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Mumford Micro offers two telecommunications programs. **TELCOM I** has most of the features needed to communicate with bulletin boards, time share systems, or for file transfers between two disk-based micros over modems or direct wire. It is menu driven and extremely simple to use. Functions include transmit a disk file, receive a disk file, save received data on disk, examine and modify UART parameters, 8 programmable log-on messages, automatic checksum verification of accurate transmission and reception, and many more user conveniences. Supports line printers, lowercase characters, Xon/Xoff protocol, and programmable character keys.

TELCOM II is an expanded version of this program for the most demanding telecommunications applications. The terminal mode now has a help menu and a large printer spooler for high baud rates. From within the terminal mode you can load disk files into the memory buffer, type into the buffer, transmit the buffer, or view the buffer or data that has already scrolled off the screen. It has 10 different programmable messages that can each be sent with a single command for auto log-on or auto dialing, and 5 different character translation tables.

TELCOM II also includes an error correction file transfer mode which is compatible with the LYNC program available on CP/M systems and the IBM PC. **TELCOM II** will exchange disk files with any computer running this protocol (including another TRS-80 running TELCOM II), and will automatically detect and correct errors in transmission. Files can be sent to or fetched from an unattended computer. The extreme ease of use TELCOM I is known for has not been compromised. Reconfiguration of the programmable features is done internally from clear menus for fast, easy operation. Both versions of TELCOM come with complete instruction manuals, which are available separately for $5 to help you decide which program is best suited to your needs.

Specify Model I or Model III. TELCOM I ..... $39.95 on disk
Specify Model I or Model III. TELCOM II ..... $69.95 on disk

MODEL I CLOCK MOD

The SK-2 clock modification allows CPU speeds to be switched between normal, an increase of 50% or 100%, or a 50% reduction. Speeds may be changed with a toggle switch (not included) or on software command. It can be configured to return to normal speed any time a disk is active and has provisions for adding an LED to indicate when the computer is not at normal speed. It mounts inside the keyboard unit with only 4 necessary connections and is easily removed if the computer ever needs service. The SK-2 has been field proven by 3 years of use, and comes fully assembled with socketed IC's and illustrated instructions.

Model I only. SK-2 ..... $24.95

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DISK INDEX will assemble a master index of your entire program library by automatically reading the program names and free space from each disk. The index may then be alphabetized or searched for any disk, program, or extension. It will alphabetize 2400 programs in less than 50 seconds and will find any program out of 2400 in less than 3 seconds. Disks or programs may be added or deleted manually, and the whole index or any selected part may be printed on paper in several different formats. The index itself may also be stored on disk for future access and update. A 48K machine will hold up to 255 disks and over 2400 programs in each file, and you may build as many files as you need. There is no limit to the number of filenames it can read on any one disk. It will run on either a Model I or Model III and catalog disks for either machine regardless of which one is running it, though Model I owners must have double density to catalog Model III disks. It will automatically recognize any DOS and disk density. **DISK INDEX** works with any operating system written for the Model I or Model III except CP/M, and is extremely fast and easy to use.

Specify Model I or Model III. DISK INDEX VERSION 3 ..... $29.95 on disk

INSIDE LEVEL II

The Programmers Guide to the TRS-80 ROMS

INSIDE LEVEL II is a comprehensive reference guide to the Model I and Model III ROMs which allows the machine language or Basic programmer to easily utilize the sophisticated routines they contain. Concisely explains set-ups, calling sequences, and variable passage for number conversion, arithmetic operations, and mathematical functions, as well as keyboard, tape, and video routines. Part II presents an entirely new composite program structure which loads under the SYSTEM command and executes in both Basic and machine code with the speed and efficiency of a compiler. In addition, the 18 chapters include a large body of other information useful to the programmer. 80 Micro said "The book has no flaws; it is a perfect gem." Byte Magazine said "I recommend this book to serious machine language programmers."

Includes updates for Model III. INSIDE LEVEL II $15.95

DEMON DEBUGGER

DEMON (for DEbugger and MONitor) is a sophisticated tool with which you can explore and debug machine language programs. It has two modes of operation. In the STEP mode, it "emulates" the operation of the Z-80 and allows you to step through any machine language program one instruction at a time, showing you the address, hexadecimal value, Zilog mnemonic, register contents, and step count for each instruction. The 19 different STEP mode commands include step, step to a branch, run in step mode at a variable rate, run for a specified number of steps, change flags or registers, execute a CALL or RST, set breakpoints in RAM or ROM, and break when a number in a defined range appears in any double register. The 26 commands in the MONITOR mode include hex arithmetic, hex to decimal conversion, block move, fill memory, find bytes, jump to address, disassemble to screen, printer, disk, or tape, load memory from disk or tape, write memory to disk or tape, full screen memory edit in hex or ASCII, and relocate other programs or itself. Screen displays may be routed to your line printer for hard copy. **DEMON** includes a comprehensive 40 page manual with many examples.

Specify Model I or Model III. DEMON ..... $29.95 on tape or disk

8748 ASSEMBLER

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Eisenberg	"Consulting the I Ching."	10/83:267		100	Finding guidance to problems with the 100.
Firschein	"Harmony and Me."	11/83:265		100	A tone generator for the Model 100.
Jarvela	"Punch Out."	7/83:172		100	A portable payroll program.
Jarvela	"The Final Notice."	7/83:176	9/83:22	100	A payment-scheduling program.
Jarvela	"Subterra."	8/83:203		100	Richard Ramella's adventure game gone portable.
Jarvela	"If It's Tuesday."	9/83:285		100	A currency and measurement conversion program.
Jarvela	"To Market, To Market."	10/83:276		100	A portable shopping list program.
Jarvela	"Nag Analysis."	11/83:264		100	A program that rates horses by a handicapping system.
Oppedahl	"Make Your Own Modem Cable."	12/83:244		100	Shows how to build your own inexpensive modem cable.
Ramella	"The Year in Review."	8/83:207		100	A bar graph that displays data for a 12-month period.
Ramella	"Elapsed Time."	9/83:284		100	Marks the start and end times of a program and gives the elapsed time.
Serotta	"Blackjack."	12/83:247		100	A simulation of the popular casino card game also known as 21.
Sumner	"Inside the Model 100."	12/83:232		100	An extensive memory map for the Model 100.
Woodbury	"Gas/Oil Mileage."	7/83:170		100	Keeping track of your car's gas and oil consumption.
Woodbury	"Traveling Expenses."	7/83:171	9/83:22	100	A program that cumulatively records your travel expenses.
Woodbury	"The Rule of 78."	7/83:180		100	Calculating the interest on a loan.
Woodbury	"Intel."	8/83:201		100	A portable chess-pawn game.
Woodbury	"Renumber 100."	8/83:206		100	A renumbering utility.

COMMUNICATIONS

Author	*Title*	*Issue:Page*	*Debug*	*Model*	*Annotation*
Aldrich	"Satellite Word Processing."	9/83:180		I, III, CoCo	Using your Color Computer as a satellite terminal.
Cameron & Gould	"Compac."	3/83:280		I	A communications package for your computer.
Conviser	"The Murphy Box."	4/83:300			Use this device to diagnose your acoustic coupler's problems.
Miller	"Into the 232."	A/83:582			The scoop about the RS-232 port.
Moyer	"Auto-Dial/Auto-Answer."	A/83:300		I	An addition to your modem that lets your computer answer and dial your phone automatically.
Oppedahl	"Make Your Own Modem Cable."	12/83:244		100	Shows how to build your own inexpensive modem cable.
Payne	"Talk to the Big Guys."	9/83:230	12/83:20	III	A dumb-terminal program.
Rappaport	"Smartcat."	A/83:278		I, III	A powerful communications package for your computer.
Steele	"CASS-80."	2/83:152	5/83:26	I, III	How to have your own cassette-based bulletin board.

DATA-BASE MANAGERS

Author	*Title*	*Issue:Page*	*Debug*	*Model*	*Annotation*
Barbarello	"Financial Transactions Recorder."	9/83:140		II, 16	Organize and tally your business deals.
Eisenberg	"Aid for AIDS-III."	9/83:216		I, III	Getting the most out of this DBMS.
Fiorelli	"Inside AIDS-III."	3/83:136		I, II, III	All about the AIDS-III data-base manager.
Fiorelli	"Inside AIDS-III—Part II."	4/83:168		I, III	Round off your data-management system with MAPS-III, CALCS-III, and MERGE-III.
Ford	"Profile II Modified."	5/83:230		II	Make Profile II easier to use.
Keller	"The Data Base Explained."	A/83:32			An introduction to data bases.
Knight	"Directory Information, Please."	A/83:320	2/83:32		A flexible disk directory to meet your needs.
Mabry	"Profile File Transfer."	7/83:290	10/83:22	I, III	Put Profile data in new files.
Nestor	"Service with a Smile."	7/83:240		II, 12, 16	Learn Basic programming while keeping customer records up-to-date.
Terre	"FlexCat, Your Basic DBM."	A/83:264	5/83:27	I	A data base that meets all your filing and retrieval needs.
Townsend	"Making Hay with Arrays."	10/83:234		I, III	Random access without disk drives.
Trojak	"Finding the Search Solution."	12/83:110		II, III	Search text files faster with signature screening.

EDUCATION

Author	*Title*	*Issue:Page*	*Debug*	*Model*	*Annotation*
Albino	"Billy and the Electric Troll."	5/83:320		I, III	Let these creatures teach your children number patterns.
Bahcall	"Fun for the Younger Set."	2/83:254		I, III	Introduces your youngster to the TRS-80 with math and word programs.
Biedenweg	"Refrigerator Controller."	2/83:212		I	Control the lighting and temperature of your refrigerator for science projects.
Brackney	"TRS-Turtle."	2/83:116	6/83:23	I, III	Brings this famous teaching tool into your Tandy machine.
Cecil	"Long, Long Division."	A/83:284		I	Learning division with a patient tutor.
Christensen	"Horse Race II."	2/83:237		I, III	Revision of a previously published program: Now it's more educational.
Gillen	"Robot Reader."	6/83:302		I, II, III, 12, 16	A Basic program that analyzes text and tells you its difficulty level.
Groll	"The 2,000-Year-Old Algorithm."	3/83:332	6/83:22	I, III, CoCo	Teach your computer to find the greatest common denominator.
Haan	"Math Fun."	2/83:184		III	Learning addition and subtraction the easy way.
Hawkins	"Son of Pilot."	2/83:218		I, III	An altered version of Pilot for your use.
Jacobs	"Election."	A/83:148	5/83:26	I, III	All about the intricacies of campaigning.
Knight	"Math Hangman."	A/83:274		I, III	Develop your math skills with this game.
Krengel	"Spelling Challenger."	2/83:178		I, III	Three word programs that help increase your spelling skills.
Lacy & Gorden	"Colorful Language Instruction."	A/83:442	5/83:26	CoCo	A graphic depiction of how your mouth makes certain sounds.

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✓ See List of Advertisers on Page 227

Modney	"Michael's Game."	2/83:208	7/83:22	I, III	Overcoming computer fear with fun programs for children.
Morgenstern	"Maxwell's Demon."	8/83:234		I, III	Learning thermodynamics the fun way.
Neidenbach	"Foreign Flag Quiz."	2/83:149		I, III	Tests your knowledge of world flags.
Perelman	"B$ Sharp."	3/83:236		II, 16	Teaches your child musical note recognition.
Perry	"Color Life."	2/83:314		CoCo	Learning about the development of communities of organisms.
Stone	"The Glamour of Grammar."	A/83:228		I, III	Learn grammar rules and have fun doing it.
Welde	"States and Capitals."	2/83:166		CoCo	Learning the states and capitals.

FILE HANDLING

Author	*Title*	*Issue:Page*	*Debug*	*Model*	*Annotation*
Baker	"Using Data Files—Part I."	6/83:258		I, II, III	Learning how to handle data files correctly.
Barak	"Statements in Common."	5/83:144		I, II, III	Transferring data from one program to another.
Castor	"Cassette Operating System."	3/83:226		I, III	Data-base management with a tape-based system.
Collins	"DATATP."	10/83:252		I	A hybrid Basic and Assembly listing that simplifies tape data handling.
Faulds	"Tape File Manager."	1/83:324		I	Four routines that will speed up your buffer's reading and writing capabilities.
Ford	"Profile II Modified."	5/83:230		II	Making Profile II easier to use with minor modifications.
Haan	"What's the DIF?"	9/83:108		III	Accessing VisiCalc files from Basic for error-free reports.
Haan	"Assembly-Language Disk I/O."	12/83:88		III	Mastering Assembly-language's I/O techniques for more efficient programs.
Heusinkveld	"Color Computer Merge."	2/83:332		CoCo	Lets you concatenate your programs on tape.
Kepner	"Mod II Random Access."	2/83:280		II	A description of how the II random access really works.
Mabry	"Profile File Transfer."	7/83:290	10/83:22	I, III	An easy Basic program that puts Profile data in new files.
Murray	"Chameleon Code."	12/83:170		I	From Assembly-language to Basic in the blink of an eye.
Nestor	"Mod II File Transfer Utility."	9/83:268		II	How to transfer disk files.
Nicolettos	"Cassette Merge."	1/83:310		CoCo	Combining old Color Computer programs with new ones, and without any retyping!
Reardon	"Sorting in Place."	10/83:172		I, II, III	What to do when there's no room for a random-access disk file.
Sprouse	"Color Disk Directory."	4/83:285	8/83:28	CoCo	A master directory that helps you categorize and quickly locate programs and files.
Townsend	"Making Hay with Arrays."	10/83:234		I, III	Random access without disk drives.
Trojak	"Finding the Search Solution."	12/83:110		II, III	Search text files faster with signature screening.

FINANCE

Author	*Title*	*Issue:Page*	*Debug*	*Model*	*Annotation*
Barbarello	"Financial Transactions Recorder."	9/83:140		II, 16	A data base that organizes and tallies your business deals.
Bell	"Straddle the Market."	11/83:242		I, III	An introductory program to stock options.
Cangro	"The Business of Planning."	9/83:74		I, III	Using Monte Carlo analysis to defeat business problems.
Haan	"What's the DIF?"	9/83:108		III	Accessing VisiCalc files from Basic for error-free reports.
Kemball-Cook	"Build a Better Budget."	3/83:246		I	Let your computer become a financial expert.
Perelman	"Investment Advisor."	A/83:564		II, 16	Determines the profit margin of an investment.
Plyer	"Project Assessment Technique."	9/83:128		I, III	Calculates the rate of return and plans business alternatives.
Sprouse	"Denominational Computation."	1/83:227		CoCo	A financial statement program for the Color Computer.

FORMAT

Author	*Title*	*Issue:Page*	*Debug*	*Model*	*Annotation*
Barbarello	"Space Maker."	11/83:186		II, 16	Inserting spaces into your compressed program listings.
Belcher	"Screen Format Program Generator."	2/83:296		I, III	Lets your computer figure screen locations, field prompts, and input fields.
Chidsey	"Bit Smitten—Part VI."	1/83:316		I, III	How to create nice looking title and credit pages for your programs.
Faulds	"Tape File Manager."	1/83:324		I	Four routines that will speed up your buffer's reading and writing capabilities.
Haan	"What's the DIF?"	9/83:108		III	Accessing VisiCalc files from Basic for error-free reports.
Knight	"Directory Information, Please."	A/83:320	2/83:32		A flexible disk directory to meet your needs.
Morra	"Disk Mysteries Revealed."	A/83:44			Everything you ever wanted to know about floppy disks.

GAME

Author	*Title*	*Issue:Page*	*Debug*	*Model*	*Annotation*
Alar	"Armageddon."	8/83:86		III	Save the city from falling meteors.
Albino	"Commander Flynn in Color."	4/83:242		CoCo	Wild adventures in space.
Albino	"Billy and the Electric Troll."	5/83:320		I, III	Let these creatures teach your children number patterns.
Bell	"Micro-Melodies."	8/83:182		I, III	A new way of testing your memory—match those tunes.
Blatt	"In Search of . . ."	10/83:244		I, II, III	Hides words in diabolical puzzles.
Cataldo	"Building a Better Adventure."	1/83:268		I, III	Knowing about parsing helps you to create better games.
Cebik	"Depth Charge."	11/83:244		I, III	Destroy undersea bases.
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Christensen	"Horse Race II."	2/83:237		I, III	Revision of a previously published program: Now it's more educational.
Cohn	"Fly Like an Eagle."	A/83:306	8/83:28	I	Be behind the controls of this simulation of a sailplane race.
Collura	"Categories."	A/83:200		I, III	Finding words that match the categories.
Conforti	"Muddy Pig Simulator."	8/83:120		III	Catch the muddy pig, if you can.
Cook	"Android Picture Gallery."	A/83:190		I, III	A game that keeps you dusting up the art gallery.
David	"Light Cycle."	8/83:268		I, III	Rev up your light cycle and paint your video screen.
Dixon	"Foxfighter.'	8/83:200		100	Clear the sky of air-mines suspended over a city.
Dixon	"Cram 100."	10/83:283		100	An exciting line-action game.
Efroymson	"Pick a Card. . ."	A/83:176		I	The computer becomes a magician in this exciting card game.
Finkelstein	"Turret."	3/83:326		I, III	Pit your skills against an oncoming invader.
Fisher	"Prime Mission."	11/83:256		I, III	Save the planet from attacking, vicious prime numbers.
Gulick	"Peek Pong."	2/83:310		I, III	Playing a fast table tennis game with your TRS-80.
Hague	"Bustout."	6/83:296		CoCo	A Color Computer version of the popular arcade game.
Hanson	"Outbreak."	1/83:216	6/83:22	I, III	A Basic version of the popular arcade game.
Harrell	"Fortran Breakout."	7/83:186	12/83:20	I, III	A popular arcade game converted to the TRS-80.
Hildreth	"Time Warp."	3/83:218		I, III	Destroy all the time gates and live.
Huben	"Music Composer."	2/83:104		CoCo	Store up to 200 notes on your Color Computer and save the music on tape.
Jarvela	"Subterra."	8/83:203		100	Richard Ramella's adventure game gone portable.
Johnstone	"Lost on the Great Barrier Reef."	8/83:92		I, III	An adventure that might leave you stranded.
Karr	"Maze Chase."	8/83:272		I, III	Catch the asterisk before enemies catch you.
Kime	"Batter Up!"	4/83:130		I, III	Playing baseball when you can't get out to the park.
Knight	"Math Hangman."	A/83:274		I, III	Develop your math skills with this game.
Koch	"Lunar Lander."	1/83:188		II	Model II lunar landing game.
Krengel	"Spelling Challenger."	2/83:178		I, III	Three word programs that help increase your spelling skills.
Kupchanko	"Boxer."	2/83:134		I, III	Tests your pugilistic skill in this game that pits you against the computer.
Lake	"Project Deep Dive."	2/83:96		I, III	Guide your sub through a winding tunnel filled with mines and torpedos.
Llamas	"Almazar I."	A/83:288		I, III	A multi-part adventure game.
Lott	"Model II Casino."	8/83:148	11/83:24	II	It's Las Vegas Night for the Model II.
Michaels	"Kings and Castles."	8/83:246		CoCo	Use your warriors to become Monarch of all kingdoms.
Michel	"Ultimate Joystick Interface."	A/83:592		I	A cheap and easy-to-build joystick interface.
Miller	"Byte Cycles."	2/83:132		CoCo	A joystick game a la the light cycle races in TRON.
Mills	"Strip Blackjack."	8/83:256	10/83:22, 12/83:20		Playing for high stakes in this adult version of a computer favorite.
Modney	"Michael's Game."	2/83:208	7/83:22	I, III	Overcoming computer fear with fun programs for children.
Morgenstern	"Maxwell's Demon."	8/83:234		I, III	Learning thermodynamics the fun way.
Norman	"The Lair of Kraken."	2/83:124		CoCo	Travel through an underwater palace, battling the abominable Kraken.
Parks	"Tee-Off."	4/83:108	9/83:22	I, III	A golf game in which you have to contend with the hazards and wind conditions.
Ramella	"Brainstorm."	A/83:213		I	This game challenges you with number sequences.
Riggs	"Soccer Anyone?"	4/83:322		CoCo	A fast-action, two-person game of soccer.
Rogers	"Jet Bomber."	5/83:298	8/83:26	I	A game that features screen-scrolling.
Saisi	"The Poop on PEEK."	3/83:278		CoCo	Give your arms a rest during fast games by using PEEK instead of INKEY$.
Satterfield	"Attack of the TRS-80."	8/83:226		I, III	Save a lunar colony from a crazed Model I.
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Sutton	"Color Computer Color Code Combo."	5/83:254		CoCo	A game in which you use logic to guess the color combinations.
Toscani	"Games in Color."	A/83:416		CoCo	Color Computer games that will keep you amused and busy.
Uglum	"Rat Maze."	8/83:110		CoCo	A game that lets you feel like a laboratory animal.
Wells	"Math Countdown."	2/83:160	9/83:22	I, III	A basic-math learning game.
White	"Dogfight."	1/83:192		CoCo	You're a flying ace shooting the enemy's biplanes.
Wood	"Return to the Castle."	4/83:326		CoCo	An adventure game complete with dragons, princesses, and gold.
Wood	"Solitary Maneuvers."	A/83:440		CoCo	The Computer is your opponent in this followup to Colorful Maneuvers.

GENERAL

Author	*Title*	*Issue:Page*	*Debug*	*Model*	*Annotation*
Boyd	"Memory Exerciser."	4/83:332		II, 16	Let your computer help strengthen your memory.
Busch	"DROSSDOS/8E."	1/83:342		I, III	KTI takes on the world of disk operating systems.
Busch	"Monkey Business."	5/83:324		I, II, III	KTI strikes again: A novel-writing computer.
Dacus	"Reconcile with Color."	A/83:482		CoCo	Your Color Computer organizes your checkbook and reconciles bank statements.
Deming	"When OK Isn't."	1/83:348		CoCo	Changing your computer's prompts.
Grout	"Twinkle, Twinkle, Little Star."	2/83:270		I, III	Writing graphic poetry on your computer.
Grout	"Apple Core Emulator."	6/83:78		I, III	Shows how your TRS-80 can write and run Apple II software.
Keen & Dischert	"Channels of Communication."	12/83:140		I, III	How to access over 140 TV stations with a satellite dish.
Maloney	"Punklist."	4/83:141		I, II, III, 12, 16	Search for the perfect name for your rock group.

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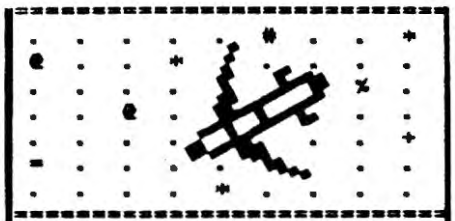

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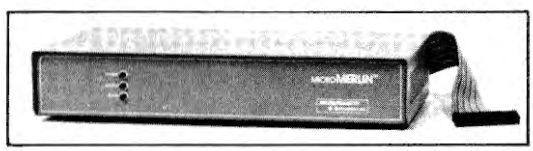

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Martel & Nicholas	"Drop Your Color Computer Into Disk Drive."	2/83:282		CoCo	Upgrading your Color Computer to disk drives.
McDowell	"Insure Your Computer."	A/83:40			How to purchase insurance for your computer.
Mendez	"Hello Bar Codes, Goodbye Keyboard?"	11/83:94			An introduction to bar codes and bar-code readers.
Neibauer	"A History of Programming Languages."	7/83:228			Traces dialects' development from the days of wires and switches to the modern programming era.
Sprouse	"Denominational Computation."	1/83:227		CoCo	A financial statement program for the Color Computer.
Trojak	"Finding the Search Solution."	12/83:110		II, III	Search text files faster with signature screening.

GRAPHICS

Author	*Title*	*Issue:Page*	*Debug*	*Model*	*Annotation*
Barbarello	"Take a Letter. . ."	A/83:558		II, 16	Draw large block letters using regular size letters, any printer, and a Model II.
Belcher	"Screen Format Program Generator."	2/83:296		I, III	Lets your computer figure screen locations, field prompts, and input fields.
Berman	"Block Letters for the Mod II."	1/83:178		II, 16	Print block letter titles on your fanfold printouts.
Brackney	"TRS-Turtle."	2/83:116	6/83:23	I, III	Brings this famous teaching tool into your Tandy machine.
Calmettes	"LP VII Screen Printout."	2/83:252		I, III	Reproduces the video display on paper.
Chidsey	"Bit Smitten—Part VI."	1/83:316		I, III	Teaches you how to create nice looking title and credit pages for your programs.
Clinger	"Tiger Graphics."	A/83:326		I	Graphic techniques for the IDS Paper Tiger printer.
Cole	"The 80 Goes Color."	5/83:90		I, III	Color for the Model III.
Cole	"The 80 Goes Color—Part II."	6/83:116		I, III	USR routines to enhance your programming of color graphics.
Colle	"Color Sketchpad."	6/83:110	11/83:24	CoCo	Your Color Computer's keyboard helps you design graphics.
Commander	"Something-Or-Other 3-D."	A/83:436		CoCo	A 3-D program that features a rotating cube in two colors.
Corbani	"Business Graphics."	5/83:326		I, III	Self-documenting subroutines that tell your company's story in graphics.
Davis	"A Turn of the Screw Revisited."	5/83:246		CoCo	3-D graphics on your Color Computer.
Fowler	"Symmetrical Graphics."	5/83:104		I, III	Learn about the visual symmetry of rotations in a plane and of reflections across a line.
Freese	"Music-80."	3/83:310		I	Belt out your favorite tunes with this music interpreter.
Grant	"Mod II CRT Controller."	7/83:208		II, 12, 16	Program the Model II's chip and control up to 16 screen functions.
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Lacy & Gorden	"Colorful Language Instruction."	A/83:442	5/83:26	CoCo	A graphic depiction of how your mouth makes certain sounds.
Myerson	"Super-Draw."	2/83:108		I, III	Turn your CRT into a sketch pad and save your drawings.
Norman	"High-Res Alphanumerics."	A/83:469		CoCo	Making your own high-res character sets on the Color Computer.
O'Dell	"The Artful Plotter."	9/83:208		III	Plotting intricate, eye-catching figures on Radio Shack's plotter/printer.
Ohs	"Flowchart Generator."	6/83:246		I, III	Makes it easier to plan your programs.
Perelman	"B$ Sharp."	3/83:236		II, 16	Teaches your child musical note recognition.
Ramella	"The Year in Review."	8/83:207		100	A bar graph that displays data for a 12-month period.
Ring	"Chart Maker."	3/83:354		I, III	A bar-graph program to help you bring those figures into focus.
Thornton	"Bars and Stripes Forever."	11/83:104		III	A look at industrial bar codes, with three popular styles for your Model III.
Thornton	"Check-Out UPCs."	11/83:114		I, III	How to create and print UPC codes.
Thume	"Better CoCo Graphics."	6/83:164	11/83:24	CoCo	Graphics editor for the Color Computer.
Tinsley	"Graphics on the Line Printer VII."	4/83:306	8/83:28	I, III	Everything you need to know about creating graphics on the LP VII.

HARDWARE

Author	*Title*	*Issue:Page*	*Debug*	*Model*	*Annotation*
Barbarello	"Model II Real-World Input-Output."	6/83:270		II	A capacitance meter that lets your computer communicate with the outside world.
Barbarello	"The Biobox."	10/83:176		II	A biofeedback interface that helps you monitor your stress.
Biedenweg	"Refrigerator Controller."	2/83:212		I	Control the lighting and temperature of your refrigerator for science projects.
Brewer	"CP/M Cheap."	3/83:112		III	A CP/M modification for $5.
Brothers & Durbin	"Computer Security with a Credit Card."	3/83:74		I	Limit computer access with a credit card.
Cameron	"Using the Model III I/O Bus."	10/83:126		III	A guide to the III's system expansion port.
Chipman	"Do-It-Yourself Computer."	3/83:298			The LNW-80: a versatile and inexpensive upgrade.
Cole	"The 80 Goes Color."	5/83:90		I, III	Color for the Model III.

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✓ See List of Advertisers on Page 227

Cole	"The 80 Goes Color—Part II."	6/83:116		I, III	USR routines to enhance your programming of color graphics.
Cole	"Judge 80."	1/83:221	6/83:22	I	The TRS-80 becomes a soapbox derby judge.
Conroy	"Homebrew Green Screen."	A/83:588			Building your own filter for your video screen.
Conviser	"The Murphy Box."	4/83:300			Use this device to diagnose your acoustic coupler's problems.
Craft & Beplat	"Decoding Bar Codes."	11/83:128		III	Programs that let your Model III read bar codes.
Crew	"Meet the MC68000."	10/83:120		16	A look at the 16 CPU's features for Assembly programmers.
DeTray	"Your First Hardware Project."	3/83:124			An easy hardware-starter kit for the novice.
DeTray	"Hardware Hacker's Tool Kit."	3/83:156			Tools you need to start your career as a hardware hacker.
Deininger	"Remote Robot."	11/83:269		100	A program that controls Radio Shack's radio-controlled robot.
Engelhardt	"Real World, It's About Time!"	3/83:342		III	How to devise a clock that keeps real time.
Engelhardt	"Real-World Control—Part I."	11/83:216		III	Using your computer to monitor home functions.
Engelhardt	"Real-World Control—Part II."	12/83:152		III	Letting your Model III run household appliances.
Fisher	"Interrupt Your 80."	1/83:258		I	A hardware modification to interrupt your TRS-80.
Gangwisch	"Color Black Box."	4/83:232		CoCo	Untangle your RS-232 cables.
Hart	"OMNIPROM."	4/83:262		I	A nearly universal EPROM programmer.
Hartmann	"Making a Weak Link Stronger."	7/83:286			How to cope with the TRS-80's screen.
Hartmann	"Portable Word Processor."	9/83:272		III	Use the Sony Typecorder and your III to create a powerful writing combination.
Lisowski	"Circuit Board Scanner."	5/83:152		I, III	Using Scripsit to help you find PC board part locations.
Mahoney	"Build an EPROM Programmer."	6/83:200	8/83:26	CoCo	Put your favorite programs in ROM packs.
Martel & Nicholas	"Drop Your Color Computer into Disk Drive."	2/83:282		CoCo	Upgrading your CoCo to disk drives.
McGarvey	"Permanent Sound."	A/83:186		I	Installing an internal sound amplifier in your computer.
Michel & May	"Ultimate Joystick Interface."	A/83:592		I	A cheap and easy-to-build joystick interface.
Moses	"Color Computer Light Pen."	5/83:110		CoCo	Enjoy faster and easier input of data with this inexpensive light pen.
Navarrete	"Build It Yourself."	7/83:138		CoCo	A simple serial interface for the MX-80 and CoCo.
Oppedahl	"Make Your Own Modem Cable."	12/83:244		100	Build your own inexpensive modem cable.
Parris	"A Port Mapped A/D Converter."	1/83:358		I	Monitor your freezer and play Pong, too.
Schaefer	"More Memory for Peanuts."	A/83:216		III	Adding memory to your III.
Van Praag	"Hardware Hacker Help."	7/83:274			Analyzing PSI circuitry problems.

HOME/HOBBY

Author	*Title*	*Issue:Page*	*Debug*	*Model*	*Annotation*
Cole	"Judge 80."	1/83:221	6/83:22	I	The TRS-80 becomes a soapbox derby judge.
Deininger	"Remote Robot."	11/83:269		100	A program that controls Radio Shack's radio-controlled robot.
Engelhardt	"Real-World Control—Part I."	11/83:216		III	Using your computer to monitor home functions.
Engelhardt	"Real-World Control—Part II."	12/83:152		III	Letting your III run household appliances.
Freese	"Music-80."	3/83:310		I	Belt out your favorite tunes with this music interpreter.
Hoppesch	"Bowling Statistician."	4/83:218		III	Let a TRS-80 keep track of the pins.
Jarvela	"To Market, To Market."	10/83:276		100	A portable shopping list program.
Lisowski	"Circuit Board Scanner."	5/83:152		I, III	Use Scripsit to help you find PC board part locations.
Morgenstern	"Dual-Voice Music Synthesizer."	A/83:253	6/83:22, 11/83:24	I, III	How to get your computer to play multinotes.
Robichaux	"To Boldly Go. . ."	A/83:156	5/83:27	I, III	Using a computer to help find position and distances of stars.

INPUT/OUTPUT

Author	*Title*	*Issue:Page*	*Debug*	*Model*	*Annotation*
Baker	"Using Data Files—Part I."	6/83:258		I, II, III	Learning how to handle data files correctly.
Barbarello	"Model II Real-World Input/Output."	6/83:270		II	A capacitance meter that lets your computer communicate with the outside world.
Beer	"Lisp: Basically Speaking—Part III."	5/83:306			Learning about I/O methods, temporary variables, saving definitions, and more.
Cameron	"Using the Model III I/O Bus."	10/83:126		III	A guide to the III's system expansion port.
Craft & Beplat	"Decoding Bar Codes."	11/83:128		III	Programs that let your III read bar codes.
Engelhardt	"Real-World Control—Part I."	11/83:216		III	Using your computer to monitor home functions.
Haan	"Assembly-Language Disk I/O."	12/83:88		III	Mastering Assembly-language's I/O techniques for more efficient programs.
Kepner	"Mod II Random Access."	2/83:280		II	A description of how the II random access really works.
Lindsly	"Drivers and DCBs."	6/83:68		I, III	ROM subroutines that teach you all about machine-language programming.
Mabry	"Profile File Transfer."	7/83:290	10/83:22	I, III	An easy Basic program that puts Profile data in new files.
Mendez	"Hello Bar Codes, Goodbye Keyboard?"	11/83:94			An introduction to bar codes and bar-code readers.
Miller	"Into the 232."	A/83:582			The scoop about the RS-232 port.
Morra	"Disk Mysteries Revealed."	A/83:44			Everything you ever wanted to know about floppy disks.
Moses	"Color Computer Light Pen."	5/83:110		CoCo	Enjoy faster and easier input of data with this inexpensive light pen.
Moyer	"Auto-Dial/Auto-Answer."	A/83:300		I	An addition to your modem that lets your computer answer and dial your phone automatically.
Oppedahl	"Make Your Own Modem Cable."	12/83:244		100	Shows how to build your own inexpensive modem cable.
Quindry	"Easy Loader."	3/83:260		I	Basic to machine language to CLOAD.
Rucks	"Model III Relative Files."	A/83:78		III	Overcoming the drawbacks of direct-access files by using relative files accessed by the scatter technique.

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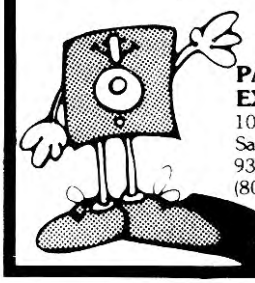

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↙ See List of Advertisers on Page 227

Thornton	"Bars and Stripes Forever."	11/83:104		III	A look at industrial bar codes, with three popular styles for your III.
Thornton	"Check-Out UPCs."	11/83:114		I, III	How to create and print UPC codes.
Townsend	"Rapid Random Access."	A/83:298		I, III	Find specific records quickly, even if you have 10,000 records.

INTERFACE

Author	*Title*	*Issue:Page*	*Debug*	*Model*	*Annotation*
Aldrich	"Satellite Word Processing."	9/83:180		I, III, CoCo	Use your CoCo as a satellite terminal.
Barbarello	"Model II Real-World Input-Output."	6/83:270		II	A capacitance meter that lets your computer communicate with the outside world.
Barbarello	"The Biobox."	10/83:176		II	A biofeedback interface that helps you monitor stress.
Cameron	"Using the Model III I/O Bus."	10/83:126		III	A guide to the III's system expansion port.
Cole	"Judge 80."	1/83:221	6/83:22	I	The TRS-80 becomes a soapbox derby judge.
Craft & Beplat	"Decoding Bar Codes."	11/83:128		III	Programs that let your III read bar codes.
Deininger	"Remote Robot."	11/83:269		100	A program that controls Radio Shack's radio-controlled robot.
Engelhardt	"Real World, It's About Time!"	3/83:342		III	How to devise a clock that keeps real time.
Engelhardt	"Real-World Control—Part I."	11/83:216		III	Using your computer to monitor home functions.
Engelhardt	"Real-World Control—Part II."	12/83:152		III	Letting your III run household appliances.
Hartmann	"Portable Word Processor."	9/83:272		III	Use the Sony Typecorder and your III to create a powerful writing combination.
Michel & May	"Ultimate Joystick Interface."	A/83:592		I	A cheap and easy-to-build joystick interface.
Miller	"Into the 232."	A/83:582			The scoop about the RS-232 port.
Navarrete	"Build It Yourself."	7/83:138		CoCo	A simple serial interface for the MX-80 and CoCo.
Oppedahl	"Make Your Own Modem Cable."	12/83:244		100	How to build your own inexpensive modem cable.
Parris	"A Port Mapped A/D Converter."	1/83:358		I	How to monitor your freezer and play Pong, too.
Payne	"Talk to the Big Guys."	9/83:230	12/83:20	III	A dumb-terminal program.
Van Praag	"Hardware Hacker—Part IV."	1/83:132			Combines 1982 projects in a peripheral support system.

OPERATING SYSTEMS

Author	*Title*	*Issue:Page*	*Debug*	*Model*	*Annotation*
Busch	"DROSSDOS/8E."	1/83:342		I, III	KTI takes on the world of disk operating systems.
Castor	"Cassette Operating System."	3/83:226		I, III	Data-base management with a tape-based system.
Hawkes	"Using Unix-Xenix—Part I."	11/83:212		16	All about the new operating system that gives 16-bit micros mainframe capabilities.
Odneal	"FLEX for the Color Computer."	4/83:144		CoCo	Combining the Color Computer's disk system with the versatile and inexpensive FLEX disk operating system.
Pollard	"Fast Tape Operating System."	A/83:220		I	FTOS lets you use disk commands to increase the speed of storage time in your cassette system.
Quindry	"NODOS 80."	A/83:96		I, III	Getting features of disk operating systems on cassette.

RS-232

Author	*Title*	*Issue:Page*	*Debug*	*Model*	*Annotation*
Aldrich	"Satellite Word Processing."	9/83:180		I, III, CoCo	Using your Color Computer as a satellite terminal.
Barbier	"Nothing's Perfect."	8/83:209		100	A closer look at the 100.
Bogardus	"CC DLOAD."	3/83:190		I	Linking the Color Computer to the I via the DLOAD command.
Conviser	"The Murphy Box."	4/83:300			Use this device to diagnose your acoustic coupler's problems.
Craft & Beplat	"Decoding Bar Codes."	11/83:128		III	Programs that let your III read bar codes.
Gangwisch	"Color Black Box."	4/83:232		CoCo	Stop switching your RS-232 cables around. Build this black box and leave them plugged in.
Hartmann	"Portable Word Processor."	9/83:272		III	Using the Sony Typecorder and your III to create a powerful writing combination.
Miller	"Into the 232."	A/83:582			The scoop about the RS-232 port.
Moyer	"Auto-Dial/Auto-Answer."	A/83:300		I	An addition to your modem that lets your computer answer and dial your phone automatically.
Navarrete	"Build It Yourself."	7/83:138		CoCo	A simple serial interface for the MX-80 and the Color Computer.
Oppedahl	"Make Your Own Modem Cable."	12/83:244		100	Shows how to build your own inexpensive modem cable.

SCIENCE

Author	*Title*	*Issue:Page*	*Debug*	*Model*	*Annotation*
Barbarello	"The Biobox."	10/83:176		II	A biofeedback interface that helps you monitor your stress.
Biedenweg	"Refrigerator Controller."	2/83:212		I	Control the lighting and temperature of your refrigerator for science projects.
Boyd	"Memory Exerciser."	4/83:332		II, 16	Let your computer help strengthen your memory.
Carrera	"Planetary Orbits."	1/83:156		I, III	Calculates a planet's location.
Conviser	"Physically Astronomycal."	10/83:148		CoCo	Three programs that help you understand relativity and learn about star systems.
Durell	"Brief Exposures."	10/83:236		I, III	A tachistoscope program that tests your perceptions.
Eisenberg	"Consulting the I Ching."	10/83:267		100	Finding guidance to problems with the 100.

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See List of Advertisers on Page 227

Faske	"Life with the Model II."	10/83:136		II	Using your computer to examine the population cycles of a community of living organisms.
Fox	"Ephemeris for Comets and Minor Planets."	10/83:90		I, III	Projects the positions of comets and asteroids.
Harris	"Catching Rays."	10/83:256		I, III	Calculates the sun's altitude and azimuth.
Keen & Dischert	"Channels of Communication."	12/83:140		I, III	How to access over 140 TV stations with a satellite dish.
Lilly	"What's Up and When."	10/83:114		III	Finds and names any constellation you are looking for.
Morgenstern	"Maxwell's Demon."	8/83:234		I, III	Learning thermodynamics the fun way.
Perry	"Color Life."	2/83:314		CoCo	Learning about the development of communities of organisms.
Sarnow	"Molecular Matters."	10/83:100		I, III	The molecular orbital theories of chemistry made easy on the I/III.

SECURITY

Author	*Title*	*Issue:Page*	*Debug*	*Model*	*Annotation*
Brothers & Durbin	"Computer Security with a Credit Card."	3/83:74		I	Limited computer access with a credit card.
Engelhardt	"Real-World Control—Part I"	11/83:216		III	How to build a port I/O board to control your household appliances.
Engelhardt	"Real-World Control—Part II."	12/83:152		III	Letting your III run household appliances.
Lantis	"The Password Is . . ."	12/83:179		4	About removing password protection from your DOS.

SERIES

Author	*Title*	*Issue:Page*	*Debug*	*Model*	*Annotation*
Andreassen	"The Art of Encoding and Decoding."	A/83:530		II, 16	Keeping your correspondence private with code.
Andreassen	"The Art of Encoding and Decoding."	2/83:244		II, 16	Translates your cryptic files into readable form.
Andreassen	"The Magic Matrix—Cryptology, Part III."	4/83:291		II, 16	Learn the background of secret ciphers.
Andreassen	"Letter-Frequency Distribution—Cryptology, Part IV."	6/83:190		II, 16	Using letter-frequency distribution to crack ciphertext.
Andreassen	"Scrambled Alphabets—Cryptology, Part V."	11/83:234		II, 12, 16, I, III, 100	Rearranging letters to encrypt data files.
Beer	"Lisp: Basically Speaking—Part I."	3/83:176	7/83:22, 8/83:26	I, II, III, 16	All about Lisp, a language that uses objects instead of numbers.
Beer	"Lisp: Basically Speaking—Part II."	4/83:254			Learning Lisp's LAMBDA, NLAMBDA, and DEFINE atoms.
Beer	"Lisp: Basically Speaking—Part III."	5/83:306			Learning about I/O methods, temporary variables, saving definitions, and more.
Bowker	"Assembly-Language Shortcuts—Part I."	6/83:173		I, III	Simple tricks to make writing Assembly-language programs an easier process
Bowker	"Assembly-Language Shortcuts—Part II."	12/83:116		I, III	More simple tricks of Assembly-language programming.
Chidsey	"Bit Smitten—Part VI."	1/83:316		I, III	Teaches you how to create nice looking title and credit pages for your programs.
Corbani	"Basic, Faster and Readable—Part I."	6/83:104		I, III	The grammar of Microsoft Basic.
Corbani	"Basic, Faster and Readable—Part II."	7/83:200		I, III	Conditional testing and utilizing MBasic.
Corbani	"Basic, Faster and Readable—Part III."	11/83:228		I, III	How to save time by speeding up Basic loops.
Corbani	"Basic, Faster and Readable—Part IV."	12/83:174		I, III	How to make variables work for you.
Grothman	"APL Primer—Part II."	1/83:302			How to use vectors in APL on your TRS-80.
Grothman	"APL Primer—Part III."	2/83:260			A bonanza of functions for your computer.
Grothman	"APL Primer—Part IV."	3/83:200			Learn all about transposing a matrix.
Grothman	"APL Primer—Part V."	4/83:157			All about pi and trig functions, statistics, determinants, and the quadratic formula.
Keller	"The Printer as a Paintbrush—Part I."	5/83:218		I	Learning to use dot-addressable graphics.
Keller	"The Printer as a Paintbrush—Part II."	6/83:282		I	Reproducing the finer shading levels.

TECHNIQUES

Author	*Title*	*Issue:Page*	*Debug*	*Model*	*Annotation*
Andreassen	"The Art of Encoding and Decoding."	A/83:530		II	Keeping your correspondence private with code.
Andreassen	"The Art of Encoding and Decoding."	2/83:244		II, 16	Translates your cryptic files into readable form.
Andreassen	"The Magic Matrix—Cryptology, Part III."	4/83:291		II, 12, 16	Learn the background of secret ciphers.
Andreassen	"Letter-Frequency Distribution—Cryptology, Part IV."	6/83:190		II, 16	Using letter-frequency distribution to crack ciphertext.
Andreassen	"Scrambled Alphabets—Cryptology, Part V."	11/83:234		II, 12, 16, I, III, 100	Rearranging letters to encrypt data files.
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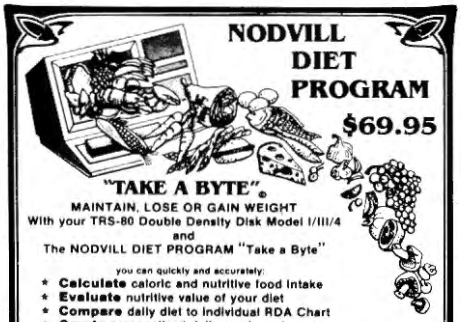

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↙ See List of Advertisers on Page 227

Bowker	"Assembly-Language Shortcuts—Part I."	6/83:173		I, III	Simple tricks to make writing Assembly-language programs an easier process.
Bowker	"Assembly-Language Shortcuts—Part II."	12/83:116		I, III	More simple tricks of Assembly-language programming.
Bunch & Lisi	"Which Way the Wind Blows."	7/83:130		I, III	A weather data base.
Cataldo	"Building a Better Adventure."	1/83:268		I, III	Knowing about parsing helps you to create better games.
Clapp	"Linear Programming."	A/83:70		I	Using linear programming to help analyze your decision problems.
Clinger	"Tiger Graphics."	A/83:326		I	Graphic techniques for the IDS Paper Tiger printer.
Corbani	"MiniCalc."	5/83:140		I, III	Applying matrix logic to business applications.
Corbani	"Basic, Faster and Readable—Part I."	6/83:104		I, III	The grammar of Microsoft Basic.
Corbani	"Basic, Faster and Readable—Part II."	7/83:200		I, III	Makes conditional tests easier by tailoring the logic to the expected input.
Cranmer	"Windchill Determiner."	1/83:238		III	Determines just how cold those winter mornings really are.
Curtis	"Teach Your CC New Words."	A/83:408		CoCo	Adding commands, statements, and functions to Color Basic.
Dihopolsky	"My Foe Flicker."	8/83:124		III	Keeping your electron gun on target, and eliminating video flicker.
Haan	"Assembly-Language Disk I/O."	12/83:88		III	Mastering Assembly-language's I/O techniques for more efficient programs.
Kalinowski	"PRINT @ Graphics."	3/83:164		I, III	Demonstration programs that help you produce graphics and improve your programming skills.
Keen & Dischert	"Programming the Model 16."	6/83:244		16	Everything you need to know about programming the 68000 chip.
Keil	"Saving Strings."	9/83:116		I, III	A very fast and powerful INKEY$ routine.
Lindsly	"Drivers and DCBs."	6/83:68		I, III	ROM subroutines that teach you all about machine-language programming.
McTernan	"Optimize Your Code."	1/83:270		I	Making your programs run faster with help from a stopwatch.
Miller	"Compress It."	3/83:336		I, II, III, CoCo	Squeeze a 12K program into a 4K computer.
Mills	"Partially Disabled Break."	1/83:197	5/83:27	I, III	Salvation for accidentally hitting the break key.
Nicolettos	"Cassette Merge."	1/83:310		CoCo	Combining old Color Computer programs with new ones, and without any retyping!
Payne	"Talk to the Big Guys."	9/83:230	12/83:20	III	A dumb-terminal program.
Plyer	"Project Assessment Technique."	9/83:128		I, III	Calculates the rate of return and plans business alternatives.
Reardon	"Secret Ciphers."	3/83:208		I, II, III	A public-key cipher system that is almost unbreakable.
Reardon	"Sorting in Place."	10/83:172		I, II, III	What to do when there's no room for a random-access disk file.
Rideout	"Using DEFFN."	A/83:196		I, III	Save memory and simplify your programs with the DEFFN statement.
Rifkin	"Self-Modifying Programs."	3/83:252		I, III	Gets rid of clumsy duplications of code.
Rucks	"Model III Relative Files."	A/83:78		III	Overcoming the drawbacks of direct-access files by using relative files accessed by the scatter technique.
Saisi	"The Poop on PEEK."	3/83:278		CoCo	Give your arms a rest during fast games by using PEEK instead of INKEY$.
Sensicle	"Cassette Index."	2/83:224		CoCo	Shortens your Color Computer's loading time to less than 20 seconds.
Sprouse	"Mailing List Compiler."	1/83:126	5/83:27	CoCo	Color Computer mailing list program.
Stover	"Ordering Via Recursive Routines."	6/83:300		I, II, III, CoCo	Recursive routines that calculate all possible number combinations in a small amount of code.
Tinis	"Tee-Totaler."	4/83:236		I, III	Become your golf league's record keeper.
Townsend	"Rapid Random Access."	A/83:298		I, III	Find specific records quickly, even if you have 10,000 records.
Weide	"Testing Your New RAM."	3/83:150		CoCo	Locating the problem of why your added memory doesn't work.
Whitney	"Coping with Cassettes."	A/83:590			Maintenance procedures for your cassette recorder.
Wood	"Expanded Color Capabilities."	A/83:486		CoCo	Display four colors on your Color Computer's screen at one time.

TUTORIAL

Author	*Title*	*Issue:Page*	*Debug*	*Model*	*Annotation*
Andreassen	"The Art of Encoding and Decoding."	A/83:530		II, 16	Keeping your correspondence private with code.
Andreassen	"The Art of Encoding and Decoding."	2/83:244		II, 16	Translates your cryptic files into readable form.
Andreassen	"The Magic Matrix—Cryptology, Part III."	4/83:291		II, 16	Learn the background of secret ciphers.
Andreassen	"Letter-Frequency Distribution—Cryptology, Part IV."	6/83:190		II, 16	Using letter-frequency distribution to crack ciphertext.
Andreassen	"Scrambled Alphabets—Cryptology, Part V."	11/83:234		II, 12, 16, I, III, 100	Rearranging letters to encrypt data files.
Barden	"Assembly-Language Primer."	A/83:16	6/83:23	I, III	Making the plunge into Assembly language.
Beer	"Lisp: Basically Speaking—Part I."	3/83:176	7/83:22, 8/83:28	I, II, III, 16	All about Lisp, a language that uses objects instead of numbers.
Beer	"Lisp: Basically Speaking—Part II."	4/83:254			Learning Lisp's LAMBDA, NLAMBDA, and DEFINE atoms.
Beer	"Lisp: Basically Speaking—Part III."	5/83:306			Learning about I/O methods, temporary variables, saving definitions, and more.
Bowker	"Assembly-Language Shortcuts—Part I."	6/83:173		I, III	Simple tricks to make writing Assembly-language programs an easier process.

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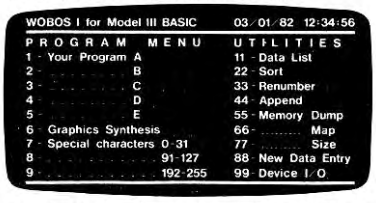

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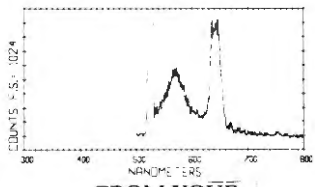

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Brothers	"Assembly Language Made Simple—Part I."	12/83:74		I, III	An introduction to writing Assembly programs: How the Z80 processes instructions.
Busch	"Nine Programming Tricks."	A/83:56			Shortcuts to faster Basic programming.
Chidsey	"Bit Smitten—Part VI."	1/83:316		I, III	Teaches you how to create nice looking title and credit pages for your programs.
Colle	"Color Sketchpad."	6/83:110	11/83:24	CoCo	Your Color Computer's keyboard helps you design graphics.
Corbani	"Basic, Faster and Readable—Part I."	6/83:104		I, III	The grammar of Microsoft Basic.
Corbani	"Basic, Faster and Readable—Part II."	7/83:200		I, III	Conditional testing and utilizing MBasic.
Corbani	"Basic, Faster and Readable—Part III."	11/83:228			How to save time by speeding up Basic loops.
Corbani	"Basic, Faster and Readable—Part IV."	12/83:174		I, III	How to make variables work for you.
Crew	"Meet the MC68000."	10/83:120		16	A look at the 16 CPU's features for Assembly programmers.
DeTray	"Your First Hardware Project."	3/83:124			An easy hardware-starter kit for the novice.
DeTray	"Hardware Hacker's Tool Kit."	3/83:156			Tools you need to start your career as a hardware hacker.
Eisenberg	"Aid for AIDS-III."	9/83:216		I, III	Getting the most out of this data-base manager.
Engelhardt	"Take It Off."	12/83:177		4	How to crack TRSDOS 6.0's password so that you can erase utilities and clear disk space.
Esposito	"Binary Breakfast."	A/83:50		I, III, CoCo	Understanding the binary system your computer uses.
Grant	"Mod II CRT Controller."	7/83:208		II, 12, 16	Program the II's chip and control up to 16 screen functions.
Grothman	"APL Primer—Part II."	1/83:302			How to use vectors in APL on your TRS-80.
Grothman	"APL Primer—Part III."	2/83:260			A bonanza of functions for your computer.
Grothman	"APL Primer—Part IV."	3/83:200			Learn all about transposing a matrix.
Grothman	"APL Primer—Part V."	4/83:157			All about pi and trig functions, statistics, determinants, and the quadratic formula.
Hansen	"How to Buy a Printer."	A/83:572			Good advice on how to select a printer.
Harrell	"A Pascal Primer."	7/83:94	11/83:24	I, III	Learning Pascal while playing cribbage.
Harrell	"Fortran Breakout."	7/83:186	12/83:20	I, III	A popular game speeded up with Fortran.
Hawkes	"Using Unix-Xenix—Part I."	11/83:212		16	All about the new operating system that gives 16-bit micros mainframe capabilities.
Keen & Dischert	"Ribbon Rewind."	A/83:586			Save money by rewinding multistrike carbon ribbons for your Daisy Wheel II printer.
Keller	"The Data Base Explained."	A/83:32			An introduction to data bases.
Kepner	"Mod II Random Access."	2/83:280		II	A description of how the II random access really works.
Martel & Nicholas	"La Plume de Ma Tante."	7/83:78	11/83:24		An overview of popular computer languages.
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Scarpelli	"How to Copyright."	1/83:154			All about copyrighting your programs.
Schaefer	"More Memory for Peanuts."	A/83:216		III	Adding memory to your III.
Sumner	"Inside the 100."	12/83:232		100	An extensive memory map for the 100.
Townsend	"Making Hay with Arrays."	10/83:234		I, III	Random access without disk drives.
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Van Praag	"Hardware Hacker Help."	7/83:274			Analyzes PSI circuitry problems.
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Vose	"The Art of Documentation."	1/83:117			How to write clear and precise manuals for your programs.
Weersing	"The Sum of its Parts."	A/83:60			How to go about writing a Basic program.

UTILITY

Author	*Title*	*Issue:Page*	*Debug*	*Model*	*Annotation*
Baker	"PENRAM."	1/83:276		I	A machine-language utility to edit random access memory.
Balewski	"Super Spooler."	A/83:144		I	Use your computer while it's printing.
Balonis	"Program Length."	12/83:246		100	Compute program length to manage memory space on the 100.
Barak	"Statements in Common."	5/83:144		I, II, III	Transferring data from one program to another.
Barbarello	"Take a Letter..."	A/83:558		II, 16	Draw large block letters using regular size letters, any printer, and a II.
Barbarello	"Space Maker."	11/83:186		II, 16	Inserting spaces into your compressed program listings.
Barbarello	"BRKSEL."	A/83:534		II	Disable the break key with this program.
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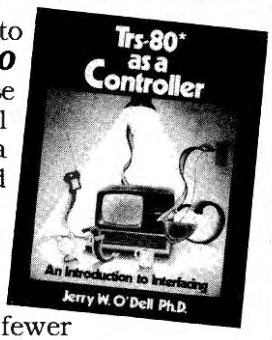

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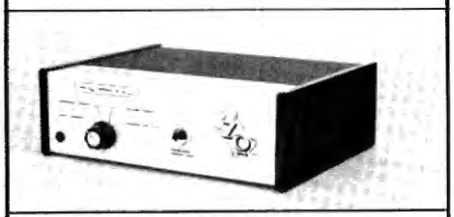

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6.	f3-d4	g8-f6	22.	c3-b4	a5-b4
7.	b1-c3	g7-g6	23.	a1-c1!	c4-b6
8.	e1-g1	f8-g7	24.	c1-c8+	b6-c8
9.	c1-e3	e8-g8	25.	b3-c4	b5-d7
10.	d1-d3	a7-a6	26.	c4-b4	c8-a7
11.	c3-d5	b7-b5?	27.	b4-b8+	f6-e8
12.	d5-b6	d7-b7	28.	d4-c4	a7-c6
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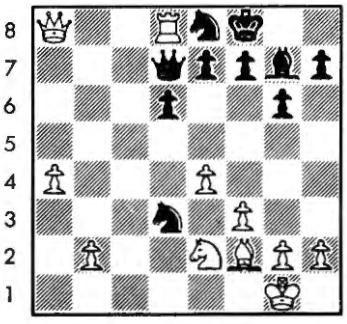

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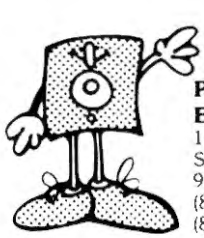

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FULLY EQUIPPED

The LNW80 2 was developed to anticipate the needs of both expansion and compatibility. So the computer was designed with enough built-in features to keep you from having to spend a small fortune as you move down the road to higher levels of user sophistication. Standard features include high and low resolution graphics in both color and black-and-white, an asynchronous serial communication channel, and a wide variety of tape, printer, monitor and hardware expansion ports. In addition, the LNW80 2 contains an array of quality construction features that fully justify its remarkable one-year limited warranty.

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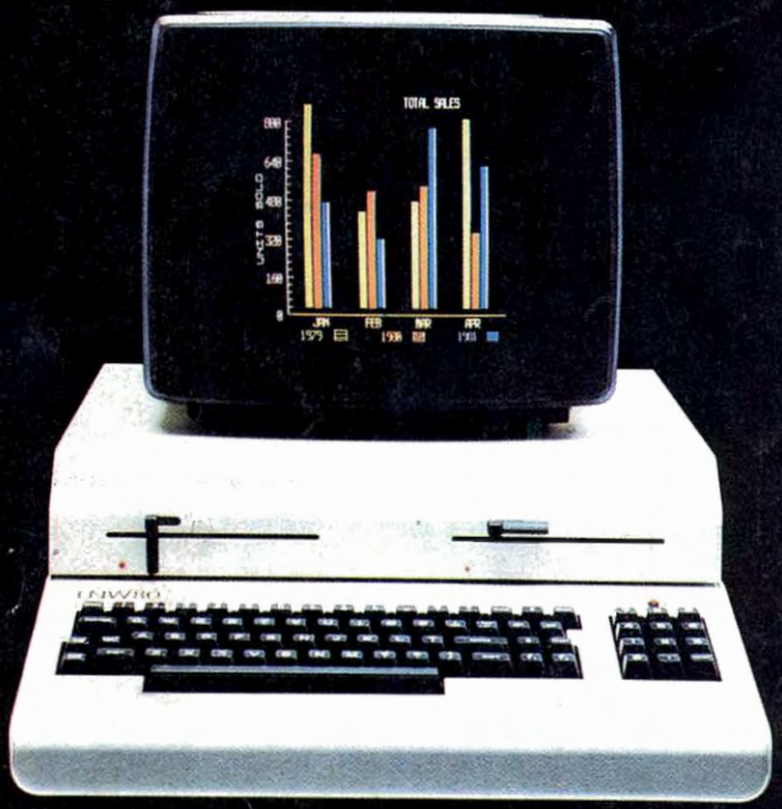

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